ISSN 1027-7811 Volume 27 / Number 1 April 2019

Journal of the Hong Kong College of CARDIOLOGY

Including Abstracts of
Twenty-Seventh Annual Scientific Congress
Hong Kong College of Cardiology
31 May 2019 – 2 June 2019

Journal of the Hong Kong College of Cardiology

Journal of the Hong Kong College of Cardiology (ISSN 1027-7811) is published bi-yearly by **Medcom Limited**, Flat E8, 10th Floor, Ka Ming Court, 688-690 Castle Peak Road, Cheung Sha Wan, Kowloon, Hong Kong, tel (852) 2578 3833, fax (852) 2578 3929, email: mcl@medcom.com.hk

Indexed in EMBASE/Excerpta Medica

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Journal of the Hong Kong College of Cardiology

April 2019
Volume 27, No. 1

Table of Contents

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Acute and Remote Thrombotic Complications in Patients with Implanted Drug-eluting Stents; Influence of Smoking as a Risk Factor

MAJA STOJANOVIĆ,[1] RADE BABIC,[2] ZORAN STAJIC,[3] MILICA CIZMIC,[1] VIOLETA IRIC CUPIC[4]

From [1]Military Medical Academy, Belgrade; [2]Institute of Cardiovascular Disease "Belgrade", Belgrade; [3]Clinical Hospital Center "Zemun", Belgrade; [4]Clinical Hospital Center "Kragujevac", Kragujevac, Serbia

STOJANOVIĆ ET AL: ***Acute and Remote Thrombotic Complications in Patients with Implanted Drug-eluting Stents; Influence of Smoking as a Risk Factor.*** The use of percutaneous coronary intervention (PCI) with the procedural success and continuous technological improvements contributed to a better treatment of coronary heart disease also resulted in the development of acute and remote thrombotic complications. Environmental factors such as smoking significantly worsen unwanted cardiac events after percutaneous coronary intervention. The aim of this study was to determine the influence of risk factors (smoking) the number and severity of adverse cardiac events and its possible selective effect on the formation of acute and subacute thrombotic complications during the application of stents coated with paclitaxel (PES) and sirolimus-coated stents (SES). The study was based on a five-year follow-up of all consecutive patients at the Institute for Cardiovascular Diseases Dedinje in which are embedded drug-eluting stents with sirolimus (Cyphar) and paclitaxel (Taxus). Average age of the tested population was 68.4±8.4 years, of which 585 patients were men (83.4%) and 116 (16.6%) women. Four patients (0.6%) died. Myocardial infarction occurred in nine patients (1.3%). The overall incidence of MACE events was 14.5%, which was registered in 102 patients. Stent thrombosis, definite criteria according to ARC, occurred in 22 patients (3.14%). Probable stent thrombosis was observed in 1 patient (0.14%), possible stent thrombosis in 1 patient (0.14%). Sirolimus and paclitaxel-coated stents are safe and effective means of percutaneous coronary interventions conducted for treatment of atherosclerotic coronary artery disease. Research has shown a large impact of smoking as a risk factor in the development of adverse cardiac events. *(J HK Coll Cardiol 2019;27:1-10)*

Coronary artery disease, Paclitaxel, Sirolimus, Smoking

摘要

經皮冠狀動脈介入治療（ＰＣＩ）使用成功及持續的技術改進，有助於更好地治療冠狀動脈疾病的同時，也可導致急性及遠端血栓性併發症的發展。諸如吸煙等環境因素在經皮冠狀動脈介入治療後，會嚴重惡化了不必要的心臟事件。本研究的目的是確定風險因素（吸煙）對心臟不良事件的數量和影響的嚴重程度，以及使用紫杉醇塗層支架（PES）和西羅莫司塗層支架（SES）的應用過程中對急性和亞急性血栓併發症形成的可能影響。此項研究基於對Dedinje心血管病研究所患者連續5年的隨訪，患者皆有植入藥物塗層支架，包括西羅莫司（Cyphar）及紫杉醇

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Received August 22, 2018; revision accepted October 10, 2018

（Taxus）。參與研究的人平均年齡爲68.4歲（ ± 8.4歲），其中585名（83.4%）患者爲男性（83.4%），116名（16.6%）爲女性。4名病人（0.6%）死亡，9名患者（1.3%）出現心肌梗塞，在102名患者中記錄得MACE事件，總發生率爲14.5%。根據ARC的標準，支架內血栓形成的發生在22例患者（3.14%）中。1名患者（0.14%）可能被監測發生支架內血栓形成，1名患者可能出現支架內血栓形成（0.14%）。 西羅莫司和紫杉醇塗層支架是治療冠狀動脈粥樣硬化疾病經皮冠狀動脈介入治療的安全有效方法。研究表明，吸煙是導致心臟不良事件發生的一個風險因素。

關鍵詞：冠狀動脈疾病、紫杉醇、西羅莫司、吸煙

Introduction

The use of percutaneous coronary intervention (PCI) for the treatment of coronary ischemic disease experienced a dramatic expansion in the past two decades. At the same time, procedural success, safety and durability PCI dramatically improved due to continuous technological improvements, the periprocedure prepare patients and better understanding early and late complications of treatment. These improvements support the expansive use of PCI as definitive therapy.[1,2]

Application of stents still has the effect of two potentially very significant complications, such as stent thrombosis and restenosis at the site of installation. Therefore, attempts to create stents that will be less thrombogenic and that will cause less inflammatory reaction, and reduce the aforementioned complications to a minimum. Stents coated with biocompatible materials are not significantly reduce major adverse cardiac events. Unlike biocompatible stents, stents with sirolimus and paclitaxel have proved to be very effective in reducing unwanted cardiac events.[3,4]

Smoking is one of the major risks of coronary artery disease. It is known that the risk of coronary heart disease is twice as high in smokers. It is believed that nicotine increases the mortality rate in patients with coronary artery disease by about 30%. The attacks of angina are more common in smokers in about 3 times, and last about 12 times longer. This is due to the increase in pulse rate and blood flow resistance which burdens the heart muscle. In a country where 40% of the population smokes and how this needs to warn of this danger. One should know that smoking is a sign unenlightenement and delays in the acceptance of scientific knowledge. Despite the huge loss of human lives smoking significantly affects the expenditure envisaged for health.[5,6]

In relation to the timing of the stent thrombosis it is divided into:

- Acute – 24 hours after stent implantation,
- Subacute – 24 hours to 30 days after stent implantation,
- Late – 30 days to 1 year after stent implantation,
- Very late – more than one year after stent implantation.

The definition of stent thrombosis was proposed by the Academic Research Consortium (ARC). Some authors believe that the use of precisely ARC definitions of stent thrombosis provides the best estimate of the true prevalence of this phenomenon.

According to this classification stent thrombosis are divided into:

- Definitive – angiographic evidence of stent thrombosis with clinical signs of myocardial ischemia within 48 hours (chest pain with ECG changes or an increase of cardiac enzymes). Pathological evidence of stent thrombosis,
- Probable – unexplained death within 30 days after stent implantation. Myocardial infarction region stentirane artery
- Possible – the unexplained death after more than 30 days after stent implantation.[7]

Aim

Based on all the above aim of this study was to determine the influence of risk factors (smoking) the number and severity of adverse cardiac events and their possible selective effect on the occurrence of acute and

subacute thrombotic complications during the application of stents coated with paclitaxel (PES) and sirolimus-coated stents (SES) .

Hypothesis

Based on the literature data is not expected difference in the security application of stents coated with paclitaxel and sirolimus-coated stents with regard to the occurrence of acute and remote thrombotic complications.

Materials and Methods

Five-year follow-up of all consecutive patients at the Institute for Cardiovascular Diseases Dedinje, in which the embedded drug eluting stents with sirulimusom (Cypher) and paclitaxel (Taxus).

Monitoring methods: ambulatory visits, and telephone contact with the patient. The study was retrospective, clinical, nonintervention, with the follow-up period of five years for an individual patient. Data on the patients included in the database formed to monitor. Enter their demographic, clinical, angiographic data.

Telephone interview with patients was based on a questionnaire containing the contact details of the patient, date of the telephone contact, presence of diabetes mellitus, evaluation angina eventual death of the patient, information on the occurrence of death, hospitalization for cardiac reasons, myocardial infarction, percutaneous coronary reintervention or surgical myocardial revascularization. The questionnaire contains questions related to all the drugs taken by the patient after the intervention, especially acetyl-salicylic acid, ticlopidine or clopidogrel, thienopyridine derivatives duration of therapy, statin therapy, the presence of risk factors (hiperlipoproteinemia, smoking). Based on the questionnaire, if judged to have significant angina patients, the patients were invited to a preview on an outpatient basis of which were sent to the existence of non-invasive testing provoked ischemia, and in case of ischemia, were sent to coronary angiography and subsequent percutaneous myocardial revascularization or surgery or resume conservatively therapy.

Significant adverse cardiac events, MACE are defined as follows. Death is defined as cardiac or noncardiac origin. The death of unknown cause was recorded as cardiac origin. On the basis of ischemic changes in the ECG and / or an increase in CK three times the upper limit of the laboratory reference value, an increase in troponin T above the upper limit of reference values were used for the definition of myocardial infarction.

All reintervention within the stent implanted during the index procedure, as well as 5 mm proximal or distal edges of the stent imlantiranog classified as re-target lesion revascularization, TLR (target lesion revascularization). Other percutaneous coronary intervention on the same blood vessel outside the defined zones are defined as repeat revascularization of the target vessel, TVR (target vessel revacularization).

Accompanied by the outcome of patients in the study group was also stent thrombosis according to ARC criteria.

Initially the study included 800 patients who underwent percutaneous coronary angioplasty. After the indexing procedure clinical monitoring is completed for 701 (87.6%) patients whose data after the completion of the follow-up period subjected to statistical analysis. Ninety-nine patients (12.3%) were not available for cooperation. Of the 701 patients in whom were implanted stents, 340 patients were implanted stents coated with sirolimus and in 361 patients with paclitaxel-coated.

Statistical Analysis

In case of continuous data, variables were presented as mean value ± standard deviation (SD).

Some of the variables were presented as frequency of certain categories, while statistical significance of differences was tested with the Chi square test. In the case of low frequencies, probability is calculated by Fisher's Exact test.

The Kaplan-Meier non-parametric statistic was used to estimate the survival function of clinical outcome

(MACE events) in nonsmokers and smokers. *Post hoc* analysis was done by using log rank test.

Differences between groups were considered significant at $p<0.05$. Complete statistical analysis of the data was conducted with the statistical software package, SPSS Statistics 18 (Chicago, Illinois, USA).

Results

Average age of the tested population was 68.4 +/- 8.4 years, of which 585 patients were men (83.4%).

Four patients (0.6%) died. Two patients death is of noncardiac origin, so that the two patients had fatal consequence of cardiac events. The occurrence of angina prompting the 288 patients (36.8%). Load test was positive in 215 patients (30.7%). Myocardial infarction occurred in nine patients (1.3%). Re-PCI was performed in 103 patients (14.7%). Surgical revascularization was performed in 42 patients (5.8%). The overall incidence of MACE events was 14.5%, or 102 pancijenata. Repeated coronary angiography was performed in 230 patients (32.8%).

Stent thrombosis, definite criteria according to ARC, occurred in 22 patients (3.14%), 5 patients (0.7%) were treated with CABG, and in 17 patients (2.4%) is done re-pci. Probable stent thrombosis in 1 patient (0.14%), possible stent thrombosis in 1 patient (0.14%).

Of the 24 patients in whom stent thrombosis occurred 10 (1.4%) had a stent coated with sirolimus, 14 (2%) had a stent coated with paclitaxel.

Of the 22 patients who came forward certain stent thrombosis, 12 (1.7%) patients had a stent coated with paclitaxel, 10 (1.4%) patients had a stent coated with sirolimus. Probable stent thrombosis occurred in 1 (0.14%) patients with paclitaxel, possible stent thrombosis occurred in 1 (0.14%) patients with paclitaxel.

Distribution of patients according to the type of stent implanted (Table 1).

After implantation of the two types of stents when it comes to survival, there was no statistically significant difference, despite the fact that all patients with lethal results belonged to the group of PES (Table 2).

When it comes to myocardial infarction showed statistically significantly greater number of myocardial infarction in the PES group (p=0.004) (Table 3).

When it comes to TLR all registered cases (N=31), took place on implanted PES ($p<0.001$) compared to the group SES (Table 4).

When it comes to TVR more than ¾ of registered cases (N=56) occurred in patients belonging to the group SES ($p<0.001$), statistically highly significant difference (Table 5).

Speaking of MACE no significant difference between the two types of stents (Table 6).

Distribution of patients (habit of smoking) in relation to the type of implanted stent is uniform between groups SES and PES (Table 7).

Table 1. Distribution of patients using 2 different drug eluting stents

Percutaneouscoronary intervention	Number	%
SES	340	48.5
PES	361	51.5
Total	701	100.0

Table 2. Clinical outcome and stent types implantation

		Stents		
Outcome		**SES**	**PES**	**Total**
Survivors	N	340	357	697
	(outcome)	48.8%	51.2%	100.0%
	(stents)	100.0%	98.9%	99.4%
Died	N	0	4	4
	(outcome)	0.0%	100.0%	100.0%
	(stents)	0.0%	1.1%	0.6%
Total	N	340	361	701
	(outcome)	48.5%	51.5%	100.0%
	(stents)	100.0%	100.0%	100.0%
Statistics		Chi-Square = 3.78; p=0.07		

A statistically significantly higher number of smokers completed annually in the PES group (p=0.048) (Table 8).

Statistically significantly higher MI in the PES group of smokers (Table 9).

Statistically significantly higher number of MACE in the PES group of smokers (Table 10)

Based on statistical processing (Table 10) and Kaplan-Mayer curve (Figure 1), it is concluded that in non-smokers, 50% of MACE occurs after 61,714 months, and smokers are slightly earlier (60,180 months). Using a log-rank test showed a statistically significant difference between these two groups (p=0.013) (Table 11).

Discussion

Stent thrombosis (TS) is a rare but potentially fatal complication of percutaneous coronary intervention (PCI). The frequency of TS varies in literature depending on the type of stent, it presents patients with stable angina

Table 3. Myocardial infarction and stent types implantation

Myocardial infarction		Stents SES	Stents PES	Total
No	N	340	352	692
	(outcome)	49.1%	50.9%	100.0%
	(stents)	100.0%	97.5%	98.7%
Yes	N	0	9	9
	(outcome)	0.0%	100.0%	100.0%
	(stents)	0.0%	2.5%	1.3%
Total	N	340	361	701
	(outcome)	48.5%	51.5%	100.0%
	(stents)	100.0%	100.0%	100.0%
Statistics		Chi-Square = 8.587; p=0.004		

Table 4. Target lesion revascularization (TLR) and stent types implantation

TLR		Stents SES	Stents PES	Total
No	N	340	330	670
	(outcome)	50.7%	49.3%	100.0%
	(stents)	100.0%	91.4%	95.6%
Yes	N	0	31	31
	(outcome)	0.0%	100.0%	100.0%
	(stents)	0.0%	8.6%	4.4%
Total	N	340	361	701
	(outcome)	48.5%	51.5%	100.0%
	(stents)	100.0%	100.0%	100.0%
Statistics		Chi-Square = 28.550; p=0.000		

Table 5. Target vessel revascularization (TVR) and stent types implantation

TVR		Stents SES	Stents PES	Total
Survivors	N	284	346	630
	(outcome)	45.1%	54.9%	100.0%
	(stents)	83.5%	95.8%	89.9%
Yes	N	56	15	71
	(outcome)	78.9%	21.1%	100.0%
	(stents)	16.5%	4.2%	10.1%
Total	N	340	361	701
	(outcome)	48.5%	51.5%	100.0%
	(stents)	100.0%	100.0%	100.0%
Statistics		Chi-Square = 27.837; p=0.000		

Table 6. Major adverse cardiac event (MACE) and stent types implantation

MACE		Stents SES	Stents PES	Total
No	N	284	315	599
	(outcome)	47.4%	52.6%	100.0%
	(stents)	83.5%	87.3%	85.4%
Yes	N	56	46	102
	(outcome)	54.9%	45.1%	100.0%
	(stents)	16.5%	12.7%	14.6%
Total	N	340	361	701
	(outcome)	48.5%	51.5%	100.0%
	(stents)	100.0%	100.0%	100.0%
Statistics		Chi-Square = 1.669; p=0.196		

pectoris and acute coronary syndrome in the study, etc. The obtained data on the incidence of stent thrombosis are consistent with the data obtained in many world studies.

The success of drug-coated stents is highly dependent on each component of the complex as well as the interactions among the elements of the complex. Different DES have different potential to inhibit neointimal proliferation.[8,9] Given the fact that the experiments on animal models can not be directly translated to human populations, using the results of clinical studies.

In cardiology, as in any other branch of medicine revived the concept of 'evidence-based medicine'. On a number of important questions attempted to come up with an answer through a well-designed, controlled, prospective, randomized trials.[10,11]

The first positive clinical data on the implementation of DES come from a study that examined the use of rapamycin (Sirolimus trade name)

Table 7. Distribution of smokers regarding stent types implantation

		Stents		
Smokers		**SES**	**PES**	**Total**
No	N	210	245	455
	(outcome)	46.2%	53.8%	100.0%
	(stents)	61.8%	67.9%	64.9%
Yes	N	130	116	246
	(outcome)	52.8%	47.2%	100.0%
	(stents)	38.2%	32.1%	35.1%
Total	N	340	361	701
	(outcome)	48,5%	51.5%	100.0%
	(stents)	100.0%	100.0%	100.0%
Statistics		Chi-Square = 2.60; p=0.107		

Table 8. Lethal outcome in smoking patients regarding stent types implantation

		Stents		
Outcome		**SES**	**PES**	**Total**
Survivors	N	130	112	242
	(outcome)	53.7%	46.3%	100.0%
	(stents)	100.0%	96.6%	98.4%
Died	N	0	4	4
	(outcome)	0.0%	100.0%	100.0%
	(stents)	0.0%	3.4%	1.6%
Total	N	130	116	246
	(outcome)	52.8%	47.2%	100.0%
	(stents)	100.0%	100.0%	100.0%
Statistics		Fisher's Exact Test = 2.65; p=0.048		

Table 9. Myocardial infarction in smoking patients regarding stent types implantation

		Stents		
Miocardial infarction		**SES**	**PES**	**Total**
No	N	130	107	237
	(outcome)	54.9%	45.1%	100.0%
	(stents)	100.0%	92.2%	96.3%
Yes	N	0	9	9
	(outcome)	0.0%	100.0%	100.0%
	(stents)	0.0%	7.8%	3.7%
Total	N	130	116	246
	(outcome)	52,8%	47.2%	100.0%
	(stents)	100,0%	100.0%	100.0%
Statistics		Fisher's Exact Test = 8.38; p=0.001		

Table 10. Major adverse cardiac event (MACE) in smoking patients regarding stent types implantation

		Stents		
MACE		**SES**	**PES**	**Total**
No	N	113	86	199
	(outcome)	56.8%	43.2%	100.0%
	(stents)	86.9%	74.1%	80.9%
Yes	N	17	30	47
	(outcome)	36,2%	63.8%	100.0%
	(stents)	13,1%	25.9%	19.1%
Total	N	130	116	246
	(outcome)	52,8%	47.2%	100.0%
	(stents)	100,0%	100.0%	100.0%
Statistics		Chi-Square = 5.68; p=0.017		

coated stents (SES). Rapamycin is a natural macrocyclic lactone with potent antiproliferative, anti-inflammatory and immunosuppressive action of the inhibitory effect on the activation of the target sites for rapamycin - mammalian target of rapamycin (mTOR), ultimately leading to cell cycle arrest.[12,13]

Cypher (Cordis, Johnson & Johnson) is a stainless steel stent covered with a very thin layer of polymer containing neerodirajuæeg rapamycin. The first implantation of Cypher stent is made in the First in Man (FIM) clinical study in Sao Paulo, Brazil and Rotterdam, the Netherlands. Four months after implantation, by using intravascular ultrasound and quantitative coronary angiography, in both studies was demonstrated minimal neointimal hyperplasia. In the Brazilian study of intravascular ultrasound after 4 years of follow-up showed continued suppression of intimal hyperplasia in a group of 30 patients with slow-releasing SES, with survival without significant clinical events by 87%.[14]

This test has demonstrated a low incidence of stent thrombosis (definite, probable, possible) and thereby simultaneously demonstrated safe use of stents coated with the drug.

The results of our study were compared with published results of the studies and meta-analyzes that examined the long-term safety and efficacy of drug-coated stents, either through long-term monitoring of patients revascularized only the implantation of DES, or in comparison to patients who were implanted with a metal stent is not coated with a drug.[15,16] We analyzed primarily studies published in reputable journals and reference cardiology.

Demographic, clinical and angiographic characteristics of the study group in our study are in accordance with the same characteristics examined groups in the studies in which they are declared.

The research showed that the use of drug-eluting stents to treat coronary disease showed a low incidence of major cardiac events (death, MI, TLR, TVR) during the follow-up of five years. Application of DES leads to lower rates of repeat revascularization (percutaneous coronary intervention or bypass surgery).

Analyses have shown the safety of the use of drug-coated stents, and in particular to the emergence of thrombosis which is not higher in DES compared to the BMS.[17,18] The occurrence of thrombosis in BMS was studied in many international studies and the data obtained are in favor of the data from our study where they analyzed patients with drug-coated stents, to the emergence of thrombosis in DES is not greater than the occurrence of thrombosis in BMS. Meta-analyzes may increase the strength of the evidence of individual studies, but also to distinguish quality (indicate) the effects of certain methods of treatment. A meta-analysis

Table 11. Cumulative probability of MACE events in nonsmokers and smokers (Kaplan-Maier method; N=701)

	Mean*			
			95% Confidence Interval	
Smokers	Estimate	Std. Error	Lower Bound	Upper Bound
No	61.714	0.454	60.824	62.605
Yes	60.191	0.763	58.696	61.686
Total	61.180	0.399	60.397	61.962

*Median could not be obtained due to distribution of MACE data

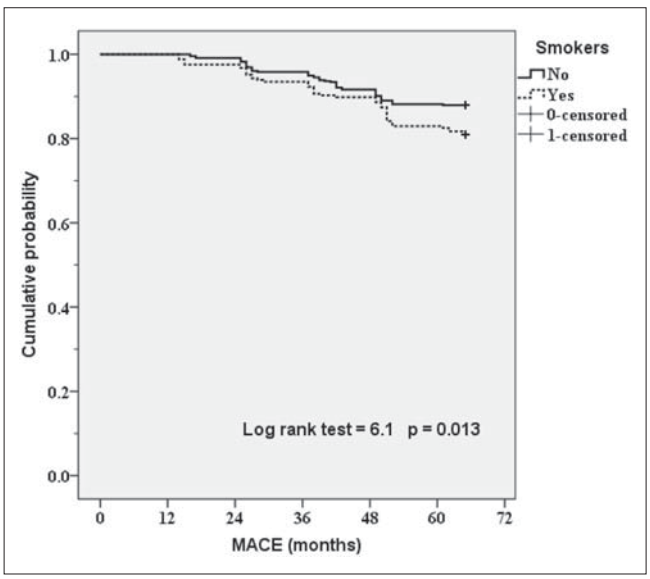

Figure 1. *Cumulative probability of MACE events in nonsmokers and smokers (five-year follow-up).*

of randomized studies on the implementation of medication-coated stents compared to uncoated (Fushs AT et al., 2008) included 28 randomized studies that have been analyzed stent thrombosis patients undergoing DES, BMS and balloon angioplasty. The total number of patients from the DES group was from 5612 a BMS Group 7639th Stent thrombosis occurred in 107 patients (1.05%), of which 56 patients were from the DES groups (1.01%) and 51 patients were from BMS groups (1.10%). The results showed no significant differences between the two groups (OR = 0.87, 95% CI 0.58 to 1.3, p<0.48). Subacute thrombosis occurred in a total of 21 patients, of which 0.43% of the DES group and 0.53% in BMS groups (OR = 0.86, 95% CI 0.50 to 1.5, p<0.6) . Late stent thrombosis occurred in 27 patients (1%) in the DES group and 20 patients (0.8%) in the BMS groups (OR = 0.92, 95% CI 0.50 to 1.68, p<0.78). After 12 months of intervention results showed a similar incidence of subacute thrombosis and late thrombosis in all types of PCI.[19]

The study, Goy, and associates from 2009 analyzed 350 patients with a SES embedded between April and December 2002 in three Swiss hospitals. Patients were 63 +/- 6 years, 78% were men, 20% had acute coronary syndrome, 19% were patients with diabetes. Stent thrombosis occurred in 12 patients (3.6%). Definitive stent thrombosis occurred in 6 (1.8%), probable 1 (0.3%), possible 5 (1.5%). Eighty-one patients were without complications. MACE events occurred in 74 patients (21%): cardiac death 10 (3%), unborn death 16 (5%), myocardial infarction 6 (2%), TLR 26 (8%), TVR 9 (3%), by-pass graft 6 (2%).[20]

In our research, after implantation of the two types of stents, when it comes to survival, there was no statistically significant difference, despite the fact that all patients with lethal results belonged to the group of PES. Join a statistically significantly greater number of myocardial infarction in the PES group (p=0.004). When it comes to TLR all registered cases (N=31), took place on implanted PES (p<0.001). In more than ¾ of registered cases (N=56) TVR occurred in patients belonging to SES group (p<0.001). There is no significant difference between the two types of stents in terms of MACE

Smoking is the most important modifiable risk factor for coronary disease and the leading cause of death in developed countries. Today in the world smokes about one billion people. The risk of myocardial infarction is high even among smokers if they are exposed to passive smoking. Among those who smoke 20 or more cigarettes daily have a triple increase in total coronary heart disease. Our research showed significant statistical association of smoking as a risk factor and the occurrence of fatal outcome, despite the fact that the number of deaths was not alarming. Smoking as a risk factor significantly contributes to the occurrence of myocardial infarction (highly statistically significantly contributes to the occurrence of myocardial infarction). Smoking also significantly affects the occurrence of MACE.

Prospective multicentre German Drug-Eluting Stent Registry (DES.DE) analyzed and identified 1,122 patients who had never smoked and 1,052 patients who were current smokers. Smokers were younger (56.5 vs. 69.4 years, $p<0.0001$), more often males, with less frequent diabetes and hypertension compared to non-smokers. Smokers presented more often with acute coronary syndromes. After a mean follow-up of 12.5 months, smokers had both higher mortality (4.6 vs. 2.7%, $p<0.05$) and myocardial infarction (MI) rates (4.9 vs. 3%, $p<0.01$). There was no significant difference between smokers and non-smokers in the rate of target vessel revascularization (9.8 vs. 11.4%, $p=0.26$). Major adverse cardiac and cerebrovascular events (defined as the composite of death, MI and stroke, MACE) were higher in smokers (10.6 vs. 6.1%, $p<0.001$). Moreover, after adjustment for baseline clinical and angiographic variables, smoking continued to be a strong independent predictor for MACE (OR = 2.34, 95% CI 1.49-3.68). In a subgroup analysis, we found that the increased risk of smoking was most prominent in patients presenting with stable angina pectoris (OR = 3.71, 95% CI 1.24-2.57, $p<0.05$). Smoking almost doubled the risk for MACE in acute MI patients, though this did not reach statistical significance (adjusted OR = 1.91, 95% CI 0.93-3.94, $p=0.74$).

This large multicentre DES registry provides evidence that smokers treated with DES, despite lower incidence of predisposing risk factors for

atherosclerosis, experience higher rates of death and MI compared to non-smokers, particularly in the setting of stable coronary artery disease. Smoking has only marginal effects on target vessel revascularization rates in patients treated with DES.[21]

Conclusion

Sirolimus and paclitaxel-coated stents are safe and effective means of percutaneous coronary interventions used for treatment of atherosclerotic coronary artery disease.

Our results agree with the results of randomized clinical trials and large registries which examined sirolimus and paclitaxel-coated stents.

Our research showed that the use of drug-eluting stents to treat coronary disease has a low incidence of major cardiac events (death, MI, TLR, TVR) during the period of five years examined groups of patients. Application of DES leads to lower rates of repeat revascularization (percutaneous coronary intervention or bypass surgery).

The significance of our study is the presentation of results from clinical practice follow-up of patients due to the current problem of stent thrombosis with the drug-coated stents. The results of low incidence of stent thrombosis are in favor of safe use of stents coated drug.

Research has shown a large impact of smoking as a risk factor in the development of adverse cardiac events. There is a significant correlation between smoking as a risk factor and the occurrence of a lethal outcome, and if the number of deaths was not alarming. Smoking as a risk factor also significantly contributes to the occurrence of myocardial infarction (highly statistically significantly contributes to the occurrence of myocardial infarction).

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Victoza®: One agent addresses both HbA_{1C} and cardiovascular (CV) risk[1-9]

Victoza® — to prevent cardiovascular events[1,2]

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- Unsurpassed HbA_{1C} reductions[3-9]
- Unsurpassed weight reductions[3-9]

For adult with type 2 diabetes and established CVD
2018 ADA/EASD consensus report recommends GLP-1 RA therapy with proven CV benefit[10]

In patients with type 2 diabetes and high CV risk†

Victoza® provided a significant life-saving cardiovascular benefit[1]

Victoza® significantly reduced the risk of major adverse cardiovascular events (MACE) by 13% (*P*=0.01). The composite primary end point included:

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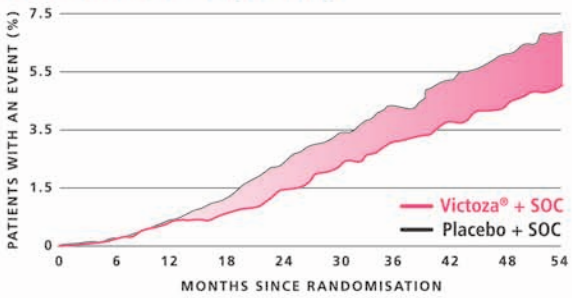

22% RRR CV DEATH

Hazard ratio, 0.78 (95% CI, 0.66-0.93)

Nonfatal MI	Nonfatal stroke
HR 0.88 (*P*=0.11)	HR 0.89 (*P*=0.30)

†High cardiovascular risk was defined as 50 years with at least 1 coexisting cardiovascular condition or 60 years with at least 1 cardiovascular risk factor as determined by the investigator

Abbreviated prescribing information
Victoza® (liraglutide injection)
Presentation: Prefilled, disposable pen containing 18 mg of liraglutide in 3 mL of solution. **Indications:** Victoza® is indicated for the treatment of adults with insufficiently controlled type 2 diabetes mellitus as an adjunct to diet and exercise as: **Monotherapy:** when metformin is considered inappropriate due to intolerance or contraindications. **Combination therapy:** in addition to other medicinal products for the treatment of diabetes. **Dosage and administration:** The starting dose is 0.6 mg once daily. After at least one week, the dose should be increased to 1.2 mg. Based on clinical response and after at least one week, the dose can be increased to 1.8 mg to further improve glycaemic control. In combination with metformin with or without a thiazolidinedione, no dose adjustment is required. When Victoza® is added to a sulphonylurea or insulin, a reduction in the dose of sulphonylurea or insulin should be considered to reduce the risk of hypoglycaemia. Victoza® can be used without dose adjustment in elderly patients (>65 years of age). No dose adjustment is required in patients with mild or moderate renal impairment. No dose adjustment is recommended for patients with mild or moderate hepatic impairment. Victoza® can currently not be recommended for use in patients with severe or end-stage renal disease or severe hepatic impairment. Victoza® is administered onzce daily at any time, independent of meals, and can be injected subcutaneously in the abdomen, thigh, or upper arm. Victoza® should not be administered intravenously or intramuscularly. **Contraindications:** Hypersensitivity to the active substance or any of the excipients. **Special warnings and precautions:** Victoza® should not be used in patients with type 1 diabetes mellitus or for the treatment of diabetic ketoacidosis. Victoza® is not a substitute for insulin. There is limited experience in patients with congestive heart failure New York Heart Association (NYHA) class I-II and no experience in patients with NYHA III-IV. Due to limited experience, Victoza® is not recommended for use in patients with inflammatory bowel disease or diabetic gastroparesis. Acute pancreatitis has been observed with the use of GLP-1 receptor agonists. Patients should be informed of the characteristic symptoms of acute pancreatitis. If pancreatitis is suspected, Victoza® should be discontinued; if acute pancreatitis is confirmed, Victoza® should not be restarted. Thyroid adverse events, such as goitre, have been reported in clinical trials and in particular in patients with pre-existing thyroid disease. Liraglutide should therefore be used with caution in these patients. Patients receiving liraglutide in combination with a sulfonylurea or insulin may have an increased risk of hypoglycaemia. Patients treated with Victoza® should be advised of the potential risk of dehydration in relation to gastrointestinal side effects and take precautions to avoid fluid depletion. **Pregnancy and lactation:** Victoza® should not be used in women who are pregnant, who wish to become pregnant, or who are breastfeeding. **Undesirable effects:** The most frequently reported adverse reactions in patients treated with Victoza® are nausea and diarrhoea. Common adverse reactions include nasopharyngitis, bronchitis, hypoglycaemia, anorexia, decreased appetite, headache, dizziness, increased heart rate, vomiting, dyspepsia, upper abdominal pain, constipation, gastritis, flatulence, abdominal distension, gastroesophageal reflux disease, abdominal discomfort, toothache, rash, fatigue, injection site reactions, increased lipase and increased amylase. Since the market introduction of Victoza®, allergic reactions and dehydration (sometimes with a decrease in kidney function) have been reported. **Overdose:** From clinical trials and marketed use overdoses up to 40 times (72 mg) the recommended maintenance dose have been reported. Generally, the patients reported severe nausea, vomiting and diarrhoea. None of the patients reported severe hypoglycaemia. All patients recovered without complications.

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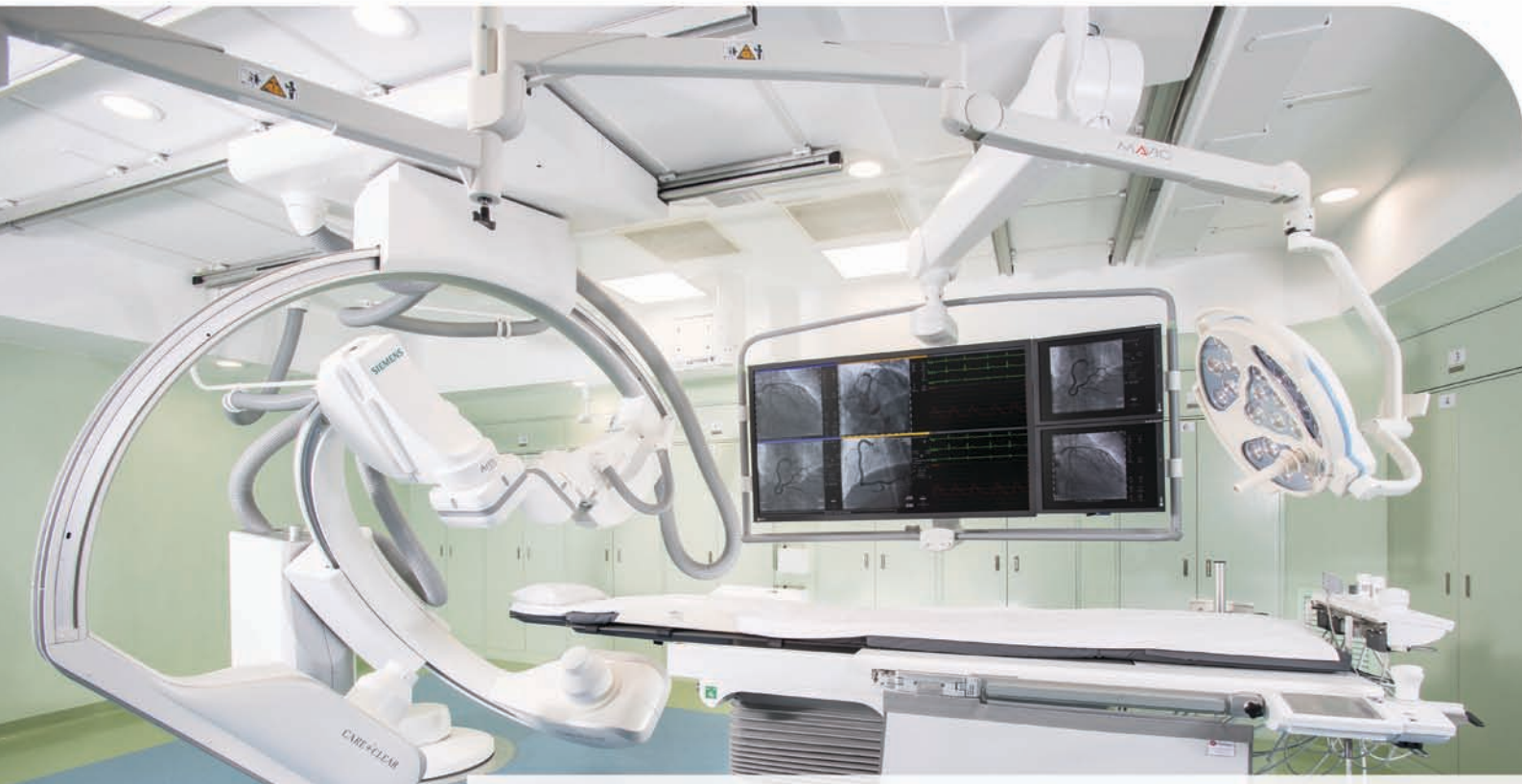

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Scientific Programme

Friday, 31 May 2019

0800-0900 Registration

0900-1030 **Oral Abstracts Presentation**
Chairpersons: Henry Kok, Kin-keung Tsang
Judges: Chiu-sun Yue

Best Posters Presentation
Judges: Cyril Ko, David Lo, Lok-yan Tam

1030-1100 Tea break & exhibition

1100-1230 **Best Abstracts Presentation**
Chairpersons: Hamish Chi-kin Chan, Hau-kwong Chung, Suet-ting Lau
Judges: Robert Hendel, Andrew Kates, Alex Lee, Kai-hang Yiu

Best Posters Presentation
Judges: Myles Chan, Nim-pong Kwong, Pui-yin Lee, Victor Lee, Andrew Li, Chiu-sun Yue

1230-1400 Lunch break

1400-1530 **HKCC-HKPHCA Challenging / Interesting Clinical Cardiology Cases Presentation I**
Chairpersons: Victor KM Goh, Wai-suen Leung, Eric Wong
Judges: Yu-ho Chan, Steven SL Li, Tak-sun Tse

1530-1730 Tea break & exhibition

1600-1730 **HKCC-HKPHCA Challenging / Interesting Clinical Cardiology Cases Presentation II**
Chairpersons: Raymond CY Fung, Gordon Ho
Judges: Chung-ho Cheng, Liang Chow, Ho Lam, Linda Lam, Kin-ming Tam

1730-1830 **Heart and Diabetes Symposium**
Chairpersons: Jason Chan, Boron Cheng

Cardiovascular safety of hypoglycaemic agents – What the fuss is all about?	Dominic Leung
Review of updated guidelines on managing diabetic patients with cardiovascular diseases	Godwin TC Leung

Saturday, 1 June 2019

0730-0800	Registration	
0800-0900	**Heart Team Breakfast Symposium** **Chairpersons:** Carmen Chan, Randolph Wong	
	Evolving MCS that are reshaping outcomes in advanced heart failure	Katherine YY Fan
	Should my patient with severe aortic stenosis undergo TAVI?	Michael KY Lee
	Challenges in CMR for adult congenital heart disease – Advantages and pitfalls	Marina Hughes
0900-1045	**Coronary Ischaemia Symposium** **Chairpersons:** Jason Ko, Ho Lam, Gary Mak	
	Complications in percutaneous cardiovascular medicine: A story about fellows, teachers and more (Keynote Lecture)	Eric Eeckhout
	Optimal PCI with optimal DAPT	Yohei Sotomi
	Personalized DAPT – For whom and for how long?	Marc P. Bonaca
	Assessment of coronary physiology: Impact on patient management	Robert Hendel
	Complex PCI: Deliver to undeliverable lesion	Raymond CY Fung
	Unmet needs in the management of chronic stable angina	Peter Collins
1045-1115	Tea break & exhibition	
1115-1245	**Heart Failure Symposium** **Chairpersons:** Gary CP Chan, Ronnie HL Chan, Elaine MC Chau, Edmond ML Wong	
	Heart failure management: From in-hospital to community	Kai-Hang Yiu
	An overview and new treatment options for amyloid cardiomyopathy	Andrew Kates
	Therapeutic advances in heart failure management – From diuretics to aquaretic agent	Yen-hung Lin
	Managing the difficult comorbidity of atrial fibrillation and heart failure	Wai-keung Lai
1245-1400	**Lunch Symposium** **Chairpersons:** Ling-ling Cheung, Suet-ting Lau	
	Lipid management for secondary prevention: Beyond the status quo	Yehuda Handelsman
1400-1515	**Congregation and Opening Ceremony**	
1515-1600	**Hong Kong Heart Foundation Symposium** **Chairperson:** Chu-pak Lau, Tak-fu Tse	
	The long and winding historical route of interventional cardiology: All you ever wanted to know	Eric Eeckhout
1600-1630	**ACS in Action** **Chairperson:** Ngai-yin Chan	Yuk-kong Lau & Vincent Luk & Chung-leung Tang
1630-1700	Tea break & exhibition	
1700-1830	**ACC-HKCC Joint Symposium: Advances in Cardiology** **Chairpersons:** Kam-tim Chan, Wai-kwong Chan, Godwin TC Leung, Chris Wong	
	Best of ACC.19	Andrew Kates
	A tale of two meta-analyses	Dominic Leung
	Latest updates on stroke prevention in AF	Hung-fat Tse
	Novel diagnostic techniques for heart failure	Robert Hendel

Sunday, 2 June 2019

0900-1030 **Hypertension and AF Symposium**
Chairpersons: Kin-wing Chan, Adrian Cheong, Bernard MY Cheung, Man-fai Ip, Victor WT Yan

Management of resistant hypertension	Andrew Kates
An update on the management of isolated systolic hypertension	Krzysztof Narkiewicz
Overcoming challenges in LAAO: Looking forward to a FLEXible treatment option	Shing-fung Chui
AF ablation: How can we do better?	Wing-hong Fung

1030-1100 Tea break & exhibition

1100-1300 **Best Challenging / Interesting Cardiac Intervention Cases Presentation**
Chairpersons: William CK Chan, Yuk-kong Lau, Kin-lam Tsui
Judges: Gary Cheung, Ping-ching Fong, MH Jim, Patrick Ko, Vincent Kwok, Eugene Wu

1300-1400 **Lunch Symposium**
Chairpersons: Chung-seung Chiang, Bryan Yan

The recent advancement in lipid management - How can we do better for our patients?	Adrian Cheong

1400-1600 **Best HKCC-HKPHCA Challenging / Interesting Clinical Cardiology Cases Presentation**
Chairpersons: Kwok-lun Lee, Li-wah Tam
Judges: Alex Chiu, Katherine YY Fan, Yuk-kong Lau, Ping-wa Yam

1600-1630 Tea break & exhibition

1630-1800 **Heart Rhythm Symposium**
Chairpersons: Kwok-keung Chan, Kathy Lee, Yui-chi So

Mapping for ventricular tachycardia: From basics to ultra-high density mapping	Cheng-hung Li
Pacing therapy for heart failure: cardiac resynchronization therapy and beyond	Joseph YS Chan
ECG interpretation for patients presenting with sudden cardiac death	Ngai-shing Mok

**The program is subject to change without prior notice.*

Allied Cardiovascular Health Professional Symposium

"Tips & Tricks" from Case Sharing in Cardiac Catheterization Laboratory and Coronary Care Unit

Saturday, 1 June 2019

	Session 1 **Chairpersons:** Ka-lung Chui and Sin-hing Chiu	
0930-1000	Interesting ECG case sharing	Sau-chi Yiu
1000-1030	Coronary angiogram interpretation and easily missed findings	David Lo
1030-1100	Tea break & exhibition	
	Session 2 **Chairpersons:** Thomas KS Wong and Shuk-ling Kan	
1100-1130	Differences among varies percutaneous mechanical circulatory support devices	Michael KL Wong
1130-1200	Handling most challenging patient in difficult situation at cath lab	Kit-ying Ho

**The program is subject to change without prior notice*

Paediatric Cardiology Symposium

Friday, 31 May 2019

1600-1700	**Free Paper Session: Paediatric Cardiology I** **Chairpersons:** Geoffrey CF Mok, Hui-shen Wang, Tak-cheung Yung	
1730-1900	**Free Paper Session: Paediatric Cardiology II** **Chairpersons:** Nai-chung Fong, Xin Li, Yu-mei Xie	

Saturday, 1 June 2019

0830-0835	**Welcome Address**	Tak-cheung Yung
0835-1035	P**aediatric Cardiology Symposium I** **Chairpersons:** Shu-bao Chen, Chi-wai Cheung, Kin-shing Lun, Shu-shui Wang	
	Applications of phase contrast imaging in congenital heart disease	Kenneth Cheung
	Cardiac MRI improves diagnostic accuracy and characterization in children with cardiomyopathy	Yuting Zhang
	Cardiac magnetic resonance assessment of myocarditis	Xiaohai Ma
	Fetal cardiac MRI for congenital heart disease	Ming Zhu
	Fetal echocardiographic diagnosis of absent pulmonary valve syndrome	Wei Pan
	Role of CMR in Ebstein anomaly. Timing and candidacy for surgical repair	Marina Hughes
1035-1100	Tea break & exhibition	
1100-1230	**Free Paper Session: Paediatric Cardiology III** **Chairpersons:** Pak-cheong Chow, Hong Li, Xiao-yun Wu	
1230-1400	**Lunch Symposium** *(Please refer to the scientific program)*	
1400-1515	**Congregation & Opening Ceremony**	
1515-1630	**Paediatric Cardiology Symposium II** **Chairpersons:** Robin Chen, Yiu-fai Cheung, Hong Gu, Silin Pan	
	Non-invasive imaging for the complex RVOT – before and after intervention	Marina Hughes
	Transcatheter ablation of arrhythmias in congenital heart disease: role of non-invasive imaging	Sabrina Tsao
	Cardiac MRI detection of coronary artery lesion of Kawasaki disease in Children	Xi-hong Hu
	HR-MRI detects peripheral vasculitis of Kawasaki disease in children	Chuan Feng
1630-1700	Tea break & exhibition	
1700-1830	**Best Interesting Clinical Case Presentation Competition** **Chairpersons:** KT Chau, Ming-yang Qian **Panelists:** Maria SH Lee, Lok-yee So	

**The program is subject to change without prior notice*

Cardiology Course for General Practitioners

Sunday, 2 June 2019

	Preventive Cardiology: Expanding the role of GP in cardiology **Chairpersons:** Elaine MC Chau, Daniel Fong	
0900-0930	Cardiac risk assessment: Risk calculators & cardiac imaging	Carmen WS Chan
0930-1000	LDL Cholesterol: How low to go & how do we get there?	Alan KC Chan
1000-1030	Atrial fibrillation screening in general practice for stroke prevention	Bryan Yan
1030-1100	Tea break	
	Cardiology Updates: What a GP needs to know **Chairpersons:** Yam-hong Wong, Kam-sang Woo	
1100-1130	Is there still a role for aspirin in primary prevention?	Frankie CC Tam
1130-1200	Optimal duration of dual-antiplatelet therapy after PCI: the long and short of it	Thomas Tunggal
1200-1230	Declaring the new landscape of T2DM in primary care setting	Marc P. Bonaca
1230-1400	Lunch Symposium *(Please refer to the scientific program)*	
	Common Cardiology Challenges in General Practice **Chairpersons:** Chi-wo Chan, Jacky Chan, John TH Wong	
1400-1430	How to manage resistant hypertension?	John TH Wong
1430-1500	Step-by-step guide to manage heart failure in primary care	Danny HF Chow
1500-1530	Management of stable angina and when to refer	Gary Mak
1530-1600	Tea break	
	Cardiology Issues in Women and Paediatrics **Chairpersons:** King-loong Cheung, Nai-chung Fong, Tak-cheung Yung	
1600-1620	Heart disease in women: putting prevention into practice	Kathy Lee
1620-1640	Common congenital heart diseases in the young	Man-ching Yam
1640-1700	Kawasaki disease and coronary artery complications	Maria SH Lee
1700-1710	Q&A	

**The program is subject to change without prior notice*

ABSTRACTS

ORAL ABSTRACTS PRESENTATION

36

Survivin Protects Neonatal Mouse Cardiomyocytes from CVB3-Induced Apoptosis in a Caspase-dependent Manner

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Background: Viral myocarditis (VMC) is a kind of inflammatory cardiomyopathy mainly affecting children and young adults and resulting in heart failure due to dilated cardiomyopathy or cardiac arrest. Cardiomyocyte apoptosis has been shown to play a critical role in the pathogenesis of coxsackievirus B3 (CVB3) induced VMC and blocking of this process may contribute to the therapeutic effect towards VMC. Therefore, the aim of this study was to examine whether survivin, one of the strongest antiapoptotic proteins, participates in the apoptotic activity after CVB3 infection and further reveal its related mechanisms.
Methods and results: Here the cultured neonatal mouse cardiomyocytes (NMCs) were exposed to CVB3 to establish the cell model of VMC and we found a time-dependent manner of survivin expression after CVB3 infection by Western Blot. Lentivirus was next used to mediate survivin expression thereby examine the function of survivin in CVB3-infected NMCs. TUNEL assay demonstrated that survivin overexpression interrupted CVB3-induced apoptosis and significantly decreased the apoptotic rate at 36h and 60h after CVB3 infection. It was next examined whether caspase-3 and -9 were involved in the antiapoptotic pathway initiated by survivin via Western Blot. The results showed a reverse relationship between survivin expression and cleaved caspase-3 and -9 expression, suggesting that survivin may inhibit apoptosis by restraining the activity of caspase-3 and -9. Moreover, the supernatant from cultured NMCs was extracted to detect the quantitation of released LDH and a sharp decrease was shown in survivin overexpressed group compared to CVB3 infected group, indicating a protective role of survivin in CVB3-induced cell damage.
Conclusions: In the present study, we demonstrated that survivin was triggered by CVB3 infection in NMCs in a time-dependent manner and executed its antiapoptotic effects via caspase-3- and caspase-9-dependent signaling pathway.

51

Ultrasound Ultrafast Imaging of the Carotid Artery Pulse Wave Velocity: Is the Surrogate of Regional Artery Stiffness?

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Background: Cardiovascular diseases (CVDs) are the leading causes of death in the world and responsible for over 17.7 million deaths annually. Arterial stiffness could be a strongest predictor for coronary heart disease and stroke. Pulsed wave velocity (PWV) is "the most hallowed and still probably the best" measure of arterial stiffness and closely related to the processing of arteriosclerosis. Techniques to measure PWV present limitations. There are based on the mathematical model calculation, or need special instruments and required a fairly high level of technical expertise. A new ultrasound-based technique, Ultrasound Ultrafast imaging could noninvasive assessment of regional carotid artery stiffness. The imaging system has a very high frame rates over than 2000 frames per second, and could quickly obtain the PWV propagate along the carotid artery. The objective is to detect the PWV in elder Humans carotid artery in vivo. Determine the feasibility and accuracy to assess artery stiffness by Ultrasound Ultrafast imaging. Confirm the relationship between the local carotid artery PWV and the stiffness of the systemic vessels.
Metheds: Ultrasound Ultrafast imaging was performed and obtain the velocity propagate along the left common carotid arteries of fiftynine (n=59) healthy volunteers. Including the PWV at the beginning of the systole and at the ending of the systole (BSPWV, ESPWV), the mean PWV (mPWV) were calculated. E-Tracking technology in measuring artery elasticity modulus (PWVβ) and cardio-ankle vascular index (CAVI) were calculated in all subjects. The correlation between parameters derived from Ultrasound Ultrafast imaging and elastic modulus were analyzed. Indicate artery elasticity and the impact of modifying factors such as BMI, age and hypertension.
Results: (1) The success rate of first obtain the BSPWV, ESPWV were 94.2% and 90.8%, which required a median overall duration of 73s. (2) mPWV were significant positively correlated with PWVβ and CAVI ($r=0.68$, $P<0.01$, $r=0.48$, $P<0.05$). BMI, age and hypertension were also positively correlated with PWV. (3) The mPWV have a good repeatability and conformity. Interobserver and intraobserver variabilities were 4.2% and 3.6% respectively.
Conclution: The elasticity of carotid artery is an integral part of the global arterial elasticity. Ultrasound Ultrafast imaging is a reliable method to assess the regional carotid artery stiffness. The technique can directly and quickly measure PWV of local vessels, with high repeatability and provides a new method for clinical early assessment artery elasticity.

ABSTRACTS

ORAL ABSTRACTS PRESENTATION

53

The Normal Biventricular Mechanical Function in the Transplanted Heart by Three-dimensional Speckle-tracking Echocardiography

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Background: Exploring the specifically normal biventricular mechanical function of heart transplantation (HT) patients is essential during follow-up studies. The studies about the normal biventricular mechanical function assessed by three-dimensional speckle-tracking echocardiography (3DSTE) of HT patients has yet to be reported. The objectives of this study were to (1) testify the feasibility and accuracy of 3DSTE to evaluate the biventricular function in HT patients; (2) explore the normal biventricular mechanical function in HT patients using 3DSTE.
Methods: Protocol 1 enrolled 38 HT patients who experienced 3DSTE and cardiac magnetic resonance (CMR) examination within 24h. Protocol 2, 3DSTE data were compared between 46 clinically stable patients at 1 year after HT and 46 healthy controls.
Results: Protocol 1, the left ventricular (LV) and right ventricular (RV) derived from 3DSTE had an excellent accuracy comparison with the corresponding value of CMR: LVEF (r=0.96, LOA =-0.5±3.7%), RVEF (r=0.95, LOA=0.5%±4.5%). LV global longitudinal strain (GLS), LV global circumferential strain (GCS) were significantly correlated with standard CMR-LVEF (r=0.85, r=0.93, respectively, P<0.001). RV free wall longitudinal strain (FWLS) were also correlated well with standard CMR-RVEF (r=0.83, P<0.001). Protocol 2, compared with healthy controls, lower 3D LVEF and RVEF were observed in HT patients (P<0.001), but these two values were still within normal range. 3D LVGLS, LVGCS, RV FWLS and LV twist were significantly reduced in HT patients, whereas LV systolic dyssynchrony index (SDI) was increased. And the LV global performance index (GPI) was also reduced. Moreover, the strain values were good for differentiating between these two groups, the cutoff value of -19.3% for the LVGLS had 94% accuracy and the cutoff value of -21.4% for the RV FWLS had 90% accuracy.
Conclusion: Our study demonstrated that 3DSTE had a high sensitivity and accuracy to evaluate biventricular function in HT patients. For clinically stable HT patients with normal conventional echocardiography parameters of ventricular function, their myocardial mechanical function was impaired. Therefore, exploring the specifically normal biventricular mechanical function of HT patients by 3DSTE is essential during follow-up studies.

56

Angiotensin II Downregulates Vascular Endothelial Cell Hydrogen Sulfide Production by Enhancing Cystathionine-γ-lyase Degradation Through ROS-activated Ubiquitin Pathway

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Objective: Vascular endothelial dysfunction is the basic pathogenesis and initiative factor of a variety of cardiovascular diseases. In this study, we investigate the regulatory effect and molecular mechanism of Ang II on endogenous hydrogen sulfide/cyctathionin-γ-lyase (H_2S/CSE) pathway in Human umbilical vein endothelial cells (HUVECs).
Methods: In this study, we used HUVECs line-EA. hy926 cells as the cell model. We observed the effect of endogenous H_2S/CSE pathway when AngII stimulated HUVECs, and studied the effect of AngII on the ubiquitination degradation of CSE protein. The effects of AngII on the level of radical oxygen species (ROS), level of CSE ubiquitination and H_2S/CSE pathways were observed, and then the experiment was carried out with oxidation scavenger NAC and antioxidant GSH to explore the role of ROS in inhibiting H_2S/CSE pathway. The content of H_2S in cells was detected by H_2S electrode and H_2S fluorescence probe. The expression of CSE, cystathionine β-synthase (CBS), 3-mercaptopyruvate sulphurtransferase (3-MST), matrix metalloproteinase 2 (MMP2), matrix metalloproteinase 9 (MMP9), intercellular cell adhesion molecule (ICAM-1) and von Willebrand factor (vWF) in cells was detected by western blot method. The activity of MMP2/9 in the cells was detected by in situ gelatin zymogram. The level of CSE mRNA in the cells was detected by RT-qPCR assay, and the cells were transfected with ubiquitin mutant plasmids (K48 or K48R). The Co-IP method was used to detect the level of CSE ubiquitin and the binding of different types of ubiquitin chained to CSE. The content of superoxide anion in cells was detected by dihydropyridine (DHE).
Results: AngII induced vascular endothelial injury by down-reguation of H_2S, while the expression of MMP2, MMP9, ICAM-1 and vWF protein was up-regulated and the activity of MMP2/9 was increased, and on the basis of which, H_2S was added to rescue experiment. AngII down-regulated the endogenous H_2S/CSE pathway in HUVECs in a concentration- and time-dependent manner. AngII inhibited H_2S/CSE pathway in HUVECs by increasing K48-linked ubiquitin chain-mediated CSE degradation. Superoxide mediated AngII-induced CSE ubiquitination and degradation in vascular endothelial cells, which was abolished by NAC or GSH.
Conclusion: AngII inhibited the endogenous H_2S/CSE pathway in HUVECs. Its inhibitory mechanism was related to the AgnII-induced CSE ubiquitination and degradation in HUVECs. AngII promoted CSE ubiquitination by activating ROS pathway to down-regulate the H_2S/CSE pathway.

ABSTRACTS

ORAL ABSTRACTS PRESENTATION

65

Intranuclear Cardiac Troponin I Regulate Atp2a2 Expression in Cardiomyocytes as a Nonclassical Transcription Factor

Q Lu
Children's Hospital of Chongqing Medical University, Chong Qing, China

Background: Past studies showed that cardiac troponin I (cTnI, encodes by TNNI3), as a cytoplasmic protein, is an inhibitory subunit in troponin complex, involves in cardiomyocyte diastolic regulation. However different base mutations of TNNI3, gene of cTnI, could generate different phenotype of inherited cardiomyopathies, indicating that cTnI is more than a structural protein. Also, studies have demonstrated cTnI presents in nucleus.
Methods: We used immunofluorescence and Western blot assays to verify the presence of cTnI in myocardial nuclear. Bioinformatics was also utilized to analyze the suspicious downstream molecules. We used recombinant adenovirus to over express cTnI both in vitro and in vivo. To knock down the expression of cTnI, we used TNNI3 gene knockout mice and RNA interference technique. In addition, we detected the function of cells treated with RNA interference using calcium detection. In molecular level, Chip-sequence and luciferase report were used to detect the interaction between cTnI and Atp2a2.
Results: We firstly find that cTnI presents in the nucleus both in human and mouse heart tissues, and approximately 30% of total cTnI presents in nucleus of mice. Interestingly, levels of cTnI nucleoprotein in left ventricle are higher than that in right ventricle. Bioinformatics analysis data display that cTnI may relate to regulate energy metabolism and calcium regulation. Guilt of association analysis shows a strong expression correlation of cTnI and Atp2a2, which encodes sarco/endoplasmic reticulum Ca2+ ATPase isoform 2 (SERCA2), (r=0.919), and involves in ATP hydrolysis and Ca2+ transient. TNNI3 gain and loss cause Atpa2a2 increase/decrease in a dose dependent manner both in mRNA and protein levels, in vivo and in vitro. In TNNI3-siRNA myocardial cells, beat frequency are decreased significantly, total ATP contents go up, and a significant reduced rate of Ca2+ transients is observed. By using ChIP-sequence we demonstrate that cTnI associates with DNA consensus sequences including the CCAT motif, which is required for YY1 binding to the promoter region of YY1-related genes. So, by employing luciferase report assay, we explore that pcDNA3.1 (-)-TNNI3-Luc increase the promoter activity of Atp2a2 approximately 1.7-fold.
Conclusion: These findings indicate, for the first time, cTnI may regulate Atp2a2 in cardiomyocytes as a nonclassical transcription factor.

74

Treatment Option for Complex Aortic Pathology: Total Aortic Arch Replacement with Frozen Elephant Trunk

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Background: Aortic arch pathology commonly involves multiple segments of the aorta. Involvement of supra-aortic and visceral branches resulting in malperfusion insults, causing it to be one of the most challenging conditions. We reviewed our experience on total aortic arch replacement and frozen elephant trunk (FET) with a single hybrid stent graft system, allowing a possible single staged surgical option.
Methods: Between August 2014 and February 2019 at the Prince of Wales Hospital Hong Kong, patients underwent total aortic arch replacement with FET by a commercially available one-piece hybrid stent graft system were recruited. Perioperative parameters, clinical and radiological outcomes were reviewed.
Results: Thirty-seven patients, including acute dissections and chronic dissecting aneurysms in both elective and emergency procedures, were recruited. Overall mortality rate was 11% (n=4), with 8% (n=3) of aortic related death and post-discharge 2.4-year mean follow up survival of 100% (n=33). Three patient (8%) developed neurological complication with two spinal cord injury. Mean operative, moderate hypothermic circulatory arrest and antegrade cerebral perfusion time were 421±120 min, 91±28 min, and 151±39 min respectively. Seven patients (19%) had a second staged procedure for distal descending aorta with endovascular (n=6) and open (n=1) techniques.
Conclusion: We demonstrated a reasonable outcome that total arch replacement with FET is a safe and effective technique for complex aortic pathologies. We have also gathered experience in endovascular and open second stage procedure with acceptable post-discharge survival. Further study is warranted to evaluate its impact on survival and disease progression in descending thoracic aorta.

ABSTRACTS

ORAL ABSTRACTS PRESENTATION

79

Effect of RhoA/Rho-kinase Inhibitor in Human Internal Mammary Artery and Clinical Implications

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Purpose: Coronary artery bypass grafting surgery (CABG) is the best treatment for severe Coronary artery disease (CAD). Graft spasm is one of the main risk factor of long-term patency in CABG. RhoA/Rho-kinase (ROCK) pathway plays an important role in cell contraction of cardiovascular disease. ROCK is a downstream effector of small GTP-binding protein RhoA and has two isoforms, ROCK1 and ROCK2. Fasudil is a ROCK inhibitor. This study investigated the inhibitory effect of fasudil on the vasoconstriction in human internal mammary artery (IMA) from patients undergoing CABG.
Methods: Isolated human IMA rings (n=51, taken from 48 patients undergoing CABG) were studied in myograph. Cumulative concentration-relaxation curves for fasudil (-9 to -2.5 log M) were established in IMA precontracted with KCl (30 mM, n=8) and U46619 (-8 log M, n=8). Cumulative concentration-contraction curves for KCl (5 to 120 Mm, n=8) and U46619 (-9 to -4.5 log M, n=8) were also established in two ways: (1) pretreated in three groups with plasma concentrations of fasudil (-6.3 log M), 10-fold higher concentrations of fasudil (-5.3 log M), and vehicle for 40 minutes to estimate the depression effect of fasudil; (2) pretreated in four groups with fasudil (-6.3 log M), NTG (0.1 mM), the combination, and vehicle for 30 minutes. Western Blot was used to measure the change of the ROCK2 protein.
Results: Fasudil caused nearly the same relaxation in KCl-contracted (93.5%2.9%, n=8) and U46619-contracted (90.7%3.4%, n=8) IMA rings. Pretreatment with Fasudil (-5.3 log M) significantly depressed subsequent contraction by KCl (from 32.42.8 mN to 21.62.9 mN, n=8, $p<0.05$) and U46619 (from 43.54.4 mN to 23.21.6 mN, n=8, $p<0.05$). Pretreatment with the combination of NTG and fasudil depressed the contraction compared with control ($P<0.01$) or fasudil alone ($P<0.01$) for KCl-induced contraction. Similarly, the combination depressed the contraction compared with control ($P<0.01$) or fasudil alone ($P<0.05$) in U46619-induced contraction. Fasudil also caused a decrease of ROCK2 protein content ($p<0.05$).
Conclusions: Fasudil has a potent inhibitory effect on the vasoconstriction mediated by KCl and U46619 in human conduit arteries (IMA). Combination of fasudil and NTG is more effective than using fasudil or NTG alone. These findings provide a new antispastic method in CABG and may be beneficial to long-term patency of the grafts.

91

First Cluster-Based 24-hour Primary Percutaneous Coronary Intervention Program for ST-Segment Elevation Myocardial Infarction in Hong Kong: Initial Experience of a Tertiary Center

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Background: Primary percutaneous coronary intervention (PPCI) is a preferred reperfusion strategy over thrombolysis in patients with ST-segment elevation myocardial infarction (STEMI). Starting from October 2018, Queen Elizabeth Hospital (QEH) has extended the PPCI service from weekday 8 am to 8 pm period to 24-hour service including weekends and holidays. STEMI cases presented to other Accident and Emergency Department (AED) within the same cluster region (Kowloon Central Cluster) outside operating hours would also be transferred to QEH for PPCI (secondary diversion). This study aims to review the outcome of the initial phase of this first cluster-based 24-hours PPCI program.
Method: Consecutive cases of STEMI with PPCI performed in QEH after commencement of 24-hour PPCI program were analyzed (between 8th October 2018 and 8th March 2019).
Results: 131 patients underwent PPCI during the study period. Male patients comprised of 79.4% and were significantly younger than female patients (59.7 years vs. 73.7 years, $p<0.001$). The mean AED door to balloon (DTB) time was 89.5 mins. There was no significant statistical difference of DTB time between QEH AED cases and secondary diversion cases (87.6 mins vs. 98.8 mins, $p=0.28$), and between cardiogenic shock (CS) and non-CS cases (89.2 mins vs 89.6 mins, $p=0.97$). However there was difference of DTB time for patients presented at weekdays 8 am-8 pm vs. other time (76.9 mins vs 95.4 mins, $p=0.02$). The crude in-hospital mortality was 14.5% (19 cases). 23 cases (17.6%) were presented with CS. There was significant in-hospital mortality difference between CS and non-CS patients (56.5% vs. 5.5%, $p<0.001$). On the other hand there was no significant difference in in-hospital mortality in terms of gender ($p=0.51$), presentation time (weekday 8 am to 8 pm or not) ($p=0.90$) and source hospital ($p=0.73$). There were 2 additional mortality cases after discharge from QEH at up to 30-days. All clinically indicated cases of STEMI received PPCI and no thrombolysis was given during this period.
Conclusion: The result shows that cluster-based PPCI service is feasible. The DTB time is reasonable even for cases of secondary diversion given the inherent system delay. While in-hospital mortality of non-CS patients was favorable, the high in-hospital mortality of CS patients was in line with major international studies. Future directions include streamlining the workflow to reduce system delay, implementing pre-hospital ECG in ambulance and primary diversion, training in management of CS and introduction of advanced mechanical circulatory support devices.

ABSTRACTS

ORAL ABSTRACTS PRESENTATION

122

Role of Pre-discharge Cardiovascular Magnetic Resonance in Myocardial Infarction with Non-Obstructive Coronary Angiography: Regional Australian Experience

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[1]Cairns Hospital, Cairns; [2]Princess Alexander Hospital, Brisbane, Australia

Background: With the increasing utilization of high-sensitivity Troponin I (hsTnI) assays, more patients are hospitalized for hsTnI-positive chest pain and subsequently undergo coronary angiography. Hence, the prevalence of myocardial infarction with non-obstructive coronary angiography (MINOCA) is climbing. There are many etiologies of MINOCA and they all have different treatments. Cardiovascular magnetic resonance (CMR) is a robust imaging modality that can differentiate different causes of MINOCA. This abstract aims to evaluate the increment value of CMR in MINOCA.

Methods: Between January 2017 and December 2018, Cairns Hospital Cardiology had performed 405 CMR studies. Sixty-four of them were pre-discharge studies performed for MINOCA. All studies were done with a Siemens 3T scanner. All of them included full ventricular volume analysis, short-tau inversion recovery (STIR) sequences for edema assessment and late gadolinium analysis. Offline analysis done with Argus CMR package.

Results: The mean age of our cohort is 50±15 years (54% female). Racial distribution (62% Caucasians, 22% Indigenous, 10% Asians and 6% others). 43% had hypertension on one or more anti-hypertensive medications. 35% had diabetes mellitus on therapies. 15% had dyslipidemia on therapies. 32% were smoker. Specific pathologies were found in 51 studies (80%) – Myocarditis in 33% (n=21); Small myocardial infarction in 22% (n=14); Takotsubo cardiomyopathy in 9% (n=6); Hypertrophic or dilated cardiomyopathy in 16% (n=10); Normal in 20% (n=13). Amongst the patients with normal CMR, 3 had segmental pulmonary embolism. Change in therapy based on CMR findings occurred in 82% of cases.

Conclusion: CMR is a reliable imaging modality to differentiate different causes of MINOCA. Pre-discharge CMR can provide insights on appropriate therapies for MINOCA patients. Hence, unnecessary therapies and complications (e.g. bleeding) can be avoided.

ABSTRACTS

BEST ABSTRACTS PRESENTATION

4

Efficacy and Safety of Novel Biodegradable Device for Closure of Atrial Septal Defect: From Preclinical Study to First-in-Man Experience

Y Li, Y Xie, Z Zhang
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Background: Percutaneous closure of ASD has emerged as the treatment of choice for the majority of defects. Closure of ASD with permanent synthetic devices can be associated with long-term potential complications and limitations. The biodegradable ASD closure device is a novel, absorbable device made of poly- L -lactic acid (PLLA). This study evaluates the feasibility, safety, and effectiveness of PLLA biodegradable ASD closure device (AbsnowTM, Shenzhen, Lifetech Scientific) in a swine ASD model and for the first time in humans.
Method: Preclinical safety study was done in swine ASD model. In a clinical setting, 5 pediatric patients with a secundum ASD who had a clinically significant left-to-right shunt were enrolled in our center. Percutaneous ASD closure procedure with PLLA device was performed with fluoroscopic and transthoracic echocardiography (TTE) guidance. Procedural results and clinical outcomes at 1 day, 30 days, 3 months and 6 months after closure procedure were analyzed.
Results: 24-and 36-month follow-up results of preclinical study demonstrated that PLLA devices exhibited good endothelialization and degradability in a swine model. In clinical study, device implantation was successfully achieved in all of 5 patients (median age, 3.6 years; range, 3.1-6.5 years). The mean ASD size was (13.4±2.4) mm (range, 10-16 mm).The mean pulmonary-to-systemic blood flow ratio (Qp:Qs) was (1.7±0.2):1 with a range of 1.5:1 to 2.0:1. The mean procedural time and the mean fluoroscopy time were (36.2±11.3) and (6.4±1.0) minutes, respectively. Follow-up at 30 days, 3 months and 6 months was completed in all of 5 cases. Trivial mitral regurgitation was detected in 4 patients (4/5) at 30 days follow-up, which disappeared spontaneously in all of 4 cases at 3 months and 6 months follow-up. Complete defect closure with no residual shunt at 30 days, 3 months and 6 months follow-up were 60% (3/5), 80% (4/5) and 80% (4/5), respectively. There was no evidence of short-term complications related to the device or delivery system. No device dislodgement, significant aortic valve or mitral valve regurgitation, new onset cardiac arrhythmia, or other adverse events were reported.
Conclusion: This study is the first to demonstrate the feasibility, safety, and effectiveness of the PLLA biodegradable ASD closure device in humans, with no evidence of short-term complications and a high rate of early shunt closure. We also demonstrated PLLA devices exhibited good endothelialization and degradability in 24- and 36-month follow-up in a swine model. Studies to evaluate long-term safety and effectiveness with the device in a large cohort of patients are warranted.

18

Comparison of Two Different Techniques of Ultrasound Guided Axillary Vein Access for Pacemaker Implantation

CW Wong, YH Chan, YH Cheng, CS Lam
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Background: Axillary vein puncture under venogram guidance or landmarks is an established technique for pacemaker lead placement but carry higher risk of incidental axillary artery puncture. We described our initial experience of two techniques of ultrasound-guided axillary venous access for pacemaker implantation.
Methods: We performed ultrasound guided puncture with ultrasound probe within the pacemaker pocket as a bailout in 16 patients (Bailout Axillary) or prior to skin incision in 46 patients (Primary Axillary). Ultrasound were performed with linear probe on GE Venue 40 or Philips CX50. For "Bailout Axillary" group, axillary puncture was performed with ultrasound probe directly over the wound If cephalic vein cutdown were failed. For "Primary Axillary" group, axillary puncture was performed under ultrasound guidance with longitudinal approach before skin incision. Skin insertion was then made adjacent of puncture site and then blunt dissection was made. The wire was pulled through the pacemaker pocket.
Results: Success rate and lead complications were similar in the two cohort. Failed ultrasound guided axillary vein puncture were 6.3% and 8.7% respectively. In "Primary Axillary" group, successful wiring within 5 mins after local infiltration was achieved in 38 patients. Difficulty advancing J tip wire despite of successful vein penetration were found in nine cases. Successful wiring was eventually achieved in seven cases with use of hydrophilic wire or straight end of wire. No similar difficulty experienced with "Bailout Axillary" group. There were a case of pacemaker pocket infection leading to death in the "Bailout" cohort.
Conclusion: "Primary Axillary" technique with ultrasound guidance provide a safe, reliable technique for venous access in a timely fashion in most cases. The ultrasound guided axillary puncture method is effective after a training phase and may be used as the initial attempt or bailout for venous access during pacemaker implantation. The infection risk remains a major concern as a bailout.

ABSTRACTS

BEST ABSTRACTS PRESENTATION

54

Prognostic Value of Right Ventricular Three-Dimensional Speckle-Tracking strain in Pulmonary Hypertension: Superiority of Longitudinal Strain over Circumferential and Radial Strain

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Aims: Right ventricular (RV) dysfunction is a predictor of adverse outcomes in patients with pulmonary hypertension (PH). Three-dimensional speckle tracking echocardiography (3D-STE) has been increasingly used to quantify RV function, but we do not know which 3D-STE parameters provide the most important clinical information. The purpose of our study was to investigate whether RV longitudinal strain (LS) provided a better estimation of RV systolic performance and prognostic information.
Methods: 60 patients with PH and 35 normal controls were enrolled in our study. RV LS, circumferential strain (CS), radial strain (RS) were calculated by 3D-STE. RV volumes and ejection fraction (EF) were obtained from cardiac magnetic resonance (CMR) imaging.
Results: Patients with moderate and severe PH had decreased RVEF compared with controls. Our findings revealed that LS showed significant reduction in mild PH patients; whereas CS and RS were decreased in moderate and severe PH patients. Patients with severe PH exhibited reduced RV LS, RS and CS compared with patients with mild PH. RV LS had a better correlation with CMR-derived RVEF, and 6-min walking distance, pulmonary vascular resistance and pulmonary artery systolic pressure than CS and RS. Only LS improved 6 months after medical treatment. RV LS (hazard ratio [HR]: 1.186; 95% confidence interval [CI]: 1.017 to 1.383; p=0.029) and RVEF (HR: 0.878; 95% CI: 0.779 to 0.989; p=0.033) were independent predictors of unfavorable clinical outcomes.
Conclusions: Patients with PH show decreased RV strain. LS best correlates with CMR-derived RVEF, hemodynamic parameters and exercise capacity, and provides prognostic information.

71

Drug-coated Balloon in De Novo Small Vessel Coronary Artery Lesion

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Background: The aim of this study is to evaluate the clinical and angiographic outcomes of drug-coated balloon (DCB) in treating small vessel coronary artery lesion.
Method: 160 symptomatic patients with 183 de novo coronary artery lesions of ≥50% diameter stenosis in small vessels ≤2.5 mm were treated with DCB. 6-month angiographic and 1-year clinical outcomes were analyzed.
Results: The mean age of the patients was 64±11 years old, with male predominance (75%). Diabetes mellitus was found in 74 (46.3%) patients. The mean reference vessel diameter was 2.10±0.24mm. 157 (85.8%) patients received paclitaxel-coated balloon (PCB), whereas 26 (14.2%) patients received sirolimus-coated balloon (SCB). The mean size and length of the DCB were 2.16±0.26mm and 22.75±7.25 mm respectively. Restudy angiography was performed in 144(78.7%) patients at mean duration of 6.4±1.7 months. Angiographic restenosis was found in 18 (12.4%) lesions; the late loss was 0.17±0.28 mm. At one year there were 2 (1.1%) cardiac death, 8 (4.4%) myocardial infarction and 9 (4.9%) target lesion revascularization (TLR), resulting in major cardiovascular event rate (MACE) of 10.9%. When comparing with SCB, PCB yielded a lower 1-year MACE (8.9% vs 23.1%, p=0.04), a trend of lower TLR rate (3.8% vs 11.5%, p=0.09) and angiographic restenosis rate (10.7% vs 20.8%, p=0.15).
Conclusion: The use of DCB, PCB particularly, to treat small vessel disease had good clinical and angiographic outcomes at 1 year. Randomized trial to compare DCB with second generation drug eluting stent is required to further evaluate the use of DBC in small vessel disease.

ABSTRACTS

BEST ABSTRACTS PRESENTATION

106

Enhancement of High-density Lipoproteins Quantity and Quality to Treat Dyslipidemia and Hypertension by Policosanol

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Background: Metabolic syndrome is closely associated with higher risk of hypertension, cardiovascular disease, diabetes and stroke. It has been reported that Cuban policosanol improves lipid parameters and HDL functionality in human participants. The aim of the present study was to investigate the long-term effects of policosanol supplementation on blood pressure (BP) and the lipid profile in healthy Korean participants with pre-hypertension.
Methods: This randomized, double-blinded, and placebo-controlled trial included 84 healthy participants who were randomly assigned to three groups receiving 10 mg of policosanol, 20 mg of policosanol, or placebo upto 24 weeks.
Results: The BP, lipid profile, and anthropometric factors were measured pre- and post-intervention and then compared. Based on an average of three measurements of brachial BP, the policosanol 20 mg group showed the most significant reduction in average systolic BP (SBP) from 138±12 mmHg at week 0 to 126±13 mmHg at week 24 ($p<0.0001$). The policosanol 10 mg group showed a 4% reduction in SBP from 135 mmHg at week 0 to 128 mmHg at week 24 ($p=0.016$), whereas the placebo group showed no change in BP between weeks 0 and 24. The policosanol consumption for 12 weeks, the policosanol 20 mg group exhibited the most significant reduction of BP, up to 7.7% reduction of average systolic BP (SBP) from 136.3± 6.1 mmHg (week 0) to 125.8±8.7 mmHg ($p<0.001$). Between group comparisons using repeated measures ANOVA analysis showed that the policosanol 20 mg group had a significant reduction of SBP ($p=0.020$) and a reduction of DBP ($p=.035$). The policosanol 10 mg and 20 mg groups showed significant reductions in aortic SBP of 7.4% and 8.3%, respectively. The policosanol groups showed significant reductions of total cholesterol (TC) of 9.6% and 8.6% for 10 mg and 20 mg of policosanol, respectively. Lipoprotein functionality improved by policosanol to be more anti-atherogenic; LDL showed more anti-oxidant while HDL showed more anti-glycation properties
Conclusion: Consumption of policosanol resulted in significant reductions of peripheral SBP and DBP, aortic SBP and DBP, and mean arterial pressure (MAP) and serum TC and LDL-C with elevation of %HDL-C.

147

Air Pollution (PM2.5) and Arterial Endothelial Dysfunction in Modernizing China: A Report from CATHAY Study

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Background: Air pollution (AP) has been associated with prevalence of cardiovascular diseases and stroke (atherosclerosis), but whether as a triggering or atherogenic factor remains to be elucidated. Arterial endothelial dysfunction (FMD) is a surrogate marker of atherosclerotic disease, predictive of cardiovascular outcome and prognosis.
Aims: To establish a clinical model of AP-related atherogenesis (brachial flow mediated dilation FMD) as a potential surrogate marker and intervention target for atherosclerosis prevention.
Methods: 1656 Han Chinese adults (mean age 46.0±11.2 years, male 47%) in Hong Kong, Macau, Pun Yu, Yu County (coal mine in Shanxi), and 3-Gorges (Yangtze River) were studied in 1996-2007 (CATHAY Study). Cardiovascular risk profiles (smoking, body mass index BMI, waist hip ratio WHR, blood pressure SBP/DBP, LDL-cholesterol LDL-C, triglycerides TG, and fasting glucose) were evaluated. PM2.5 parameters were computed from satellite remote sensing technology. Brachial FMD (vascular reactivity) were measured by high resolution B-mode ultrasound.
Results: Their health parameters (age, gender, BMI, WHR and glucose) were similar in lowest and top PM2.5 tertile groups. SBP, DBP, and TG were higher and LDL-C was lower in top AP tertile. Brachial FMD (7.76±0.5 vs 8.72±0.6, $p<0.0001$) was significantly lower in top PM2.5 exposure tertile compared with lowest tertile.

	Lowest AP Tertile (N=552)	Top AP Tertile (N=552)	P-Values (Bonferroni adjustment)
PM2.5 ($\mu g/m^3$)	42.9±4.9	83.8±9.7	<0.0001 (<0.001)
Smoking (%)	8%	28%	<0.0001 (<0.001)
Age (yrs)	48.0±12.5	46.8±10.2	0.334 (>0.9)
Male (%)	48±0.5	41±0.5	0.027 (0.27)
SBP (mmHg)	119.1±17.8	123.4±16.5	<0.0001 (<0.001)
DBP (mmHg)	75.2±10.2	79.6±10.8	<0.0001 (<0.001)
BMI	23.2±3.4	23.7±3.3	0.016 (0.16)
WHR	0.85±0.06	0.86±0.07	0.027 (0.27)
LDL-C (mmol/l)	3.2±1.0	2.5±0.8	<0.0001 (<0.001)
TG (mmol/l)	1.19±0.76	1.50±1.50	<0.0001 (<0.001)
Glucose (mmol/l)	5.39±1.24	5.55±1.03	0.021 (0.21)
FMD (%)	8.72±0.6	7.76±0.5	<0.0001

On multiple regression of the whole cohort, FMD was significantly related to PM2.5 (beta=0.134, $p=0.015$) independent of gender (beta=0.228, $p<0.0001$), age (beta=0.188, $p<0.0001$) and DBP (beta=0.205, $p<0.007$) but not related to smoking, BMI, WHR, SBP, blood glucose and TG ($R^2=0.158$; F-value=7.6; $P<0.0001$). These variables accounted for 39% of variation in brachial FMD ($P<2.2x10^{-14}$).
Conclusion: AP has an impact on early atherogenic process in modernizing China, proposing a practical surrogate target for preventive intervention of atherosclerosis.

ABSTRACTS

HKCC-HKPHCA CHALLENGING/ INTERESTING CLINICAL CARDIOLOGY CASES PRESENTATION I

2

A Case Showing How Impella and ECMO Can Worsen Haemodynamics Synergistically

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Background: An ECMO was added on top of Impella for inadequate perfusion. Severe aortic regurgitation due to impella impringing on the valves, resulting in increased left ventricular end diastolic pressure causing acute pulmonary edema, and stasis of blood in pulmonary artery causing pulmonary embolism.
Case: A 59-year-old man developed cardiogenic shock after a complicated percutaneous coronary intervention. Echocardiography showed left ventricular ejection fraction of 15%, and no aortic regurgitation. An Impella-CP was inserted which provided 3.1 L/min flow at P8 revolution. A peripheral VA ECMO was added on day 5 due to inadequate systemic perfusion. The ECMO ran at 4.2 L/min retrograde flow and the Impella gave a forward flow of 1.9 L/min at P2 revolution to vent the left ventricle. In a few hours' time, the blood pressure dropped precipitously and the patient developed severe acute pulmonary edema (APO). The APO was unexpected as we usually expected good left ventricular venting by the Impella. An urgent echocardiogram showed an acute severe eccentric aortic regurgitation (AR). It was caused by the Impella which sat between the non and right cusps of the aortic valve, hindering its proper coaptation. Aggregated by the fast retrograde ECMO flow, acute severe AR developed. In fact, there was recirculation of blood between the AR and the Impella flow, with the former faster than the latter, resulting in APO. We stepped up the Impella flow for venting, but failed to reposition the catheter. The haemodynamic further worsened. There was gradual progression of pulmonary embolism at the main trunk, despite full systemic anticoagulation. This was likely due to stasis of blood in the pulmonary artery, due to high left ventrciular end diastolic pressure and reduced venous return as blood was shunted to the ECMO. The patient was not fit for transport nor for open heart operation. Systemic fibrinolytic would be shunted by ECMO. Bedside local alteplase was given through the PA catheter and we aimed to crack the thrombus by gentle manipulation of the PA balloon. The above bail-out treatment all failed and the patient finally succumbed.
Decision-making: It was postulated that the Impella was shifted when its revolution was turned down after ECMO set up. A good aortic valve short axis view was necessary to confirm the proper positioning of the Impella each time its flow is adjusted, especially when it was in combination with peripheral VA ECMO.
Conclusion: ECMO and Impella could synergistically worsen haemodynamics.

17

The Culprit of Recurrent Pain

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Background: Coronary spasm is not uncommon in young patients presenting with chest pain. Identification of precipitating factors are crucial in preventing recurrence.
Case: A 39-year-old lady, non-smoker and non-drinker, enjoying good past health, with known family history of hyperthyroidism, presented with one-month history of intermittent chest pain with no specific precipitating factors. Initial evaluation, including blood tests for cardiac enzymes, blood counts, liver and renal function were normal. Electrocardiography was unremarkable with no ischemic changes. Chest X-ray did not show widened mediastinum or pneumothorax. Echocardiography showed normal chamber sizes and normal left ventricular systolic function. There was no significant valvular lesion or pericardial effusion. Initially plan for discharge, but she developed recurrent severe chest pain. Repeated electrocardiography showed diffuse ST depression over inferolateral leads (II, III, aVF, V3-6) with 1mm ST elevation over aVR. Urgent coronary angiography showed severe diffuse narrowing from left main to distal left anterior descending artery. There was also severe narrowing over proximal right coronary artery after catheter engagement. Intracoronary nitroglycerin was given with immediate resolution of chest pain and restoration of normal coronary artery calibers. Subsequent optical coherence tomography (OCT) confirmed normal vessel wall without significant atherosclerotic plaque. Overall features are compatible with coronary spasm. Oral nitrates and diltiazem were initiated. However, the patient still developed few episodes of severe recurrent chest pain requiring nitrates infusion. Otherwise, she denied use of any ilicit drugs eg. cocaine or traditional Chinese medicine all along.
Decision-making: Given recurrent history of coronary spasm in a young female in the absence of cardiovascular risk factors or suspicious drug use, it prompted us to search for alternative precipitating factor. Subsequent detailed systemic enquiry revealed three months history of heat intolerance. Subtle goiter with mild hand tremor were detected in clinical examinations. Thyroid function test confirmed thyrotoxicosis with raised anti-thyroglobulin antibodies, suggesting diagnosis of Grave's disease. Carbimazole and propranolol were given, and the patient was free of chest pain thereafter.
Conclusion: Coronary spasm especially in young female without cardiovascular risk factors should raise suspicion for thyrotoxicosis, which if treated early, is the key of preventing future spasm.

ABSTRACTS

HKCC-HKPHCA CHALLENGING/ INTERESTING CLINICAL CARDIOLOGY CASES PRESENTATION I

85

Complete Atrioventricular Block in a Patient with a History of Henoch-Schönlein Purpura: A Case Report

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Background: Henoch-Schönlein Purpura (HSP) is a common condition which mostly affects cutaneous, gastrointestinal and renal systems. However, due to the immune-complex deposition causing its characteristic vasculitis, it can also affect the heart.
Case: A 15-year-old Filipino male, weighing 100 kilograms with a height of 183 centimeters presented with one week bilateral leg pain, inability to ambulate, abdominal pain, vomiting and purpura on his ankles. Physical exam showed normal blood pressure, normal heart rate and was afebrile. Complete blood count showed leukocytosis and thrombocytosis, normal serum creatinine and ANA; negative anti-dsDNA; elevated ESR. No skin biopsy performed. He was diagnosed with HSP, started on Prednisone 15 mg daily and discharged well. Eight months after, he started complaining of dizziness, without accompanying nausea, vomiting or syncope. During an episode of dizziness, he was found to have a heart rate of 40 beats per minute with normal blood pressure. A resting electrocardiogram (ECG) showed a complete atrioventricular block with junctional escape rhythm. A 2D echocardiography with Doppler was normal. 24-hour Holter monitoring was not done. Thyroid function tests including TSH, fT3, and fT4 to rule out hypothyroidism as a cause of bradycardia were normal. He was started on clopidogrel 75 mg daily and monitored with monthly ECG's. Due to no spontaneous resolution of the complete AV block, the patient underwent permanent pacemaker implantation (PPI). A dual chamber pacemaker was placed on the right atrium and right ventricle via the left cephalic vein using the Modified Seldinger Technique. On follow-up eight months after, the ECG showed regular ventricular-paced rhythm with a rate of 90. However, echocardiogram shows a decline in ejection fraction (55% from 72% Simpson's), Grade 1 left ventricular diastolic dysfunction and mitral valve thickening without prolapse. There is no recurrence of dizziness.
Decision-making: The decision to do a permanent pacemaker implantation was based on the American College of Cardiology/American Heart Association Class I, Level C recommendation that treatment of symptomatic bradycardia a PPI.
Conclusion: The natural history of HSP and the possibility of coexsiting cardiac dysrhytmia warrant an electrocardiogram, at the bare minimum, to unveil these rhythm and conduction abnormalities early on. Further investigations may be considered to uncover underlying structural heart disease.

108

A Rare Case of Anomalous Origin of Left and Right Coronary Artery

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Background: Congenital coronary artery anomalies (CCAAs) are abnormalities in the origin, course or structure of these arteries, and their incidence varies from 0.2% to 5.6%. CCAAs may cause myocardial ischemia and sudden cardiac death. Anomalous origin of the left coronary artery from the pulmonary artery (ALCAPA) is more common in CCAAs.
Case: Our case was a thirty eight day old female infant born by normal vaginal delivery. She was asymptomatic till 30th day of life when parents noticed that baby had a cough and wheezing. Chest X-ray showed enlargement of cardiac shadow, echocardiogram revealed dilation of left atrium and ventricle with severe LV dysfunction in local hospital. She was admitted to our hospital for endocardial fibroelastosis. In our hospital, the ECG displayed normal sinus rhythm, abnormal Q (q) waves in high lateral wall with QRS waveform of anterior lateral wall fragmentation, prolonged QT interval, and T-wave inversion in leads I, II, avL, avF, V5, V6. On 2D echo the beginning of the left coronary artery was invisible, a similar echo of left coronary artery (LMCA) was seen to connect with the main pulmonary artery (PA) however on color Doppler anterograde-flow was seen in the left coronary artery, right coronary artery (RCA) was visible from aorta and its starting position was about 1 o'clock. It was discussed CT angiogram (CTA) could help to demonstrate diagnosis. Baby was administered oxygen inhalation, digitalis and diuretics during this period. After 6 days CTA demonstrated that RCA originated from the left side of the ascending aorta, and LMCA originated from the PA. Transthoracic echocardiogram was repeated. Interestingly, the bi-directional shunt was showed in the left coronary artery this time, and it was mainly shunt of right-to-left on color Doppler.
Decision-making: Correction of abnormal origin of coronary artery and ECMO placement were performed in the baby. Unfortunately, owing to poor left ventricular function, the infant could not be weaned from ECMO. She died on the 7th day after the operation.
Conclusion: We are reporting a case of abnormal position of RCA and ALCAPA with severe LV dysfunction. It is result of pulmonary hypertension due to left ventricular heart failure. By anti-heart failure treatment, pulmonary artery pressure decreased. The blood-flow was transferred anterograde-flow pattern to bi-directional and right-to-left shunt in left coronary artery.

ABSTRACTS

HKCC-HKPHCA CHALLENGING/ INTERESTING CLINICAL CARDIOLOGY CASES PRESENTATION I

125
Progressive Dyspnea: Pulmonary Embolism Refractory to Anticoagulation

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Background: Anticoagulation is the treatment of choice for pulmonary embolism. Poor treatment response warrants further differential diagnosis.
Case: A 44-year-old housewife complained with progressive shortness of breath for 2 months. Initially, dyspnea occurred after heavy physical activities, accompanied with chest pain which relieved after rest. Her exercise capacity continued to decrease, and dyspnea with cyanosis could be triggered by emotional fluctuation. Her pulmonary artery CT scan showed multiple filling defects in arteries. She was therefore diagnosed with pulmonary embolism and was given thrombolytic therapy. Her symptoms deteriorate two days later, and she was transferred to our hospital. She denied any history of coronary heart disease, hypertension or diabetes. Physical examination: Vital signs: T 38.5°C, P 111 bpm, R 31/min, BP 117/71 mmHg. BMI: 18.03 kg/cm^2. Distension of jugular vein was noted. Laboratory tests: Arterial blood gas: pO2 57 mmHg, pCO2 29 mmHg, pH 7.5, HCO3- 22.6, BE -0.6, Lactate 1.8, SO2 92%. NT-proBNP: 2977 pg/ml. NSE: 25.5ng/ml (ref: 0-16.3 ng/ml). D-dimer and cardiac enzyme was normal. ECG: Sinus rhythm, with T wave inversion in V1-V5. Echocardiogram: Enlargement of right atrium and right ventriculum. Marked pulmonary hypertension. Pulmonary artery CT scan: Multiple filling defects in both left and right pulmonary arteries. Medication: Riociguat 0.5 mg Bid, Tracleer 62.5 mg Bid, and Enoxaparin 4000U q12h. However, her symptoms worsened, with pulmonary pressure reaching 112 mmHg, compared with 95 mmHg at admission. Heart MR: Cancer focus in pulmonary arteries. PET-CT: Filling defects in pulmonary arteries with increased glucose absorption, indicating pulmonary arterial sarcoma. Pulmonary arterial tumor resection was performed. Pathological report revealed endarterial sarcoma. Patient suffered from recurrent airway bleeding on postoperative day 2, and develop infection and MODS afterwards. She was discharged upon deamand by family.
Decision-making: Progressive dyspnea, pulmonary hypertension and arterial filling defects supported pulmonary embolism, while poor therapeutic response suggested otherwise. Weight loss and hypoalbuminemia indicated catabolic state including malignancy, which was corroborated by elevated NSE. MR and PET-CT were therefore performed, leading to the rare finding of pulmonary artery sarcoma.
Conclusion: Pulmonary artery sarcoma is a rare disease with an incidence of 0.001-0.003%. Surgery was the only cure with survival benefit reported by retrospective studies. In patients with pulmonary embolism refractory to anticoagulation, differential diagnosis of rare etiologies should be considered.

130
Mid-Ventricular Obstructive Hypertrophic Cardiomyopathy Associated with Apical Aneurysm and Left Ventricular Thrombus

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Background: This case report reviewed a patient with Mid-Ventricular Obstructive Hypertrophic Cardiomyopathy (MVOHCM) with initial presentation mimicking acute coronary syndrome and Takotsubo cardiomyopathy.
Case: A 72-year-old female presented with worsening of shortness of breath without significant chest pain. She developed ventricular tachycardia with unstable hemodynamic condition soon within 1 hour of emergency room arrival. The arrhythmia was converted to sinus rhythm after total 4 times of electrical cardioversion (150-200J) followed by amiodarone infusion. Post conversion 12-leads ECG showed ST segment depression over lead I, aVL, V2-V6 with T wave inversion throughout the anterior, inferior and lateral leads. Pre-cardioversion blood test later reported elevated levels of cardiac enzymes including creatin kinase-MB and troponin T. With the provisional diagnosis of suspected acute coronary syndrome with ventricular arrhythmia, coronary angiography and left ventriculography were performed. Coronary angiogram revealed patent coronary arteries. Left ventriculography showed an akinetic apex with ballooning appearance and hyperkinesia at basal region. A contrast defect image consistent of thrombus was also noted at apex. Echocardiography was repeated showing significant LV eccentric hypertrophy (IVS=1.9 cm, LVPW=0.9 cm). LV contraction is preserved but apical aneurysm with an organized thrombus size 1.8x1.7 cm was found. Severe left ventricular obstruction at mid-cavity level during systole was observed. Using continuous wave Doppler, the pressure gradient was measured as 70 mmHg. The patient was eventually diagnosed as having Mid-Ventricular Obstructive Hypertrophic Cardiomyopathy (MVOHCM) with apical aneurysm and LV thrombus, and medical treatment with a beta blocker and warfarin was started.
Decision-making: Patient is haemodynamically stable and no more arrhythmia including premature ventricular beat presented during hospital stay. ICD implantation after cardiac magnetic resonance (CMR) examination were scheduled. Yet patient developed another episode of sustained ventricular fibrillation before the CMR study and did not make through the resuscitation. The patient eventually succumbed.
Conclusion: Mid-Ventricular Obstructive Hypertrophic Cardiomyopathy (MVOHCM) is an uncommon form of hypertrophic cardiomyopathy. This case showed a patient with MVOHCM with early presentation mimicking acute coronary syndrome and Takotsubo cardiomyopathy. Patients with Takosubo cardiomyopathy usually recovers from the acute stage and had favourable prognosis. However, patients with MVOHCM and apical aneurysm are commonly associated with adverse clinical course, including sudden death events. CMR is the preferred imaging study for hypertrophic cardiomyopathy. Yet timely recognition of MVOHCM with apical aneurysm by echocardiography is still important because it may change the clinical decision of management and provoke early ICD implantation for prevention of malignant arrhythmia or sudden death.

ABSTRACTS

HKCC-HKPHCA CHALLENGING/ INTERESTING CLINICAL CARDIOLOGY CASES PRESENTATION II

9

Weathering an Adenosine Insensitive Right Ventricular Outlow Tract Ventriclular Tachycardia (Adenosine Insensitive RVOT VT) Storm in an Adolescent Female. A Case Report

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Majority of VT's are associated with structural heart disease. However, 10% are idiopathic such as RVOT-VT which hallmark is its sensitivity to adenosine (ADO), consistent with triggered mechanism. Exceptionally, only 11% of RVOT-VT is ADO-insensitive, posing a diagnostic challenge.

Case Summary: A 15-year-old female, asthmatic, had palpitations, lightheadedness and dyspnea. She had a similar episode of incessant palpitations a month ago, which necessitated electrical cardioversion and amiodarone. No family history of sudden death. On admission, she was in cardiorespiratory distress and very tachycardic. Cardiac exam was unremarkable except for faint pulses. A wide complex tachycardia was documented. Initially managed as a case of myocarditis and supraventricular tachycardia with aberrancy, vagal maneuvers, adenosine, amiodarone and diltiazem were given. Echocardiogram showed a structurally normal heart. All work-ups for alternate diagnosis were normal. Despite treatment, VT recurred in 24 hours, yet she remained hemodynamically stable. Detailed analysis showed wide complex tachycardia, LBBB morphology, AV dissociation, positive QRS complexes in inferior leads, suggestive of RVOT-VT storm. Adenosine was given however, the patient did not revert back to sinus, hence, ADO-insensitive RVOT-VT was considered. Synchronous cardioversion terminated the tachyarrhythmia. On EPS, VT was induced/localized at the RVOT via 3D-electroanatomical mapping. RFA of the focus was performed, immediately terminating the tachycardia. Post ablation, she was asymptomatic and discharged with excellent prognosis.

Discussion: ECG remains accessible/reliable in recognizing and localizing RVOT-VT. Albeit very rare, ADO-insensitive RVOT-VT was documented and it linked to somatic myocardial mutations in A1-ADO receptor-associated CAMP-mediated pathway. We highlight the importance of prompt recognition of this arrhythmia, because management/prognosis is dissimilar from common causes of VT. By correctly managing this arrhythmia, long-term complications such as tachycardia related cardiomyopathy and sudden death can be prevented.

30

Where is the ASD?

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Background and Case: A 71-year-old man with history of hypertension and hyperlipidemia underwent transthoracic echocardiography (TTE) for the assessment of incidental systolic heart murmur during routine check-up. TTE color flow Doppler revealed left-to-right shunt across the inter-atrial septum suggestive of secundum atrial septal defect (ASD). Subsequent transesophageal echocardiography (TEE) demonstrated turbulent color flow in mid-portion of coronary sinus (CS) but no evidence of ASD Transvenous agitated saline injection test was negative for right-to-left shunt.

Decision-making: Computed Tomography (CT) of the heart showed a dilated and tortuous right coronary artery (RCA) with a small (approximately 2 mm in diameter) posterior descending artery (PDA) fistulating into CS draining into the right atrium. Invasive coronary angiogram revealed giant aneurysmal dilatation of the RCA with fistula to CS through distal circulation and significant stenosis in left anterior descending artery (LAD) and left circumflex artery (LCx). The patient was referred for surgical ligation of RCA fistula with bypass grafting to PDA and left coronary system (LAD and LCx). Schematic illustrations of the heart denote the rationale how abnormal Doppler flow from coronary sinus mimicked a secundum ASD. RCA fistulation to CS resulting in aneurysmal dilatation of RCA is a rare congenital anomaly, usually presenting late with right heart volume overload secondary to left-to-right shunt. Spontaneous rupture of aneurysmal fistula leading to hemopericardium has been reported.

Conclusion: Multimodality imaging including echocardiography, CT and magnetic resonance imaging of heart is essential for definitive diagnosis and subsequent treatment planning.

ABSTRACTS

HKCC-HKPHCA CHALLENGING/ INTERESTING CLINICAL CARDIOLOGY CASES PRESENTATION II

35

Two Tachycardias, One Cause

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Background: Aconite poisoning is an uncommon yet important cause of serious arrhythmias.
Case: A 72-year-old woman presented with confusion, vomiting, diarrhea and tongue numbness 2 hours after consuming home-made herbal soup. Her blood pressure was 118/90 mmHg, heart rate 104 beats per minute. She had incoherent speech. Thirty minutes later her blood pressure dropped to 58/39 mmHg, heart rate 144 bpm. The electrocardiogram (ECG) showed a regular wide complex tachycardia, right bundle-branch block (RBBB) morphology, extreme right axis and atrioventricular dissociation consistent with fascicular ventricular tachycardia (VT). As the rhythm spontaneously aborted, another ECG was obtained showing a tachycardia with a rapidly alternating QRS axis. Troponin T was <14 ng/L.
Decision-making: The second ECG was characteristic of bidirectional VT. A notable example is digoxin overdose. However, digoxin level was undetectable, and the patient's symptom closely following ingestion of herbs is concerning for alkaloid poisoning. The patient reported ingestion of Fuzi, a medicinal plant containing cardio- and neurotoxic aconites. Her blood pressure was stabilized with intravenous fluids, ionotropes and amiodarone. Bidirectional tachycardia was gradually replaced by occasional premature ventricular complexes, which together with her gastrointestinal and neurologic symptoms, completely resolved the day after. Analysis of herbal remnant and urine sample returned positive for aconite alkaloids and their metabolites. Fuzi is used in Chinese herbal medicine for pain relief and cardiotonic effects. Consumed in large quantities, aconites are highly neurotoxic and proarrhythmic. Toxicity usually appears 30 minutes after consumption, including vomiting, numbness, confusion, arrhythmias and hypotension. Sensory symptoms are prevalent. Besides bidirectional tachycardia, fascicular VT has also been reported. Since no antidote is available, supportive care is the only treatment. Aconites are lipophilic and are not dialyzable. The duration to recovery ranges from 2-7 days.
Conclusion: Aconite poisoning may cause arrhythmias that mimic digoxin overdose. A careful history is often revealing.

131

Development of Deep Vein Thrombosis After Achieving Remission in a Patient with Acquired Hemophilia A

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Background: Acquired hemophilia A (AHA) is an uncommon autoimmune disease caused by immunoglobulin G antibodies against Factor VIII (FVIII). Occurrence of clinical thrombosis rarely occurs in congenital or acquired hemophilia. We report a case of AHA, in remission, with subsequent development of deep vein thrombosis (DVT).
Case: A 53-year-old Filipino male presented with left lower quadrant abdominal pain. Diagnostics revealed anemia, isolated activated partial thromboplastin time (APTT) prolongation, and left psoas hematoma on ultrasound. Based on decreased FVIII levels and PTT mixing studies confirming presence of an inhibitor, AHA was diagnosed. Acute bleeding was managed with supportive transfusion (Fresh Frozen Plasma or cryoprecipitate), bypassing agents (FEIBA and rFVIIa) and FVIII concentrates. For inhibitor eradication, Prednisone and Cyclophosphamide were used. Upon discharge, steroids and factor concentrates were maintained. After 2 months of treatment, he achieved partial remission based on normal repeat FVIII and reduced hematoma size. However, sudden left leg swelling prompted readmission. Venous duplex scan (VDS) showed DVT of the distal external iliac, common femoral, deep femoral and popliteal veins.
Decision-making: Balancing the treatment of thrombosis with the high risk of bleeding at any time was a major concern in this patient's case. Because the patient did not have bleeding at the time, treatment for DVT with appropriate anticoagulation was prioritized. He was treated with low molecular weight heparin and bridging anti-coagulation. The consensus was that if bleeding occurred at any point, the treatment paradigm would shift to prioritize treatment for acquired hemophilia A, control bleeding with bypassing agents and factor replacement, transfuse blood products supportively, and monitor for progression of thrombosis or development of new thrombotic events. Fortunately, bleeding never occurred during anticoagulation. Upon discharge, he was maintained on Prednisone, which was tapered down gradually, and Warfarin 5mg daily, with INR target of 2 to 2.5. After 10 months of Warfarin treatment, repeat venous duplex scan revealed full resolution of the DVT.
Conclusion: Thrombosis occurring in the setting of hemophilia is a paradox. Rapid increase in FVIII activation during remission phase leads to elevated FVIII levels and a dose-dependent predisposition to thrombosis. Massive local tissue factor generation in response to widespread vascular injury can activate Factor X directly. Bypassing agents also confer significant thromboembolic risk. Hence, AHA patients with risk factors for thrombosis should be monitored closely by clinical assessment and coagulation testing. Treatment of thrombosis must be vigilantly balanced with the high bleeding risk innate among hemophiliacs.

ABSTRACTS

HKCC-HKPHCA CHALLENGING/ INTERESTING CLINICAL CARDIOLOGY CASES PRESENTATION II

134
An Atypical Left Atrial Mass

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Background: A 63-year-old gentle was incidentally found to have a large left atrial mass
Case: A 63-year-old gentle with past history of Hypertension, Diabetes mellitus and ischemic stroke was admitted for Chest pain. Electrocardiogram show diffuse ST elevation over chest leads. Urgent coronary angiogram was done showing mild disease over Left anterior descending artery and Left circumflex artery only. However, there is a 5 cm x 6 cm mass obliterating Left atrium identified by echocardiogram. Trans-esophageal echocardiogram was done show a 5 cm x 4 cm x 4.5 cm well cirumscribed non-mobile mass with multiple cavitation and septae attaching to atrial septum and inferior wall of left atrium. There is another 3.4 cm x 3.1 cm x 2 cm mass attaching to superior wall of Left atrium. The masses filled a large portion of Left atrial lumen but allow passages for blood flow from all four pulmonary veins to mitral valve. The left atrium is dilated but left atrial pressured was not increased. MRI heart was done for better delineation of the Left atrial mass. It has discovered that the 2 mass detected in Trans-esophageal echocardiogram were actually one large bilobed oval shape mass adherent to posterior Left atrial wall. Main bulk of the mass has shown no significant contrast enhancement, it is therefore more suggestive for large left atrial thrombus. The patient developed atrial fibrillation during hospital stay and dabigatran was started for stroke prevention.

Decision-making: What is the most appropriate treatment of choice for this patient? Although the Left atrial thrombus may resolve with anticoagulation therapy, the patient was still at risk of thromboembolic event or mitral valve obstruction. The patient was referred for surgical excision of the left atrial mass. A 9 cm lesion over Left atrium was excised. Tissue pathology shows organizing thrombus with amyloid deposit and amyloidosis in myocardium. Typing of amyloidosis was uncertain but in favour of transthyretin amyloidosis. Abdominal fat pad biopsy found no amyloid deposition. Pyrophosphate scan reveal minimal uptake over heart and bilateral maxilliary sinuses. The subtype of amyloidosis cannot be determined despite intensive investigation. After discussion with hematology team, we decided for supportive management and monitoring of paraproteinemia.
Conclusion: It is a case of very atypical presentation of amyloidosis.

143
Investigate the Indications of Percutaneous Ablation for Atrial Fibrillation in Patients with Rheumatic Mitral Stenosis

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Background: Atrial fibrillation is frequent in patients with rheumatic mitral stenosis. The ablation of targeted atrial tissue has emerged as an effective rhythm management strategy in patients with atrial fibrillation. But the indications of atrial fibrillation ablation in patients with mitral stenosis is not addressed in recent atrial fibrillation management guidelines.
Case: A 63-year-old woman was admitted to the hospital on July 30, 2018. She complained recurrent onset of chest discomfort for more than 4 years and became significant after the activity with shortness of breath for more than one month. She has hypertension for 4 years. The highest blood pressure was 160/100 mmHg and take medical treatment to control blood pressure well. She had no history of stroke and diabetes. She once was in the hospitalization in January 2014. During that time, she underwent examination, including CAG and echo. There was no obvious abnormality in CAG. The cardiac echo showed rheumatic heart valve disease, mitral stenosis (valve area 1.9 cm^2). In 2015, She was diagnosed with "atrial fibrillation" in community hospitals and did not take anticoagulant therapy and rhythm control treatment.

Decision-making: We discuss which choices would be more beneficial, safe and useful to the patient: (1) percutaneous ablation? (2) PMC? (3) Percutaneous ablation after or during PMC? (4) surgical ablation during mitral valve surgery? (5) Anticoagulation treatment? (6) Left atrial appendage closure? Through comparing all the examination, especially echo data, the patient suffered the percutaneous ablation and take oral Warfarin postprocedure until now. The patient resumed sinus rhythm on the second postoperative day followed by chest discomfort disappeared. Holter examination showed maintenance of sinus rate after 8 months follow up.
Conclusion: In our experience, percutaneous atrial fibrillation ablation could be performed in the highly selected patient with mitral valve stenosis. Still, more studies are needed to evaluate the efficacy and clinical impact of percutaneous ablation at different stages of mitral stenosis.

ABSTRACTS

BEST CHALLENGING/ INTERESTING CARDIAC INTERVENTION CASES PRESENTATION

47

Successful Retriveal of Entrapped Rotablator after Failure of Traditional Method

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A 70-year-old housewife presented chest pain and severe calcified stenosis in pLAD in CT angiogram. PCI was performed via RRA using a 6F EBU catheter. LAD was wired but 2.0 balloon would not dilate the proximal lesion. Rotablation was performed, using a 1.25 mm burr with short peckings at 180k rpm, could pass pLAD. Further attempt at mLAD bend suddenly resulted in burr entrapment, just distal to D1. Separate 7F EBU engaged LM via new right femoral access. Attempt to pass various parallel wires beyond the burr all failed despite supported by micro-catheter. The second wire was then directed to D1 to support balloon dilatation at pLAD. Simple traction of burr still failed, though hemodynamics of patient remained stable. The plan was then changed to disassembly of rotablator to allow child-in-mother technique for enhancement of traction. The driveshaft and its encircling plastic sheath were cut with preservation of rotawire inside. With its radio-opaque spring tip withdrawn to the tip of burr, traction of rotawire together with counter-traction of Guideliner along the burr resulted in successful retrieval without complication. The D1 wire was directed to dLAD. We decided to upsize the burr to 1.5 mm, which crossed mLAD lesion upon the 26th short run. However patient presented slow flow afterwards, which was improved with intracoronary adenosine plus intravenous inotrope. After IVUS assessment and OPN pre-dilatation, Synergy 2.5 x 48 mm stented ostial to mid LAD. 3.5 NC upsized proximally. Final IVUS and angiographic result was good. Traction via a transected driveshaft alone may lead to unwinding and elongation of its helical structure, thus reducing the traction force. On the other hand, preservation of intact rotawire, with cut and removal of the driveshaft and its sheath, allows the local application of traction distal to tip of entrapped burr via a child-in-mother system. This partial disassembly, unlike other publications of complete disassembly with rotawire cut off, has not been reported, to the best of our knowledge.

66

Thrombus in LAA: Nothing Ventured, Nothing Gained

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We implanted a left atrial appendage occluder (LAAO) into a patient with very high bleeding and stroke risk. Our patient was a 69-year-old Chinese lady with multiple comorbidities including IgA nephropathy with renal transplant done in 2009, hypertension, diabetes, hepatitis E infection, hypothyroidism, and sleep apnoea. She was also known to have AF on oral anti-coagulation (OAC). CT coro in 2017 already noted suspicious thrombus in the LAA. She was admitted to our hospital surgical unit in 5/2018 for epigastric pain and anaemia with subsequent OGD showed acute GU. Colonoscopy showed diverticula and piles. OAC was then withheld until 7/2018 when repeated OGD showed healed GU but still with diffused gastritis and erosion at antrum. She was re-admitted in 8/2018 for dizziness. Physical examination showed right homonymous hemianopia. CT brain showed left occipital Infarction. OAC was not resumed due to persistent anaemia and positive faecal occult blood testing. Her CHA2DS2VASc score was 7. Because of the very high bleeding risk, we decided to proceed to LAAO implantation. However, the pre-procedure TEE in 11/2018 and 1/2019 showed severe LA smoke and LAA thrombus. The procedure was abandoned. She was put on Pradaxa and hopefully it would dissolve the clot. She was admitted to our surgical unit in 2/2019 for PRB with proctoscopy showed first degree haemorrhoids. CT showed multiple diverticula with inflammatory changes. Pradaxa was stopped. TEE was repeated on 12/2/2019 and still showed LAA thrombus. After thorough discussion with patient and her relatives on the risk and benefit of LAAO, they agreed to proceed. The procedure was done on 4/3/2019 under general anaesthesia. We inserted the Sentinel cerebral protection device via the right radial artery to minimize the stroke risk. We injected contrast into the pulmonary artery in order to visualize the LA and LAA morphology. The positioning of LAAO was heavily rely on TEE guidance instead of injecting contrast directly into the LA to avoid dislodgement of the LAA thrombus. Finally we successfully implanted a Lambre 30/36 into the LAA in 1 attempt with satisfactory TEE results. The patient recovered well with no clinical stroke or systemic embolization. She was put on aspirin and clopidogrel and discharged from our hospital 2 days after the procedure. A follow up TEE was arranged in 45 days post LAAO implantation. In conclusion, we successfully implanted a LAAO in a patient with LAA thrombus with no evidence of systemic embolization.

ABSTRACTS

BEST CHALLENGING/ INTERESTING CARDIAC INTERVENTION CASES PRESENTATION

67

A Missing Vessel

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Background: Dual left anterior descending artery (LAD) is a rare congenital anomaly. Concomitant dual LAD with anomalous origin and right coronary artery chronic total occlusion (CTO) is challenging for coronary intervention.
Case: A 60-year-old man, chronic smoker with diabetes mellitus presented with stable effort angina. Angiogram found moderate left main disease, significant proximal LAD and left circumflex artery (LCx) stenosis, suspected mid LAD CTO with retrograde filling from right side coronaries and mid to distal right coronary artery (RCA) total occlusion with retrograde filling from left coronaries. The left main bifurcation lesions were first stented with culotte technique. Subsequently, attempt to wire the mid LAD CTO with antegrade approach was unsuccessful. Initially plan to wire the mid LAD CTO from right side collateral vessel. However, upon careful examination, the 'right side collateral' was actually an anomalous origin LAD from right coronary cusp supplying the mid to distal LAD territory. It was a dual LAD system rather than a LAD CTO lesion. Therefore, no intervention was required to perform to mid LAD. There was a stenosis at the distal anomalous LAD. Attempt to wire across the lesion using Runthrough and Fielder XT wires supported by Corsair with 7Fr AL1 guiding catheter was made. However, it was unsuccessful due to the angulation of the vessel. In view of the difficulty and distal disease, the strategy was changed to tackle the RCA CTO. Finally the RCA CTO intervention was successful through epicardial collaterals from LCx with reverse CART technique.
Decision-making: The short LAD originating from left main artery terminated early, it is easily mistaken as mid LAD CTO. However, it is essential to distinguish it from the dual LAD anomaly. Moreover, intervention to the anomalous LAD was difficult due to the acute angulation. Stent delivery may not be easy even if wiring to distal LAD was successful. Therefore, percutaneous coronary intervention to the distal LAD was abandoned after brief attempt. Also, it is mandatory to perform computer tomography (CT) of coronary arteries afterwards to identify the types of dual LAD. In this patient, CT confirmed the anomalous LAD travelling between aorta and pulmonary artery, a potential malignant course. The patient was advised to avoid strenuous exercise.
Conclusion: Dual LAD anomaly is a rare but important disease entity. It is crucial to identify the course of dual LAD by CT scan in order to have a successful coronary intervention and best clinical management.

92

Coronary Artery Fistula – A Nightmare to the Patient and Doctors

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Background: Coronary artery fistulas (CAF) is anomaly with abnormal connection between coronary arteries and cardiac chambers or great vessels. Although it is a rare disease, it can result in undesirable consequence.
Case: An 82-year-old man with history of hypertension and diabetes mellitus, presented with chest pain and hemodynamic unstable ventricular tachycardia. His condition was stabilized after cardioversion. Echocardiogram reviewed ejection fraction 50% with hypokinesia over anteroseptal region. Urgent coronary angiogram showed coronary fistula arised from proximal left anterior descending artery (LAD) connected to a giant aneurysm and drained into pulmonary artery, flow to distal LAD was markedly diminished due to coronary steal.
Decision-marking: He was referred to surgical intervention in view of symptomatic coronary fistula with large aneurysm. Fistula ligation, repairment of aneurysm and CABG with LIMA to LAD were performed. Four months later, patient presented again with chest pain and hemodynamic unstable ventricular tachycardia. Restudy coronary angiogram showed persistent coronary artery fistula and aneurysm. Cardiothoracic surgeons were consulted again but they concluded no more benefit from another surgical intervention. Thus, we discussed with the patient for transcatheter coil embolization, but the patient refused. Patient was intolerant to betablocker due to bradycardia and refused ICD as a backup therapy. Few weeks later, he presented with another episode of chest pain and hemodynamic unstable VT. Eventually, the patient agreed for transcatheter coil embolization to the coronary artery fistula. He was asymptomatic after the intervention. Myocardial SPECT scan 9 months later showed no evidence of myocardial perfusion defect. Relevant learning points would be the indication of intervention and management approach to coronary fistula.
Conclusion: In conclusion, surgery was the traditional treatment method for coronary fistula, but percutaneous catheter closure appears as an alternative treatment option, which is proven feasible and safe in the anatomically suitable vessel.

ABSTRACTS

BEST CHALLENGING/ INTERESTING CARDIAC INTERVENTION CASES PRESENTATION

128

Tackling Knot & Fracture in Transradial Procedure

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Background: Transradial access has nowadays become a standard of care for percutaneous coronary angiography & intervention. This approach has demonstrated significant reduction in bleeding rate, length of hospital stay & improvement in clinical outcomes when compared to the traditional TF approach. However this novel approach may lead to severe catheter kinking & twisting & further manipulation may be required to unravel the catheter & avoid complication. An interesting case of complete fracture of a 6 Fr Ikari guide catheter in the brachial artery during transradial coronary intervention is presented.
Case: A 58-year-old hypertensive, diabetic, dyslipidaemic lady with prior history of PCI to OM & RCA 2 years back was admitted with Unstable Angina. Her ECG revealed inferior ischaemia. LAD has mild to moderate disease in its mid part. Stent in principal OM branch is patent. Dominant RCA has 70% stenosis in its mid part. Stent in distal RCA is patent. PLV branch has 80% proximal disease. So PCI to mid RCA & PLV branch was planned. Guide catheter Ikari 1.5 5 Fr & Guide wire Sion blue were used. Predilataion balloon was 2.0x8 mm. PLV lesion was stented by 2.25x12 mm DES & mid RCA lesion by another 2.75x20 mm DES. There was sudden displacement of guide catheter before taking final image due to deep inspiration by the patient. Final images revealed TIMI 3 flow in RCA after reengagement of Ikari guide catheter. There was partial dampening of pressure curve on monitor. Fluoroscopy revealed a tight knot within the right brachial artery along with the PTCA guide wire. A long guide wire was advanced to untie the knot but failed. Guide catheter was broken into two pieces at the level of elbow. Proximal part of broken catheter was removed through the radial sheath. Snare catheter was used to retrieve the remaining broken segment but failed. Finally a 6 Fr JR guiding catheter was advanced and the distal part of the broken catheter was captivated into the JR guiding catheter and was removed successfully removed through the ipsilateral radial approach.
Conclusion: As TR approach becomes more diffusely used, complications related to this procedure will likely be encountered more frequently. Extra care should be taken when engaging an Ikari guiding catheter. All retrieval techniques are part of endovascular practice & need to be known & applied where necessary.

132

Unstable Pulmonary Embolism Contraindicated for Thrombolytic

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Background: A 56-year-old female had gynaecological operation performed and post-operatively the patient was having on and off severe bleeding over surgical wound. She developed shortness of breathe and severe shock shortly after; CT scan was performed showing bilateral pulmonary embolism.
Case: Patient's blood pressure remained very low despite fluid resuscitation and triple inotropic support, hence she was put in VA ECMO circulatory support. Due to haemodynamic comprimisation, she is indicated for thrombolytic therapy; However, as patient had recent surgery with active bleeding from surgical site, she was contraindicated for thrombolytics.
Decision-making: Invasive pulmonary artery arthrectomy was performed with various method. As EKOS was not available in our hospital, various other methods were attempted including angioget, direct catheter suction, snaring to decrease the clot size, etc. Different support to facilitate the procedure (e.g. Shuttle Sheath) was also employed. Finally pulmonary angiogram showed much improved flow. Patient was continued on anticoagulation post-operatively with close monitoring of the haemoglobin level and bleeding over surgical site. She was able to gradually wean off ECMO and discharged.
Conclusion: Pulmonary Embolism is a relatively common post-operative complication, which in most cases, are relatively stable. However it could also be potentially very severe with haemodynamic comprimisation and in these group of post-operative patients, not all are fit for thrombolytic therapy. This case illustrated various methods we could help this group of patients and different technical difficulty that we may encounter with corresponding trouble-shooting demonstrated.

ABSTRACTS

BEST HKCC-HKPHCA CHALLENGING/ INTERESTING CLINICAL CARDIOLOGY CASES PRESENTATION

3

A Case of Kleinfelter Syndrome with Cardiomyopathy

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A 54 year of male with no previous cardiac history presented with rapid atrial fibrillation with left ventricular hypertrophy (LVH) on his ECG requiring cardioversion to restore sinus rthym. At the age of 39 he was investigated for infertility and was diagnosed to have Klinefelter syndrome but his documentation was not available. He was having three monthly injection of testosterone. His father died of a myocardial infarction at 50. He had 2 brothers, one of whom required fortnightly treatment for a heart condition. The other brother was well and refused medical assessment. On examination the patient had gyaecomastia, abdominal obesity and tiny testicles on scrotal ultrasound (8x8x7 mm on the right and 11x10x7 mm on the left). There was a late crescendo systolic murmur in the mitral area on auscultation. His echocardiogram showed symmetrical 17 mm LVH with mild diastolic dysfunction and a mildly enlarged left atrium. Cytogenetic study confirmed XXY karotype. Further history was obtained after reviewing his echocardiographic findings. The patient revealed that he had hypohydrosis, distal neuropathic pain, tinnitus and a long history of abdominal pain with diarrhorea after meals since childhood. The patient's symptoms with his suggestive family history and symmetrical LVH raised the possibilty of Fabry disease with cardiomyopathy despite his XXY karotype. Fabry disease is a sex-linked recessive mutation involving the alpha- galactosidase (α-gal) A gene. The diagnosis was confirmed with his low leucocyte alpha-galactosidase level (0.04 nmol/min/mg, NL 0.7-3.3). His brother also had a low α-gal level with an XY karotype. Female carriers with Fabry disease often have minimal symptoms and an intermediate to near normal α-gal enzyme level. This patient with Kleinfelter syndrome with XXY karotype had a very low α-gal level with clinical manifestations of Fabry disease and cardiomyopathy indicating that he was homozygous for the X-linked recessive mutation. This is a unique case of Kleinfelter syndrome with XXY karotype and concomitant recessive sex-linked mutation in the α-galactosidase gene. Non-dysjunction of the X chromosome must have occured at meiosis II to account for the patient's homozygous state resulting in a low α-gal enzyme level. If this patient was a heterozygote he would have a much higher enzyme level with minimal symptoms and he might not have significant cardiomyopathy.

24

Ablation with Absolute Alcohol in Cardiac Vein

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Background: PVCs originating from left ventricular summits are difficult to be treated with traditional endocardial or epicardial catheter ablation.
Case: A 53-year-old male with history of non-ischemic dilated cardiomyopathy was noted to have monomorphic PVC possibly contributing to his poor ejection fraction of 18%. He agreed for electrophysiology study and ablation for his PVC. EP study was performed with Carto electro-anatomical mapping system. Spontaneous monomorphic PVCs with an inferior axis, transition at V3 and slurred upstroke, QS complex in lead I were recorded. The morphology suggests possible exit from left ventricular summit. Pace mapping with ablation catheter in RVOT and aortic cusps did not match with the PVC morphology. Mapping at distal great cardiac vein showed good but not perfect pace map, local signal around 30 msec preceding PVC. Ablation with irrigation ablation catheter at this site fail to suppress the PVC. Detailed mapping with coronary wire shielded with a microcatheter (finecross catheter) showed excellent pacing mapping at a branch of distal coronary vein, with local unipolar signal preceeding PVC by 40 msec suggesting a promising site for ablation. However, ablation catheter, with its large caliber, cannot reach this small venous branch. Decision was made for ablation with absolute alcohol. With a monorail 2.0 mm balloon to occlude the vien, 2.5 mL of absolute alcohol was slowly injected into this venous branch. Slow run of idioventricular rhythm was resulted. After that PVCs were non-inducible. Post procedure echocardiogram confirmed absence of pericardial effusion.
Decision-making: Because the PVCs were not suppressed by endocardial ablation, epicardial approach can be considered. Yet usually LV summit is hidden beneath a thick fat pad, making it inaccessible via epicardial route. Because of excellent pace mapping and well preceded local signal, ablation with absolute alcohol guarded by a balloon to prevent spill over was decided.
Conclusion: Ablation with absolute alcohol in coronary veins is a potential approach for selected PVC cases if endocardial approach fails.

ABSTRACTS

BEST HKCC-HKPHCA CHALLENGING/ INTERESTING CLINICAL CARDIOLOGY CASES PRESENTATION

45

An Obstacle in the Way

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Background: Pheochromocytoma could have cardiovascular manifestations mimicking cardiomyopathies. We present a case of pheochromocytoma presenting with features suggestive of hypertrophic obstructive cardiomyopathy (HOCM), which completely resolved after curative therapy of pheochromocytoma.

Case: A fifty-one years old lady with good past health was admitted for headache, palpitation and chest discomfort. She was hemodynamically stable. Physical examination revealed loud ejection systolic murmur over left lower sternal border. ECG showed normal sinus rhythm and left ventricular strain pattern. She developed episodic hypertension after admission, with blood pressure rising up to 210/120 mmHg. Echocardiogram (ECHO) showed features suggestive of HOCM. There was concentric left ventricular hypertrophy (LVH) with interventricular septum and posterior wall thickness measuring up to 1.7 cm, systolic anterior motion (SAM) of mitral valve leaflet and left ventricular outflow tract (LVOT) obstruction. The LVOT peak gradient was 90 mmHg. Pheochromocytoma was suspected and the patient was given phenoxybenzamine followed by betablocker. 24-hour urine catecholamines were elevated. Abdominal ultrasound showed a mixed solid/cystic lesion adrenal tumor. Computed tomography of abdomen showed a 4.7x4.8x4.5 cm circumscribed left adrenal hypervascular mass. Metaiodobenzylguanidine (MIBG) scan showed findings suggestive of pheochromocytoma. Laparoscopic adrenalectomy was performed. Follow-up echo several months after surgery showed complete resolution of LVH and SAM. The patient remained well at follow-up.

Decision-making: Pheochromocytoma could present with features mimicking HOCM. The presence of paroxysmal headache and hypertensive crisis should raise the suspicion of this condition. A detailed history taking, dedicated examination and relevant investigations are of utmost importance for accurate diagnosis and appropriate management. It is crucial to recognize pheochromocytoma as the cause of HOCM-like phenotype, because administration of betablockers, which is the standard treatment for HOCM, could be disastrous if they were given before adequate alpha blockade. Lastly, it is noteworthy that HOCM-like features could resolve completely after removal of pheochromocytoma. Follow-up echo is essential to avoid misdiagnosis of HOCM which could lead to inappropriate decision of implantable cardioverter defibrillator implantation.

Conclusion: Early recognition of pheochromocytoma as a cause of HOCM-like phenotype is important. Hypertrophic obstructive cardiomyopathy-like features could resolve completely after removal of the pheochromocytoma.

63

Mitral Annulus Disjunction: More Than Just the Valve

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Background: Mitral Annulus Disjunction (MAD) Arrhythmic Syndrome is a condition that should be consider in patient presenting with ventricular arrhythmia / SCD. We described a case of MAD presented with VF arrest and its subsequent management.

Case: Mr S is a 40-year-old gentleman who travel to HK from Canada for business. He has history of palpitation and was previously seen by a cardiologist in Canada. Screening ECG has shown frequent PVC and echocardiogram has revealed a prolapsed mitral valve with mild regurgitation. He present to us with VF arrest that required in total 7 defibrillation shock with a downtime of 38 minutes. Diffused ST depression was noted on initial ECG. Echocardiogram on admission has shown a heart with poor LVEF of 20% and MVP with mild MR. Urgent coronary angiogram was done showing a normal coronary vasculature. Cardiac MRI revealed a dilated LV with global hypokinesia, there was no abnormal tissue signal or LGE. Evidence of mitral annulus disjunction was noted on both echocardiography and CMR upon image review (See figure). Mr S was put on bisoprolol and a single chamber ICD was implanted. His ejection fraction has improved to 50% on subsequent echocardiogram.

Decision-making: On initial presentation, our working diagnosis was that of an ischaemia-related arrhythmic event causing the VF arrest. However, this was quickly call into doubt by the normal coronary angiogram. In a young patient without any known family history of SCD / Risk factor for atherosclerotic heart disease, the diagnosis of myocarditis will also need to be contemplated. Readily available CMR imaging has facilitated us in ruling out this diagnosis by using the Lake-Louise Criteria (Myocardial oedema, hyperaemia and fibrosis). It also allowed the recognition of the presence of a MAD that might otherwise be missed. Although genetic testing was not available, there is no evidence of channelopathy from history and on ECG. As there is no definitive treatment for this condition, a single chamber ICD was implanted after thorough discussion with the patient for secondary prevention.

Conclusion: Mitral Annulus Disjunction Arrhythmic Syndrome is an entity that should be considered in patient presenting with ventricular arrhythmic event.

ABSTRACTS

BEST HKCC-HKPHCA CHALLENGING/ INTERESTING CLINICAL CARDIOLOGY CASES PRESENTATION

95

A Neurogenic Block

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Background: Seizure may masquerade as conduction block. We describe the first case in the literature of high-grade atrioventricular block due to complex partial seizure in a patient with herpes encephalitis.
Case: A 57-year-old man presented with recurrent syncope. He had had malaise and flu-like illness days prior. Telemetry showed intermittent high-grade atrioventricular block. While he was prepared for pacemaker implantation, he became febrile, confused and had two complex partial seizures coinciding with occurrence of high-grade block. Cerebrospinal fluid tested positive for herpes simplex virus type 1. Magnetic resonance imaging (MRI) of the brain revealed swelling and FLAIR hyperintense signals at left temporal lobe and limbic region. Electroencephalography (EEG) was compatible with left temporal lobe seizure. Following initiation of valproate and acyclovir, he remained seizure-free, and made a complete neurologic recovery. Telemetry showed complete resolution of atrioventricular block. A Holter recording four weeks after discharge was also normal.
Decision-making: Development of atrioventricular block is rare at time of seizure, having been reportedly only several times in the literature and never for herpes encephalitis. In the absence of EEG correlation, it is difficult to discern from cardiogenic syncope, where arrhythmia is the primary event leading to impaired consciousness. The diagnosis becomes challenging when aura is present, such as a rising epigastric discomfort preceding syncope, which simulates a vasovagal attack. This is particularly true in patients thought to have cardioinhibitory type of vasovagal syncope, in whom exclusion of partial seizure should be considered.
Conclusion: Seizure may mimic atrioventricular block both symptomatically and electrocardiographically. There should be a low threshold to obtain EEG correlation.

102

Just Another PE?

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Background: Chronic thromboembolic pulmonary hypertension is an infrequent complication of pulmonary embolism, but its mimickers are lesser known. We report a case of presumed pulmonary embolism refractory to treatment, the identity of which was only unveiled following surgery.
Case: A 67-year-old woman was evaluated for non-resolving pulmonary embolism. Four years prior to presentation, she underwent pancreatectomy for a benign cystic tumor. Postoperative computed tomography (CT) incidentally found filling defect in the right pulmonary artery, for which she was anticoagulated for presumably asymptomatic perioperative pulmonary embolism. Meanwhile, she was diagnosed and being treated for mycobacterium avium intracellulare (MAI) pulmonary infection. Subsequent CT showed progression of filling defect to involve the left and main pulmonary artery despite adequate anticoagulation. Echocardiogram showed worsening right ventricular systolic function and severe pulmonary hypertension. She became hypotensive with poor organ perfusion requiring ionotropic support. The cardiothoracic service was consulted for pulmonary endarterectomy.
Decision-making: Pulmonary angiogram confirmed total occlusion of the right pulmonary artery. Position emission tomography (PET) with fludeoxyglucose (FDG) was obtained to exclude malignancy before major surgery, which showed uptake in the filling defect in the pulmonary arteries as well as in cavitary lesions in the right lung raising the suspicion of septic embolism from MAI infection. Pulmonary endarterectomy was performed under deep hypothermic arrest. A yellowish white mass was seen extending from right ventricular outflow tract to the pulmonary arteries. Unexpectedly, pathology revealed pulmonary artery intimal sarcoma, a rare tumor arising from the intima of the pulmonary artery that carries a poor prognosis. Mean survival is 11 months. An unusual attribute of this case is that the tumor progressed slowly over a period of four years, though lead-time bias is also possible. The concurrent MAI infection complicated the interpretation of the PET study. The rarity of pulmonary artery intimal sarcoma makes non-invasive diagnosis challenging. FDG-PET and magnetic resonance imaging (MRI) are two modalities often found useful but data on test performance is limited.
Conclusion: Pulmonary embolism refractory to anticoagulation should trigger a search for alternative etiologies. FDG-PET and MRI may be useful for diagnosis.

ABSTRACTS

PAEDIATRIC CARDIOLOGY I

26

Effect of Percutaneous Interventional Treatment for Pulmonary Branch Stenosis in Children

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Objective: To evaluate the safety and curative effect of percutaneous interventional treatment for pulmonary branch stenosis in children.
Methods: This is retrospective clinical study including 40 children were treated with percutaneous interventional treatment for pulmonary branch stenosis from January 2012 to December 2017 in Guangdong Cardiovascular Institute. The general clinical data, echocardiography, cardiac CT, angiography, interventional results, the procedure-related complications, follow-up result were particularly assessed.
Results: A total of 40 patients consisting of 28 boys and 12 girls underwent the procedure, with mean age (4.7±3.6) years (range from 1 to 17 years). Including 16 patients were accepted balloon angioplasty and 6 patients are accepted covered stent implantation. The catheter-measured peak systolic the narrowest aortic gradient was successfully relieved in all the patients, the diameter were increasing greatly. The follow-up period was 1 month to 5 years. The blood flow was unobstructed int the stent, but there was a case of thrombosis int the stent. The peak systolic valve gradient was no significant increasing, that measured by Doppler echocardiography during the follow-up of balloon angioplasty.
Conclusion: Percutaneous balloon angioplasty and stent implantation have reliably effect and high security for children's pulmonary branch stenosis.

27

Follow Up Outcomes and Risk Factors of Complete Left Bundle Branch Block after Transcatheter Closure of Perimembranous Ventricular Septal Defect in Children

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Backgrounds: The incidence of complete atrioventricular block after transcatheter closure of perimembranous ventricular septal defect (VSD) has been remarkably decreased. However, post-procedure complete left bundle branch block (CLBBB) remains to be an issue of concern since it may lead to left ventricular dysfunction. Data regarding prognostic implications of post-procedure CLBBB is lacking.
Objectives: The present study intended to determine the overall incidence, risk factors and follow up outcomes of CLBBB after transcatheter closure of perimembranous VSD in children.
Methods: All available clinical and follow-up data of children with CLBBB after transcatheter closure of perimembranous VSD using modified symmetric double-disk occluders between January 2005 and December 2017 were retrospectively reviewed, and were compared with that of children without arrhythmias.
Results: CLBBB after transcatheter closure of perimembranous VSD occurred in 57 cases, with an incidence of 2.70% (57/2114). Fifty-five cases developed CLBBB within 2 weeks post procedure and most of them (51/55) recovered to normal conduction or reverted to other types of bundle branch block three weeks post operation after steroids treatment. Late-onset and reversible CLBBB were observed in 2 and 2 cases, respectively. Persistent CLBBB was presented in 8 cases. One of them suffered from heart failure and received cardiac resynchronization therapy. Larger occluder size and delivery sheath diameter were identified as independent risk factors for occurrence of CLBBB. The later CLBBB occurred, the less likely it would recover to normal conduction. Reversible CLBBB was another risk factor for persistence.
Conclusions: The overall incidence of CLBBB after transcatheter closure of perimembranous VSD was relatively low and the outcome was satisfactory. Close follow-up needs to be applied since late-onset and reversible CLBBB could occur, and persistent CLBBB could result in heart failure. Oversized occluder and delivery sheath should be avoided.

ABSTRACTS

PAEDIATRIC CARDIOLOGY I

59

Hybrid Procedure for Pulmonary Atresia with Intact Ventricular Septum in Neonate

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Background: Pulmonary Atresia with Intact Ventricular Septum (PA IVS) accounts for 2.5% of critically ill infants with congenital heart disease. The percutaneous transcatheter approach has a variable rate of procedural failure and most of patients require subsequent operation in the neonatal period. The surgical approach under cardiopulmonary bypass (CPB) carries a high mortality. The hybrid approach consisting of a sternotomy followed by perventricular pulmonary valve perforation and balloon dilation has an important advantage of avoiding cardiopulmonary bypass (CPB) in neonate.
Methods: Retrospective review of consecutive neonates with PA IVS who underwent a hybrid procedure between September 2016 and September 2018 in our institute was completed. The acute and mid-term outcomes were also reviewed.
Results: Six consecutive neonates with PA IVS with prospected bi-ventricular circulation underwent a hybrid procedure. Median age at operation was 4.5 days (2-10 days). Median body weight was 3 kg (2.1-3.7 kg). Before operation, all the patients had been stablized with prostaglandin E1 (PGE1) infusion and two patients required mechanical ventilation together with inotropic support. The procedure was technically successful in all patients, and none required CPB. Ductus was ligated in two patients at the time of initial hybrid procedure (including one patient had a simultaneous modified Blalock-Taussig shunt). In the rest 4 patients, PGE1 infusion was maintained to keep the ductus opening after the procedure until an acceptable forward blood flow from the right ventricle to the pulmonary artery was detected by serial echocardiography. In one patient, stenting of the ductus was done on postoperative day 12 and this was subsequently ligated after 13 days. One patient died on postoperative day 2 due to sudden cardiac arrest. In the early postoperative period, two patients required peritoneal dialysis. The median ventilation time, ICU stay and hospital stay was 4, 14 and 21 days respectively for the survivors. Follow-up was completed for all survived patients (median follow-up time 8-30 months). Three patients were followed up more than two years, all achieved bi-ventricular status. No further intervention was required.
Conclusions: Hybrid Perventricular balloon pulmonary valvotomy is a safe, effective and reproducible approach for PA IVS in neonate. Maintaining the ductus opening for the time being is important for babies to get through the early postoperative critical phase.

73

Fetal Pulmonary Valvuloplasty for Pulmonary Atresia with Intact Ventricular Septum in 10 Cases

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Background: To summarize and evaluate the clinical effect of ultrasound-guided fetal pulmonary valvuloplasty (FPV) in the treatment of intrauterine pulmonary atresia with intact ventricular septum (PA/IVS).
Methods: From July 2018 to January 2019, 10 PA/IVS fetuses were successfully operated on by FPV in our center. The median gestational age was 27+3 weeks (26+2~28+4 weeks). To summarize and analyze the changes of the morphological and functional parameters, complications and fetal postnatal outcomes.
Results: All 10 PA/IVS fetuses were successfully operated on by FPV under combined intravenous and inhalation anesthesia. The transvalvular forward blood flow was observed immediately after operation by echocardiography. The technical success rate was 100%. Transient bradycardia and a little pericardial effusion were observed during the operation. Adrenaline was injected into the right atrium of some fetuses.In case 8, sustained fetal bradycardia accompanied by increased pericardial effusion occurred 3 days after operation. Pregnancy was terminated. The remaining 9 fetuses were followed up for 2 weeks. Echocardiographic findings showed that the fetal ratio of the tricuspid valve annulus and mitral valve annulus, ratio of the length diameter right ventricle and left ventricle, ratio of pulmonary valve annulus and aortic valve annulus, ratio of the tricuspid inflow duration and cardiac cycle increased from 0.81 (0.44-0.88), 0.56 (0.52-0.80), 0.69 (0.58-1.00), 0.35 (0.26-0.43) to 0.92 (0.80-1.08), 0.83 (0.68-0.88), 0.98 (0.85-0.1), 0.45 (0.37-0.53), the difference was statistically significant (P<0.05). The tricuspid regurgitation was improved by 3.9 m/s (3.2-4.6 m/s) to 3.2m/s (2.6-4.0 m/s) compared with that pre-operation, and the difference was statistically significant (P<0.05). Follow-up for 4 weeks, echocardiography showed coronary artery circulationcdependent on right ventricle in csae 4, indicating poor prognosis and termination of pregnancy. Three fetuses were followed up to full-term for cesarean section and delivery. Case 1 had hypoxemia after birth. Percutaneous pulmonary valvuloplasty and arterial canal stenting were performed successively. Case 2 and case 3 were achieved biventricular circulation. Follow-up for 1-2months is still to be observed for further treatment. The other fetuses were followed up regularly, and the related right ventricular indexes did not deteriorate.
Conclusions: FPV for PA/IVS fetuses in the second and third trimesters of pregnancy is safe. It can effectively decompress the right ventricle and promote the development of the right ventricle. Bradycardia is the main complication leading to death after operation. It is possible for PA/IVS fetuses to increase biventricular circulation after birth, and even avoid early surgical intervention.

ABSTRACTS

PAEDIATRIC CARDIOLOGY I

94

Tricuspidization with Continuous Autologous Pericardium for Aortic Valve Reconstruction in Children

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Background: To find a simplified aortic valve reconstruction way with autologous pericardium in children.
Metheds: From April 2014 to August 2018, aortic valve reconstruction with continuous autologous pericardium was performed in 6 patients aged less than ten years. There were 2 patients with aortic regurgitation, 3 patients with aortic stenosis, 1 patient with aortic stenosis and aortic regurgitation. The surgical procedure is based on the independent tricuspid using autologous pericardium. Firstly, pericardial patch was tailored into three continuous aortic valve cusps by using template while the aortic annular was divided equally into three parts, and landmarks were noted. The continuous cusps were fixed to the noted position of aortic annular and then sutured from bottom to both sides in order. Lastly the commissure were reconstructed by suturing out aortic wall separately and then tieing.
Results: There was no in-hospital death. Postoperative echocardiography showed an average peak pressure gradient of 22.0±13.9 mmHg 3 month after surgery while that of 107.3±20.6 mmHg before surgery. All the six patients showed less than mild aortic regurgitation. No patient required reoperation during the follow-up.
Conclusion: Our new simplified tricuspidization way offers reliable and competent new pericardial valve function in case of valve replacement or ROSS operation in early age. This technology employs a simple measurement and reproducible process. It should be further assessed on valve function and pericardial calcification issues.

105

Initial Experience of Transcatheter Closure of Doubly Committed Subarterial Ventricular Septal Defect Using Amplatzer Duct Occluder II

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Backgrounds: The traditional treatment of doubly committed subarterial ventricular septal defect (VSD) is open-heart surgery. This study aimed to evaluate the feasibility, safety and outcome of transcatheter closure using Amplatzer duct occluder II.
Methods: Between January 2016 and December 2018, a total of 12 patients (8 male and 4 female) with doubly committed subarterial VSD who received transcatheter closure with ADO-II were enrolled retrospectively. All their available clinical and follow-up data were evaluated.
Results: Their age ranged from 1.7 to 12.7 years, with the median of 4.9 years and their body weight ranged from 10 to 36 kg, with the median of 17.7 kg. Left ventricular angiography showed VSD size ranged from 1.5 to 3.0 mm. The device was successfully implanted in 11 patients (11/12, 91.67%) and 1 patient failed to be closed due to severe aortic regurgitation after device deployment, with 4 patients by antegrade approach and 8 patients by retrograde approach. The operation time ranged from 20 to 75 minutes, with a median of 45.2 minutes. The diameter of device used ranged from 3/4, 4/4 and 5/4. With a follow-up duration of 3 to 18 months, only 1 patient presented with new-onset mild aortic regurgitation.
Conclusion: Transcatheter closure of small doubly committed subarterial VSD with ADO-II is technically feasible and safe in selected children. However, development or worsening of aortic regurgitation requires long-term follow-up.

ABSTRACTS

PAEDIATRIC CARDIOLOGY I

107

Incidence and Prognosis of Femoral Arteriovenous Fistula after Cardiac Catheterization in Children: Single-center Experience

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Background: Femoral arteriovenous fistula (FAVF) is one of the most common detrimental complications following cardiac catheterization in children, which leads to anxiety in their parents and the clinician as well. Our study is to find out the incidence of FAVF, and follow up of the outcome of FAVF.
Method: Between October 2016 and September 2018, 4131 children (<18-year-old) who underwent cardiac catheterization examination or intervention therapy were included in this study. New occurred continuous murmur in the inguinal region was recognized by auscultation and then a color doppler ultrasonography was done to confirm the diagnosis of the FAVF after the procedure. When FAVF was once recognized, patient may receive compression bandaging for 2 to 7 days. Follow-up studies was done for those with FAVF.
Results: 22 children were certainly diagnosed with FAVF. The incidence of FAVF following cardiac catheterization in children is 0.5% in this study. The average size of all FAVF is 1.71 (±0.12) mm measured by doppler ultrasonography and 95.5% (21/22) of all FAVF is less than 3 mm. Of all FAVF, 77.3% (17/22) was spontaneously closed in 5.24 (±1.41) months, 9.1% (2/22) was found smaller in size in 6 to 12 months and still being followed up.13.6% (3/22) patients with FAVF underwent surgical repair, one of them was due to a big size (3 mm) FAVF with a pseudoaneurysm, two of them was because of the anxiety of their parents. None of the patients with FAVF has severe complications because of FAVF during follow-up, such as cyanosis, lower limbs swelling and so on.
Conclusion: The incidence of FAVF following cardiac catheterization in children is lower compare to the researches in adults reported at home and abroad. Most of all AVF in this study have favorable prognosis and have a tendency to close spontaneously. If the size of FAVF is less than 3 mm and there is no sever complications, continuing follow-up is suggested. If the size FAVF is more than 3 mm, surgery repair is recommended when the condition of wound is stable.

110

Cardiac Transplantation in Pediatric Patients – A Report of Five Cases

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Background: Cardiac transplantation remains the gold standard for end-stage cardiomyopathies and congenital heart diseases in pediatric patients. By the end of 2016, a total of 2,149 patients had undergone cardiac transplantation in China, 103 of them younger than 18 years old.
Objective: To review records of 5 children under 14 years old who underwent cardiac transplantation last year at our institution and reveal the outcome of short-term follow-up.
Methods: 5 patients received cardiac transplantation at our institution from March 2018 to February 2019 have been involved. Three of them were girls and 2 were boys, whose age ranged from 6 to 13 and body weight ranged from 15 kg to 37 kg. Their principle diagnoses were dilated cardiomyopathy in 4 patients and restricted cardiomyopathy in 1. All patients were recognized as heart function grade IV (NYHF Classification) and underwent orthotopic heart transplantation.
Results: All patients survived. The average clamping time was 93 minutes, CPB time 217 minutes, and the mean cold ischemic time was 220 minutes. Average intubation time, ICU time and postoperative hospitalization time was 5.6, 11.6 and 26.2 days, respectively. Two patients needed ECMO support after surgery. Tacrolimus, mycophenolate mofetil and methylprednisolone have been routinely prescribed for anti-rejection purpose. All patients' heart function had been improved to grade I-II (NYHF Classification) by the end of following-up from 1 month to 1 year.
Conclusions: Technical success rate and short-term pediatric heart transplant results at our institution were quite satisfactory. Close follow-up is needed to evaluate long-term prognosis and survival quality of these patients.

ABSTRACTS

PAEDIATRIC CARDIOLOGY I

133
Outcome of Fontan conversion in patients with failing Fontan circulation

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Objectives: We reported the outcomes of conversion to extracardiac Fontan circuit with arrhythmia surgery from previous atriopulmonary Fontan connection in patients with failing Fontan circulation.
Methods: Between August 2012 to August 2017, 11 patients who had failing Fontan circulation and development of atrial arrhythmias underwent conversion from atriopulmonary Fontan to fenestrated extracardiac Fontan circuit combined with atrial arrhythmia surgery and implantation of an epicardial dual chamber pacemaker. Before Fontan conversion surgery, 3 patients were classified as New York Heart Association Class (NYHA) class II and 8 as class III. Ten patients (91%) had diagnosis of tricuspid atresia. The mean age at the initial Fontan procedure was 6.5±4.4 years (range, 2 to 16 years). The median age at Fontan conversion was 27.4±7.1 years (range, 17 to 39 years), and the median interval between initial operation to Fontan conversion was 19.9±5.4 years (range, 13 to 29 years). The median follow-up period was 4.5 years (range, 1.5 to 6.5 years).
Results: There was no operative death and no late death. The median postoperative hospital stay was 22 days (range, 12 to 50 days). Early postoperative complications included: acute renal failure (n =1), prolonged / recurrent pleural effusion (n=3), haemothorax (n=1), recurrent atrial arrhythmias (n=5), seizure (n=1). Follow-up haemodynamic study was performed in 10 patients more than 1 year after the operation. There was significant improvement in: Fontan circuit pressure, ventricular end diastolic pressure, pulmonary vascular resistance index and cardiac index (12.9±2.2 vs 10.1±2.0 mmHg, 12.9±2.2 vs 10.1±2.0 mmHg, 1.8±1.3 vs 0.9±0.6 WU. m^2, 1.9±0.6 vs 3.3±1.2 L/min/m^2 respectively, all were statistically significant, $P<0.05$). While the left ventricular ejection fraction remained similar to before Fontan conversion (63.0±12.4% vs 66±9.5 %, $P>0.05$). At the last follow-up, the resting heart rhythm were sinus (n=1), intermittent /persistent atrial pacing (n=9), ventricular pacing (n=1). Atrial arrhythmias recurred in 4 patients (36%), severe protein losing enteropathy (PLE) occurred in 1 patient. Nine patients had improvement in NYHA class. One patient had no change and 1 had worsening of NYHA class. These 2 patients, including the one with PLE had attempts of transcatheter balloon dilation of extracardiac circuit fenestration to improve the haemodynamics.
Conclusions: Fontan conversion with arrhythmia surgery in selected patients with failing Fontan circulation can be performed with low morbidity and mortality. Most patients benefited from the operation with improvement in cardiac output, exercise capacity and satisfactory control of atrial arrhythmias.

135
Clinical Characteristics and Treatment of Congenital Vascular Rings in 78 Infants

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Objective: To summarize the clinical characteristics and treatment effect of congenital vascular rings in infants.
Method: The clinical data of 78 children with vascular rings were retrospectively analyzed from August 2011 to June 2018 at our center for surgical treatment.
Result: Age is from 2 days to 11 months, the median age is 22 days. weight is from 1.4 to 9.2 kg, the average weight is 4.80±2.15 kg. The types of vascular ring includes 41 cases of double aortic arch, right aortic arch with left aortic duct / ligament with or without vagal left subclavian artery in 20 cases, 15 cases of pulmonary artery Sling, 6 cases of left aortic arch with right aortic duct / ligament, 3 cases of nameless arterial compression syndrome, 2 cases of other types of vascular rings. All cases underwent echocardiography, chest radiography, and Cardiac Computed Tomography, and 66 cases were examined by bronchoscopy before operation or intraoperative. Sixty-one cases (78%) have been confirmed with tracheal stenosis.
Result: 30 patients underwent surgery with an average extracorporeal circulation time of 160±61 min and 48 patients underwent extracorporeal circulation. Postoperative mechanical ventilation 1 to 22 days, the median number of days 2 days; hospitalization time 5 to 62 days, the median of 10 days, hospital death in 3 cases (3.8%). Discharge patients were followed up for 1 to 90 months, respiratory symptoms disappeared or improved Significantly.
Conclusion: Airway stenosis is a serious complication of the vascular ring. CT is the best way to diagnose vascular ring. To avoid serious airway complications, the vascular ring should be operated as soon as possible, and the airway stenosis and intracardiac malformation should be operated at the same time, this can improve the survival rate of surgery and improve the prognosis of children.

ABSTRACTS

PAEDIATRIC CARDIOLOGY II

25

A Prediction Model of Kawasaki Disease

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Background: Kawasaki disease (KD) is an acute autoimmune systemic vasculitis disease of unknown etiology. At present, diagnosis of KD is strongly relied on non-specific clinical symptoms. Accurate, efficient and objective evaluation of individual's risk of KD is critical for preventing childhood from acquired heart disease. This study was aimed to investigate the independent risk factors and build a model for predicting KD.
Methods: The patients with KD and other 13 kinds of febrile diseases who were hospitalized in Chongqing Children's Hospital from October 2007 to December 2017 were retrospectively reviewed. The demographic characteristics and laboratory data were collected and then compared between KD group and other febrile diseases group. The independent risk factors were further obtained using multivariate regression analysis. A prediction model was built. Receiver operating characteristic (ROC) curve and the area under the curve (AUC) were used to evaluate the predictive ability, sensitivity and specificity of the model.
Results: A total of 10367 subjects were enrolled in this study, including 5642 cases (54.4%) of KD and 4725 other febrile diseases (45.6%). Multivariate regression analysis showed that the independent risk factors were C-reactive protein (CRP), Percentage of lymphocyte (P-LYM), Percentage of monocytes (P-MON), Platelet count (PLT), Uric acid (UA), Globulin (GLB), Prealbumin(PALB), Lactic dehydrogenase (LDH), Aspartate aminotransferase/Alanine transaminase (AST/ALT) and age. A prediction model was built, with an AUC of 0.90, sensitivity of 83% and specificity of 84%.
Conclusions: Our study suggests that using of CRP, P-LYM, P-MON, PLT, UA, GLB, PALB, LDH, AST/ALT and age is accessible to evaluate individual's risk of KD.

28

Platelet Indicators: New Makers of Severity and Reversibility in Pulmonary Arterial Hypertension Secondary to Congenital Heart Disease with Left-to-right Shunt in Children?

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Background: Pulmonary artery hypertension is a serious cardiovascular disease, and associated with vasoconstriction, thrombotic lesions, extensive remodeling of the pulmonary circulation and increasing pulmonary vascular resistance. Previous studies have proved that platelet abnormalities and abnormal platelet activation are important mediators of PAH progression, but the effectiveness of platelet indicators in predicting the severity and reversibility of PAH secondary to congenital heart disease with left to right shunt in children have rarely been studied. This study aimed to investigate the platelet indicators in PAH.
Methods: A total of 155 children with CHD who underwent transcatheter closure or cardiac catheterization, were prospectively recruited from March 2012 to July 2014 at the West China Second University Hospital of Sichuan University. Patients were divided into five groups: group 1 consisted of 30 children with CHD but no PAH, group 2 contained 51 children with CHD and mild PAH, group 3 comprised 33 children with CHD and moderate PAH, group 4 included 31 children with CHD and severe PAH, and group 5 contained 10 children with CHD and irreversible PAH. Platelet counts(PLT), mean platelet volume(MPV), platelet distribution width(PDW), platelet crit (PCT) and platelet-larger cell ratio(P-LCR) are compared among groups.
Results: Comparing with group 1, the group 2, 3 and 4 had no significant differences in platelet counts and PCT, but had a significant decrease in MPV, PDW and P-LCR. In group 5, a significant decrease in platelet counts was found, and a significant increase in MPV, PDW and P-LCR was noted when comparing with group 1. In comparison among group 2, group 3 and group 4, three PAH group in different degrees, we found that these platelet indicators had no significant differences among these groups except MPV and P-LCR decreased in group 2 when comparing with group 1. When group 4 and group 5, we found a significant decrease of platelet counts in group 5, but MPV, PDW and P-LCR was significant increased in group 5. Pearson's correlation test found significant negative linear correlation between PAP, PVR and platelet indicators like MPV, PDW and P-LCR and receiver operating characteristic curve showed the cutoff values of PDW, MPV, P-LCR, and PLT are 14.6 fL, 11.35 fL, 35.75% and 235.5x10^9/L.
Conclusion: Platelet indicators might be a new method to evaluate the progress of PAH and to distinguish irreversible patients from severe PAH patients.

ABSTRACTS

PAEDIATRIC CARDIOLOGY II

34

Combination of N-terminal Pro-brain Natriuretic Peptide and Seven Risk-scoring Systems for Intravenous Immunoglobulin Resistance Prediction of Kawasaki Disease in West China

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Backgrounds: Data regarding predictive effectiveness of diverse scores on intravenous immunoglobulin (IVIG) resistance for Kawasaki disease (KD) in west China is lacking. Addition of specific indicators to current systems may provide a better performance. This study aimed to testify validity of Kobayashi, Egami, Sano and four Chinese risk scores in isolation or combination with N-terminal pro-brain natriuretic peptide (NT-ProBNP) in predicting IVIG resistance in a population of west China.
Methods: A total of 393 patients with KD were prospectively recruited between June in 2015 and March in 2018 who had been hospitalized at the Department of Pediatrics in West China Second University Hospital of Sichuan University (WCSUH-SCU). The clinical and laboratory data were compared between IVIG responders (n=339) and IVIG nonresponders (n=54). The high-risk patients for IVIG resistance were determined by protocols of Kobayashi, Egami, Sano, Formosa, Tang's, Hua's, and Yang's risk scores. The predictive value of each risk-scoring system, in isolation or combined with NT-ProBNP, in predicting IVIG resistance were determined.
Results: Serum NT-ProBNP level of nonresponders was significantly higher than responders. ROC curve analysis revealed best cut-off value of NT-ProBNP was 3755 pg/ml (area under the curve=0.64, P<0.001), yielding a sensitivity of 44.4% and a specificity of 84.1%. The seven models testified in our population showed low sensitivity (16.7%-61.1%) and moderate/high specificity (54.0%-94.1%) in IVIG resistance prediction when in isolation. The parallel test combining NT-ProBNP ≥3755 pg/ml with Formosa or Tang's models could elevate sensitivity to 72%-74%. Addition of NT-ProBNP ≥3755 pg/ml to all models could increase specificity to more than 90%.
Conclusion: All seven published scores were not ideal for IVIG resistance prediction of KD in west China. NT-ProBNP might provide additional information to these models for IVIG resistance prediction in KD patients.

57

Clinical Features and Outcomes of Ischemic Cardiomyopathy Resulted from Kawasaki Disease

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Background: Coronary artery aneurysms (CAAs) caused by Kawasaki disease (KD) can lead to severe complications in childhood. This study was designed to conclude the clinical features and outcomes of ischemic cardiomyopathy in KD in a single center.
Methods: The data of patients with ischemic cardiomyopathy resulted from KD diagnosed between January 2008 and December 2018 in Guangzhou Women and Children's Medical Center were analyzed retrospectively.
Results: There were ten patients with ischemic cardiomyopathy caused by KD, including 8 boys and 2 girls with a median age of 38 months. Nine patients had giant CAAs, and only one had median CAA. Nine children were administrated with intravenous immunoglobulin (IVIG) in acute or subacute stage of KD with the initial use on the 7th to 19th day from the onset of disease. There was a second dose of IVIG application in 2 patients with IVIG resistance, one of which had a combination treatment with plasma exchange, and another one was treated with intravenous methylprednisolone in addition. Aspirin was given to all patients in acute stage and three patients had clopidogrel therapy in combination. Low molecular weight heparin was used in one patient with coronary thrombosis in subacute stage. Combined with aspirin, warfarin was applied for anticoagulation in three children. The median duration from the onset of KD to ischemic cardiomyopathy was 9.6 months. Three patients once had chest pain and symptoms of cardiac insufficiency and myocardial infarction. The remaining 7 patients had no symptoms, but there were evidences of myocardial ischemia or arrhythmia in ECG, heart dysfunction, regional wall motion abnormality or ventricular aneurysm formation in echocardiography, and coronary artery occlusion in cardiac CT or angiography. Three patients with symptoms received thrombolytic therapy with heparin and urokinase, other 7 patients without symptoms added warfarin and/or clopidogrel as intensive treatment when ischemic cardiomyopathy was discovered. All patients are alive without any subjective symptoms and a median follow-up time is 7.6 years. Left ventricle dysfunction still exists in four patients with the ejection fraction of 40% to 50%. Formation of collateral vessels was found in three patients.
Conclusion: Ischemic cardiomyopathy is one of the most serious complications of KD and occurs mostly in patients with giant CAA or those receive delayed IVIG treatment. Most patients had no clinical signs but should consult the doctor regularly and receive anticoagulation and antiplatelet therapy standardly. Follow-up may be needed long-term and even life-long.

ABSTRACTS

PAEDIATRIC CARDIOLOGY II

58

The Association Between Alanine Aminotransferase/Aspartate Aminotransferase Ratio(AST/ALT Ratio) and Kawasaki disease

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Background: Kawasaki disease is a systemic small and medium vascular vasculitis that primarily occupies the coronary arteries. The primary objective of this study was to investigate the association between aspartate aminotransferase to alanine aminotransferase ratio (AST/ALT ratio, AAR) and IVIG resistance, coronary artery lesions (CAL), coronary artery aneurysm in (CAA) Kawasaki disease (KD)
Method: We retrospectively studied 2679 children with Kawasaki disease and divided them into two groups, low-AAR group, and high-AAR group, with median AAR=1.13 as the dividing line. The differences between the two groups of laboratory data, clinical manifestations, and coronary artery damage rates were compared.
Result: In the low-AAR group, the incidence of CAL, CAA after onset 2 weeks, 3-4 weeks and IVIG resistance rate was significantly higher than that of the high-AAR group (2 weeks: 21.70% vs. 29.46% p<0.001; 1.75% vs. 3.63% p<0.001; 3-4 weeks 17.83% vs. 24.11% p<0.001; 1.52% vs. 3.78% P=0.003; IVIG resistance 21.71% vs. 29.94% p<0.001 respectively) and laboratory data, such as C-reactive protein (CRP), Erythrocyte sedimentation rate(ESR), White blood cell count (WBC), Glutamyltranspeptidase (GGT), Bilirubin, Fibrinogen, TT, D-D dimer, Brain natriuretic peptide-, were also significantly higher than high-AAR group, album and IgG significantly lower than later, and clinical manifestations were different (Oral Changes: 81.09% vs. 70.02% p<0.001; rash: 92.33% vs. extremity changes: 80.76% p<0.001; 75.50% vs. 69.78% p=0.001 respectively).
Conclusions: low-AAR is a useful predictor to the coronary artery damage and IVIG resistance in Kawasaki disease.

68

Genotype and Phynotype of Chinese Pediatric Patients with IPAH/HPAH

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The aim of this study was to determine the clinical outcomes of gene mutations in Chinese pediatric patients with idiopathic and heritable pulmonary arterial hypertension. We screened gene mutations in 82 pediatric patients visited at Beijing Anzhen Hospital from 2008 September to 2018 December with targeted exome kits containing 22 pulmonary arterial hypertension-related genes. The clinical and hemodynamic characteristics, and outcomes of these patients were retrospectively analyzed. In a cohort of 82 patients, a total of 39 gene mutations were identified with 25 mutations in BMPR2, 5 mutations in ACVRL1, 2 mutations in KCNK3, 3 mutations in NOTCH3, 2 mutations in HTR2B, 1 mutation in ENG and 1 mutation in EIF2AK4. The average age at diagnosis was 86.4±55.1 months. Forty-eight patients (28 mutation carriers) underwent cardiac catherization examinations, with the acute vasodilator testing. Mutation carriers had higher pulmonary vascular resistance index, and tended to have higher pulmonary arterial pressure and right atrial pressure than mutation non-carriers. Ten patients responded to acute vasodilator testing and 9 of them were mutation non-carriers (p=0.001). Although similar treatments were employed, mutation carriers had higher mortality rates than mutation non-carriers (p=0.0012). The 1-, 2-, 3- year survival rate of mutation non-carriers were 95.1%, 87.8%, and 82.5%, respectively, while for mutation carriers, the proportion were 86.6%, 63.8%, and 52.2%. In conclusion, early gene screening for pediatric patients with idiopathic pulmonary arterial hypertension and heritable pulmonary arterial hypertension is recommended, and more aggressive treatment for mutation carriers are advisable.

ABSTRACTS

PAEDIATRIC CARDIOLOGY II

70

Sulfur Dioxide Inhibits Proliferation of Vascular Smooth Muscle Cells by Reducing Intracellular pH

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Background: Aberrant proliferation of VSMCs is an important pathological feature of vascular injury diseases such as hypertension and atherosclerosis. Probing into the regulatory mechanisms for the proliferation of VSMCs proliferation of VSMCs is an important research topic in the field. The previous studies indicated that SO2 could inhibit VSMCs proliferation, but the mechanisms remain unclear. In this study we focused on the intracellular pH pathway to elaborate the molecular mechanism by which SO2 inhibits the proliferation of VSMCs.
Methods: Rat thoracic aortic smooth muscle cell line A7r5 VSMCs, pH-sensitive fluorescent indicator BCECF/AM loads cells, laser confocal microscopy were used to detect pHi changes of VSMCs. DIDS, a Cl-/HCO3- exchanger (anion exchanger, AE) inhibitor, was used and the inhibitory effect of SO2 on pHi was explored. AE activity was measured by NH4Cl perfusion method. AE2 sulfenylation were detected by western blot (WB) method. Ki67 protein expression was detected by WB method and CCK8 activity was measured by colorimetry.
Results: 1) SO2 donor could reduce the pHi in VSMCs. The results showed that compared with the control group, the pHi in VSMCs decreased by 0.120±0.012, 0.134±0.011 and 0.200±0.020 after 50 μM, 100 μM and 200 μM SO2 donors treatment for 9 minutes, respectively (all $p<0.01$); 2) SO2 donor activated AE in VSMCs. The results showed that AE was significantly activated by the administration of 100 μM and 200 μM SO2 donors ($p<0.05$ and $p<0.01$). The pretreatment with 30 ìM AE inhibitor DIDS for 20 minutes prevented the reducing effect of SO2 on pHi ($p<0.01$), further confirming that SO2 could reduce pHi in VSMCs by activating AE; 3) SO2 donor could activate AE by AE2 sulphenylation in VSMCs. The results showed that the 200 ìM SO2 donor for 9 minutes significantly promoted AE2 sulphenylation and activated AE ($p<0.05$ and $p<0.01$), and the thiol reductant DTT 0.4 mM reversed the AE2 sulphenylation and AE activation ($p<0.05$); 4) SO2 donor reduced pHi by AE activation to inhibit proliferation of VSMCs. SO2 donor could significantly inhibit PDGF-BB-induced proliferation of VSMCs ($p<0.01$). When DIDS blocked AE, SO2 donors could not inhibit proliferation induced by PDGF-BB in VSMCs any longer.
Conclusion: SO2 donor could reduce the pHi in VSMCs by sulphenylating AE2 and activating AE, thus inhibiting the proliferation of VSMCs.

78

Prediction for Intravenous Immunoglobulin Resistance Combining Genetic Risk Loci Identified from Next Generation Sequencing and Laboratory data in Kawasaki Disease

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Background: Kawasaki disease (KD) is the most common cause of acquired heart disease. The primary treatment for Kawasaki disease is intravenous immunoglobulin (IVIG), and there were a substantial proportion of patients who were resistant to IVIG treatment. However, the mechanism of IVIG resistance remains unclear and the accuracy of models used to predict IVIG resistance do not meet the level of clinical expectations.
Methods: We recruited 330 KD patients (50 IVIG non-responders, 280 IVIG responders) and 105 healthy children to explore the susceptibility loci of IVIG resistance in Kawasaki disease. A next generation sequencing technology focused on 4 immune-related pathways and 466 susceptibility sites found in GWAS studies were performed in all these samples. Then an R package SNPassoc was used to identify the risk loci and student's t test was used to find risk factors associated with IVIG resistance. Finally, a prediction model of IVIG resistance which combined the identified specific SNP loci with the laboratory data was built using a random forest classifier.
Results: A total of 537 significant risk loci were found associated with IVIG resistance, in which 27 previous published SNPs were confirmed by our data. Additionally, laboratory factors, like erythrocyte sedimentation rate (ESR), platelet (PLT), C reactive protein, were significantly different in IVIG unresponsive and IVIG responsive groups. Using top 9 SNPs and 5 clinical features, a predictive model of IVIG resistance with an area under the ROC curve of 0.974 was established.
Conclusions: It is the first study that focuses on immune system in Kawasaki disease using high-throughput sequencing technology. Our findings provide a new perspective on the pathogenesis of IVIG resistance and could improve the accuracy of prediction for IVIG resistance in clinical integrating the genotype and laboratory data.

ABSTRACTS

PAEDIATRIC CARDIOLOGY II

101

A Clinical Study of Warfarin Combined with Aspirin in the Treatment of Giant Coronary Artery Aneurysm with Kawasaki Disease

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Background: To investigate the safety and efficacy of warfarin combined with aspirin in the treatment of multiple medium-sized and giant coronary artery aneurysms (GCAA) in kawasaki disease.
Case: Clinical and follow-up data of 45 children diagnosed with kawasaki disease (KD) complicated with multiple medium-sized and giant coronary artery aneurysms from April 2014 to December 2018 at guangzhou women and children's medical center were collected. These children were divided into two groups. The experimental group received regular oral warfarin combined with aspirin, with a total of 31 cases, including 27 males and 4 females, aged (3-157) m, with an average age of (44±0.19) m. The experimental group reached the target international standard value (INR) within the oral warfarin (2-20) w. In the control group, there were 14 patients (10 males and 4 females), aged (6-99) m, with an average age of (44±0.71) m, who were treated only with oral aspirin and clopidogrel for reasons including family members' inability to accept warfarin and adverse reactions, difficulty in adjusting INR value in remote families and poor treatment compliance. The patients were followed up once every 3, 6, 9 and 12 months to track the general conditions, laboratory examinations, echocardiography, electrocardiogram results, and bleeding complications of the two groups. SPSS 22.0 statistical software was used for statistical analysis of the data. $P<0.05$ for the difference was statistically significant.
Decision-making: The number of new blood clots in the experimental group was lower than that in the control group (=6.310, $P<0.05$). The number of new cases of medium and large coronary artery aneurysms in the experimental group increased slowly (12.90% vs. 14.28%). The number of giant aneurysms in the experimental group decreased rapidly (23.91% vs. 10.00%). The number of tumor retraction cases in the experimental group was more than that in the control group (74.19% compared with 42.85%). No active bleeding, epistaxis, epistaxis, petechiae and no death occurred in the two groups.
Conclusion: (1) Warfarin combined with aspirin is very safe and effective in the treatment of kawasaki disease coronary tumor, which can effectively reduce thrombosis; (2) Compared with oral aspirin or clopidogrel alone, warfarin combined with aspirin can reduce the number of multiple medium-sized and large coronary artery aneurysms and reduce the diameter of coronary artery aneurysms; (3) Warfarin combined with aspirin at a regular dose has fewer side effects and fewer adverse reactions in the treatment of kawasaki disease.

ABSTRACTS

PAEDIATRIC CARDIOLOGY III

14

Diagnosis and Treatment of Inherited Arrhythmia in Pediatric Patients – 10-year of Single Center Experience

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Objective: To analyze and summarize the 10-year single-center diagnosis and treatment experience of common inherited arrhythmia in pediatric patients, and to explore the best treatment methods.
Methods: The treatment and follow-up results of 30 cases of pediatric patients, diagnosed with long QT syndrome (LQTS), Brugada syndrome (BrS), catecholaminergic polymorphic ventricular tachycardia (CPVT), hypertrophic cardiomyopathy (HCM), arrhythmogenc right ventricular cardiomyopathy (ARVC) from January 2008 to December 2018 in the Pediatric Cardiology Department, Guangdong Provincial People's Hospital were analyzed retrospectively. Treatment included: drugs,implantable cardioverter defibrillator (ICD), radiofrequency ablation, and left cardiac sympathetic denervation. Except for 3 cases of BrS, the remaining 27 cases were admitted to hospital due to syncope. Through regular outpatient clinic and telephone follow-up, the general situation of the patients after discharge, the occurrence of arrhythmia and the working condition of ICD.
Results: Among the 30 patients, the onset age was (129.5±40.16) months. Nineteen males and 11 females, 19 patients had gene detection and the median follow-up time was 40 months. Fifteen cases were implanted with ICD and all survived. Ten cases were treated with drugs and 4 cases died. Three cases had no special treatment, 1 case died, 2 cases died after refusing treatment by family members.
Conclusion: (1) inherited arrhythmia sudden death rate is extremely high; (2) gene detection is an important means of diagnosis, family screening of high-risk patients is essential.Especially early and rapid gene detection is helpful for the diagnosis, treatment and prognosis evaluation of diseases; (3) primary electrical disease, especially long QT syndrome in the diagnosis, need to be identified with epilepsy, part can be at the same time, drug treatment effect is not ideal, ICD is the most effective and most reliable treatment method, but need to be careful.

19

Clinical Characteristics and Prognosis of NC/C<2 Patients with Noncompaction Cardiomyopathy

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Background: Clinical manifestations and prognosis is unclear in NCC patients with noncompaction to compaction ratio <2. We examined late outcomes for patients with NCC enrolled in our hospital, divided them according to the NC/C ratio, analyze the clinical features and prognosis.
Methods: Children in the Children's Hospital of Chongqing Medical University with NCC who were diagnosed at 0-<16 years of age, between January 2007 and December 2018. Outcomes for NCC subjects with NC/C <2 and NC/C>2 were compared with the use of the Kaplan-Meier method. Propensity-score analysis was used for risk factor adjustment.
Results: During the 10-year period 124 newly diagnosed cases of NCC. Among them, 47 cases were i-NCC, accounting for 8.1% of the total number of hospitalized cardiomyopathy patients. A total of 16 patients died during follow-up. Freedom from death was 68.1% (95% confidence interval [CI], 52.9 to 80.9) for i-NCC patients. The median (interquartile interval) duration of follow-up was 12 (3-30) months for all cases and 16 (6-36) months for survivors. No prognostic factor was found to impact statistically on the prognosis. Compared to NC/C>2 patient, cases with NC/C<2 patient were low age of diagnosis, and were most diagnosed in recent 5 years. Compared with patients with NC/C<2, the survival rate of patients with NC/C>2 was lower than that of patients with NC/C<2 (p=0.022).
Conclusions: Most NC/C<2 noncompaction patients were coexisting cardiac abnormalities. Outcomes for i-NCC patients with NC/C<2 were better than NC/C>2 patients. No prognostic factor was found to be statistically important.

ABSTRACTS

PAEDIATRIC CARDIOLOGY III

46

Novel Mutations of CASQ2 in Chinese Children with Catecholaminergic Polymorphic Ventricular Tachycardia

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Background: Mutations in the CASQ2 gene cause the autosomal recessive form of catecholaminergic polymorphic ventricular tachycardia (CPVT), a malignant disease that predisposes young individuals to syncope and sudden cardiac death. To date, only 24 pathogenic mutations in the CASQ2 gene have been reported in association with CPVT, but it remains unstudied in the mainland of Chinese population.
Methods: The clinical characteristics of six Chinese children (three male patients) provided by Beijing Children's Hospital were investigated. High-throughput targeted gene panel sequencing was used to screen the gene mutations. Sanger sequencing was applied to confirm the candidate mutations in CPVT probands and detect the corresponding sequences in their family members.
Results: Here, we report six Chinese children from four unrelated families who satisfied clinical criteria for CPVT. Then using targeted next-generation sequencing, we identified seven different mutations, with four being novel: two frameshift mutations c.1074_1075delinsC (p.G359Afs*12), c.1175_1178del (p.D392Vfs?), a missense mutation c.748C>T (p.R250C), a splicing mutation (c.838+1G>A), and two reported nonsense/missense mutations c.97C>T (p.R33*), c.98G>A (p.R33Q) and a splicing mutation (c.532+1G>A) in CASQ2.
Conclusion: To our knowledge, it is the first study of Chinese children with mutations in the CASQ2 gene. Our work further expands the genetic spectrum of CASQ2-associated CPVT.

55

The VVI Ventricular Function Assessment in Second-third Trimester Fetus with Tricuspid Regurgitation

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Objective: To evaluate the changes of ventricular function in second-third trimester fetus with tricuspid regurgitation by velocity vector imaging (VVI).
Methods: The fetus include in this study diagnosed as tricuspid regurgitation during January 2014 to August 2017 in the Union Hospital of HUST. They were divided in: group A-mild tricuspid regurgitation, group B- severe tricuspid regurgitation. The control group included 36 normal fetuses in the same period. To evaluate the global ventricular motion of the group A, B and the control group by VVI. The following parameters of the left and right ventricular were obtain by manual tracing endocardial at the end of ventricular diastolic in four-chamber view: the global systolic longitudinal velocity (GLVs), the global diastolic longitudinal velocity (GLVd), the global systolic longitudinal strain rate (GLSRs), the global diastolic longitudinal strain rate (GLSRd) and the global longitudinal strain (GLS). The differences of baseline and parameters between groups A, B and the control group were analyzed.
Results: (1) Comparison of general data: There were no significant differences among the group A, B and the control group (P>0.05). (2) Comparison of right ventricular parameters: There were significant differences among the group A, B and the control group in terms of the right ventricular GLVs, GLVd, GLS, GLSRs and GLSRd (P<0.01); there were significant differences between the group B and the control group in terms of the right ventricular GLVs, GLVd, GLS, GLSRs and GLSRd (P<0.01). (3) Left ventricle parameter comparison (ANOVA analysis): There were significant differences between group A and B in terms of the left ventricle GLVs, GLVd, GLS, GLSRs and GLSRd (P<0.01); There were significant differences between group B and the control group in terms of the GLVs, GLVd, GLS, GLSRs and GLSRd (P<0.01).
Conclusion: The ventricular function is significantly different among the fetus diagnosed as mild/severe tricuspid regurgitation and normal, the ventricular systolic and diastolic function is obviously impaired. There were no significant differences between the mild tricuspid regurgitation fetus and control in terms of the ventricular function index, which means mild tricuspid regurgitation did not cause fetal ventricular function damage. The qualitative and quantitative measurements of prenatal fetal tricuspid regurgitation is beneficial to evaluate the effects of cardiac structure, activity and rhythm, which helps to predict the prognosis, guide clinical practices, and give recommendations of good birth and good care.

ABSTRACTS

PAEDIATRIC CARDIOLOGY III

116

Mechanism of De Novo Mutation Microtubule Associated Scaffold Protein 1 (MTUS1) in the Process of Compaction of Ventricular Myocardium

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Objective: To investigate molecular mechanisms of de novo mutation microtubule associated scaffold protein 1 (MTUS1) in compaction of ventricular myocardium.
Methods: Lentiviral vectors containing MTUS1 wild type and containing the mutation MTUS1 were constructed and co-infected into CP15-5a cells (mutantion group, wild type group and vector group, respectively). The mRNA expression of MTUS1 and ras homolog family member A (RhoA) were evaluated by Real-time PCR. Expression level of RhoA protein was measured by Western blot. The proteins α-tubulin was detected by immunofluorescence assays. Cell migration was determined by Wound-Healing Assay.
Results: Lentiviral vectors containing MTUS1 wild type and containing the mutation MTUS1 were constructed successfully, verified by fluorescence staining and Real-time PCR. Immunofluorescence assays revealed the fluorescence intensity of α-tubulin decreased in the cells expressing the mutated MTUS1 ($P=0.006$, $P<0.01$). Real-time PCR and Western blot showed that expression of RhoA was significantly increased in mutation than that in wild type group ($P=0.005$, $P=0.01$, $P<0.05$, $P<0.01$). In Wound-Healing Assay, after the scratch 6 h and 12 h, the percent wound closure of the mutation group was significantly increased than that in wild type group ($P=0.000$, $P=0.000$, $P<0.001$).
Conclusion: A de novo mutation in MTUS1 is a protective mutation for noncompaction of ventricular myocardium, which decreased the stability of microtubules and increased cell migration by regulating the expression of RhoA.

117

Respiratory Syncytial Virus Associated Infection in Infants with Haemodynamically Significant Congenital Heart Disease before 12 Months of Age in Hong Kong: The Implication on Potential Use of Monoclonal Antibody Prophylaxis

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Background: Infants with congenital heart disease (CHD) are at increased risk for severe respiratory syncytial virus (RSV)-associated hospitalization. In Hong Kong, RSV season is prolonged and peak seasons can be unpredictable, hence the efficacy of Palivizumab, an immunoprophylaxis against RSV, in the group of hemodynamically significant congenital heart disease (HsCHD) is largely unknown. The current study aim to address the issue of cost effectiveness of Palivizumab use in Hong Kong.
Methods: Medical records of all HsCHD patients below 12 months of age referred to our centre between 1 January 2014 and 31 December 2016 were reviewed. Patients who fulfilled the American Academy of Pediatrics (AAP) guidelines for Palivizumab prophylaxis were selected, amongst which RSV infections requiring hospitalization were identified and reviewed. Palivizumab efficacy was assessed by calculating number needed to treat (NNT) to prevent hospitalization or mortality using either a 5 or 6 monthly dose regime starting from first hospital discharge after the diagnosis of HsCHD was made. Cost effectiveness was also assessed.
Results: Two hundred and thirty six patients fulfilling the AAP criteria were identified out of 1,505 patients referred to our centre during the study period. Fourteen out of 236 patients were excluded since there were no window period to administer Palivizumab. Out of 222 patients, the indication for palivizumab included CHD with heart failure requiring surgical or catheter intervention (n=160, 72%); significant pulmonary hypertension associated with CHD (n=4, 1.8%) and cyanotic CHD (n=58, 26.2%). Twenty patients had RSV-associated hospitalization, amongst which 4 required intensive care. There were no mortality. The NNT to prevent hospitalization for the whole cohort using 5 and 6 dose regime is 54.9 and 38 respectively. NNT for cohort excluding cyanotic CHD using 5 and 6 dose regime is 45.5 and 33.1 respectively. As there were no mortality, cost effectiveness was assessed based on comparison of palivizumab program expenditure versus cost for RSV-associated hospitalization. For the whole cohort, total RSV-associated hospitalization cost was HK$ 2,959,600; while palivizumab program cost for 5 and 6 dose were HK$5,809,710 and HK$ 6,856,110. For cohort excluding cyanotic heart disease, total RSV-associated hospitalization cost was HK$ 2,796,400; while palivizumab program cost for 5 and 6 doses were HK$ 4,745,070 and HK$ 6,546,040.
Conclusion: RSV-associated hospitalization in HsCHD is not uncommon. However, in Hong Kong, the use of RSV monoclonal antibody is probably not cost effective as reflected by the high NNT and comparative high cost.

ABSTRACTS

PAEDIATRIC CARDIOLOGY III

118

Respiratory Ciliary Dysfunction and Airway Symptoms in Congenital Heart Disease with/without Heterotaxy

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Background: The congenital heart disease patients with/without heterotaxy show increased ciliary dysfunction(CD) and low nasal nitric oxide with postoperative respiratory complications, which are similar to primary ciliary dyskinesia. These findings suggest that the role of motile cilia play a critical role in both mucociliary clearance and nodal flow which is fundamental for establishing embryonic left-right patterning. In this study, we process a retrospective study about CHD patients with/without heterotaxy to access the prevalence of ciliary motion and sinopulmonary symptoms.
Methods: We recruited 1181 CHD patients, 87 with heterotaxy and 1094 without heterotaxy. Collect information from clinical electronic medical records, including demographics, diagnosis and respiratory symptoms. Video microscopy of nasal biopsies were conducted to test ciliary motion and Nasal nitric oxide(nNO) were measured. Sinopulmonary symptoms were reviewed by questionnaires and outpatient records.
Results: Our study showed patients with congenital heart disease without heterotaxy a high frequency of ciliary dysfunction (33.5%) and low or borderline low nasal nitric oxide (8.8%) levels. In congenital heart disease with heterotaxy patients, we obseverd 57% of ciliary dysfunction and 36.8% of abnormal nNO value. Increased sinopulmonary symptoms were observed in the patients with ciliary motion dysfunction or low nasal nitric oxide, while both abnormal ciliary motion and low nitric oxide individual had more respiratory symptoms. Our study displayed that abnormal ciliary motion and low nasal nitric oxide were more essential in predicting risk of sinopulmonary symptoms than heterotaxy.
Conclusions: A high prevalence of abnormal ciliary motion and low or borderline nasal nitric oxide were observed in patients with congenital heart disease without heterotaxy, which is relative to more airway symptoms. These findings suggest that respiratory symptoms and ciliary motion dysfunction are more important in screening for congenital heart disease than heterotaxy status, and the role of cilia in pathogenesis of congenital heart disease no matter heterotaxy status.

120

Association between Mitochondrial DNA Copy Number and Cardiovascular Disease: Current Evidence Based on a Systematic Review and Meta-analysis

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Background: Mitochondria are energy-producing structure of the cell and help to maintain redox environment. In cardiovascular disease, the number of mitochondrial DNA (mtDNA) will changes accordingly compare to normal condition. Some investigators ask whether it has a clear association between mtDNA and cardiovascular disease with its adverse events. Thus, we conduct the meta-analysis to assess the role of circulating mtDNA in evaluating cardiovascular disease.
Methods: The meta-analysis was conducted in accordance with a predetermined protocol following the recommendations of Cochrane Handbook of Systematic Reviews. We searched the Pubmed, Embase, the Cochrane Central Register of Controlled Trials and World Health Organization clinical trials registry center to identify relevant studies up to the end of October 2017. Data were analyzed using STATA. Besides, publication bias and meta-regression analysis were also conducted.
Results: We collected results from 5 articles for further analyses with 8,252 cases and 20,904 control. The normalized mtDNA copy number level is lower in cardiovascular disease (CVD) than the control groups with a pooled standard mean difference (SMD) of -0.36(95%CI, -0.65 to -0.08); The pooled odds ratio (OR) for CVD proportion associated with a 1-SD (standard deviation) decrease in mtDNA copy number level is 1.23 (95% CI, 1.06-1.42); The OR for CVD patients with mtDNA copy number lower than median level is 1.88 (95% CI, 1.65-2.13); The OR for CVD patients with mtDNA copy number located in the lowest quartile part is 2.15 (95% CI, 1.46-3.18); the OR between mtDNA copy number and the risk of sudden cardiac death (SCD) is 1.83 (95% CI, 1.22-2.74).
Conclusion: Although inter-study variability, the overall performance test of mtDNA for evaluating CVD and SCD revealed that the mtDNA copy number presented the potential to be a biomarker for CVD and SCD prediction. Given that, the fewer copies of mtDNA, the higher the risk of CVD.

ABSTRACTS

PAEDIATRIC CARDIOLOGY III

136

High-density Mapping of Atrial Tachyarrhythmia in Congenital Heart Diseases

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Aims: The use of high-density electroanatomical mapping in Chinese population for congenital heart disease (CHD) is not well reported.
Methods: Retrospective review of consecutive transcatheter ablation of atrial tachyarrhythmia using high-density mapping for CHD patients (at least moderate complexity) in the only tertiary congenital heart centre in the territory from Jan 2017 to Jan 2019 was conducted. Orion mapping catheter in Rhythmia system (Boston Scientific) was used to create activation and voltage maps. Parameters including mechanism of arrhythmia, acute success, and follow-up data were recorded.
Results: Eight patients were identified (mean age 38.0±9.0 years) who underwent transcatheter ablation of atrial arrhythmia (focal atrial tachycardia-1; intra-atrial reentry tachycardia (IART)-3; both-4). More than one reentry circuits of IART were identified in 5 patients, in which 3 patients had three or more IART mechanism. A median of two maps were acquired per person and it took in median 32.4 minutes (IQR 15.6-50.6) with median number of 15,952 (IQR 13, 395-18,530) mapping points per map. Cavo-annulus isthmus dependent mechanism was the predominant reentry mechanism. Acute success was achieved in all patients, among which it was considered partial success in 2 patients (25%). There was recurrence of atrial arrhythmia in 3 patients (37.5%). Additional targeted substrate ablation was performed in 6 patients with multiple IART circuits. Near-miss anatomical pouches were identified in 3 patients.
Conclusion: High acute success rate of atrial arrhythmia ablation can be achieved using high-density anatomical mapping in CHD. Multiple IART circuits were often identified.

ABSTRACTS

INTERESTING PAEDIATRIC CLINICAL CASE PRESENTATION COMPETITION

23

Amiodarone-related Pure Red Cell Aplastic Anemia and Hypothyroidism After Complex Congenital Heart Surgery: One Case Report

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Background: Amiodarone is an effective anti-arrhythmia drug, but there are many clinical side effects that limit its application.
Case: The patient was a child with complete anomalous pulmonary venous drainage (intracardiac type) who underwent cardiac surgery at the age of 2 months. The preoperative body weight was 4.1 kg. On the 11th day after operation, atrial tachycardia was disturbed. The fastest heart rate was about 200 beats per minute. Amiodarone was given orally (15 mg/kg.d). The arrhythmia was controlled. Amiodarone was reduced to 10 mg/kg.d after 4 days and 5 mg/kg.d after 1 week. The patient were discharged with amiodarone (5 mg/kg.d). At 7 months old (5 months after operation), the patients returned to the hospital for reexamination. Physical examination showed that the heart rate was slow, 80 times per minute, and there was no significant increase in body weight. The electrocardiogram showed intermittent sinus bradycardia, occasional junctional escape, hemoglobin 79 g/L, and thyroid function: TSH 9.660 uIU/mL. Taking amiodarone excess into account, amiodarone was discontinued and given orally to eumethylle. Heart rate improved and TSH returned to normal. Re-visit at 8 months old, weight increased by 1.3 kg, TSH was normal, but still anemia, hemoglobin 70 g/L. Considering nutrition-related anemia, nutritional therapy was recommended. Re-visit at 9 months old, weight increased ideally, but Routine blood test indiacated that hemoglobin 59 g/L, positive cell anemia, and low reticulocyte count; Bone marrow cytology examination suggested pure red cell aplastic anemia. Prednisone was given orally (2 mg/kg.d). After 2 weeks, the hemoglobin increased to 82 g/L. After 1 month, the hemoglobin increased to 112 g/L. After 2 months, prednisone maintained at low doses (0.5 mg/kg.d) and maintained. At present, the patient is 1 year old, weighs 7 kg and 67 cm in length. The latest hemoglobin was 113 g/L. The thyroid function was normal.
Decision-making: The use of amiodarone in children should be closely followed up. Once the problem is found, the drug should be stopped and treated in a timely manner.
Conclusion: The use of amiodarone in small infants and young children should be used for as short a time as possible, and the side effects should be closely monitored.

43

Very Late-onset Complete Atrioventricular Block after Transcatheter Closure of Perimembranous Ventricular Septal Defect

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Background: Transcatheter closure of perimembranous ventricular septal defect (PmVSD) with Amplatzer VSD occluder (AVSDO) had a high incidence of complete atrioventricular block (cAVB) post closure, ranging from 8.7%-20% during early and middle term follow-up, leading to disapproval of this interventional therapy by FDA. Despite the abandonment of AVSDO by most centers thereafter, long-term outcomes of patients received AVSDO, still remain an issue of concern and the late occurrence of potentially catastrophic heart block long after hospital discharge is especially worrying. Herein, we firstly reported a case with very late-onset cAVB occurring over ten years following transcatheter closure of PmVSD using AVSDO.
Case: A five-year-old female, with a PmVSD was referred to our hospital for transcatheter closure of the defect. Transthoracic echocardiography (TTE) revealed an 11-mm sized defect with a left to right shunt, moderate pulmonary hypertension and left ventricle enlargement. The defect measured 11.5 mm on left ventricular angiography and a 14-mm AVSDO was chosen. No arrhythmias, residual shunt and aortic regurgitation was documented following occluder deployment and the device was released. Oral administration of aspirin was initiated and ECG monitoring and echocardiography post procedure were performed, during which time the patient was uneventful. After discharge, all ECG recordings and TTE examination were completely normal during the first year and annually thereafter. Unfortunately, the child lost follow-up six years post procedure. Ten years after operation, the patient was re-admitted into our hospital due to recurrent syncope. cAVB with a minimal heart rate of 42 bpm was noted on ECG. Notably, device flattening was revealed on two-dimensional TTE and the occluder appeared to return to its original size and shape. Similar findings were showed on fluoroscopic evaluation. The child was empirically treated with prednisone, but with no improvement. Lastly, a permanent pacemaker was implanted and the following course was uneventful.
Decision-making: This case report proved that the at-risk period for developing heart block after device closure appears to be much longer than we speculated. Most importantly, this finding was of clinically amount significance for underscoring the importance and necessity of long-term, perhaps life-long follow-up for these patients, since lots of patients receiving transcatheter closure of PmVSD with this kind of device had been documented in the literature.
Conclusion: The present case provided additional evidences that the progressive device flattening could occur and it may account for the very late-onset cAVB after device closure with AVSDO.

ABSTRACTS

INTERESTING PAEDIATRIC CLINICAL CASE PRESENTATION COMPETITION

64

One Case of Primary Carnitine Deficiency

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Background: In this case, the female, who was 5 years old at the time of diagnosis, was admitted to hospital due to cardiomyopathy.
Case: The child was found to have enlarged left ventricular and hypertrophy of the left ventricular wall due to cough by Echocardiography. She had frequent respiratory infections. Her physical and mental development was age appropriate. Her elder sibling had died at the age of one in a context of dilated cardiomyopathy and cardiac insufficiency. Physical examination only showed her liver enlarged to 2 cm below the costal margin; neurological examination was normal and no audible heart murmur was noted. Laboratory testing showed high blood ammonia increased to 110 μmol/L (normally 9-30 μmol/L) ; echocardiography showed left ventricular hypertrophy: left ventricular posterior wall during diastole was 8.0 mm (normally 5-7 mm); left ventricular enlargement: Left ventricular internal diameter at end-diastolic is 38 mm (normal value is less than 34 mm) and EF is 58%; chest radiographs suggest an increase in cardiothoracic ratio with 57.8%; electrocardiogram showed high T waves; screen plasma free carnitine concentration was decreased to 1.19 μmol/L (normal value 10-60 μmol/L) and with other kinds of acylcarnitine decreased, which indicated the PCD.
Decision-making: Finally, the child did the SLC22A5 gene testing and further diagnosed as PCD. At the early stage of diagnosis, 100 mg/(kg·day) L-carnitine was given intravenously to supplement carnitine. After two weeks, the serum carnitine level returned to normal, and then changed to L-carnitine oral solution (Dong Wei Li) 100-130 mg/(kg·day) for long term oral supportive therapy. Two years after the treatment, L-carnitine oral solution was adjusted to 100-140 mg/(kg·day) according to body weight and serum free carnitine concentration.
Conclusion: (1) PCD is one of the causes of cardiomyopathy in children. Detection of serum free carnitine and acylcarnitine levels by tandem mass spectrometry is the preferred screening method for PCD. SLC22A5 gene detection is an important means for the diagnosis of PCD. (2) Whether PCD heterozygous carriers are affected by various factors, there is no consensus at home and abroad about whether there is a need to supplement carnitine prevention and treatment. Therefore, long-term follow-up of PCD heterozygous carriers is still needed to avoid adverse events. (3) Combined with the long-term follow-up data, it can be found that continuous L-carnitine supplement can achieve good and positive mid- and long-term effects in the treatment of PCD.

72

The Outcome of LBBB Complicated with Transcatheter Closure of VSD in Two Children

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Background: To evaluate outcome of left bundle branch block (LBBB) after transcatheter closure of perimembranous ventricular septal defect (pmVSD) in children.
Methods: From January 2017 to December 2018, 208 patients with pmVSD underwent transcatheter closure. There were two children complicated with LBBB. The incidence of LBBB was 0.96%. *Case 1:* A 4-year-old boy. The Weight was 15 Kg. He was admitted to hospital for heart murmur in August 6, 2018. The diameter of VSD measured by transthoracic echocardiography (TTE) was 2 mm. The result of cardiac catheterization were PA 46/18 (31) mmHg, AO 106/59 (79) mmHg, Pp/Ps =0.43, Qp/Qs=1.34. The diameter of VSD in LV angiography was 2.0 mm. We used 3-4 mm ADOII (AGA) for pmVSD. *Case 2:* A 4 years and 5 months boy. The Weight was 16.8 Kg. He was admitted to hospital for heart murmur in August 19, 2018. The diameter of VSD measured by TTE was 6.3 mm in LV and 2.9 mm in RV. The result of cardiac catheterization were PA 24/10 (16) mmHg, AO 101/62 (75) mmHg, Pp/Ps =0.24, Qp/Qs=1.85. The diameter of VSD in LV angiography was 4.0 mm.We used 6mm domestic symmetric double-disk VSD occluder.
Results: *Case 1:* CLBBB was found in Day 1 after intervention. He was treated with albumin and methylprednisone. The ECG was intermittent incomplete LBBB in Day 9. He was discharged in Day 10 because of ECG was normal. Afterwards, he was lost clinic follow-up. CLBBB was found in 7 months after intervention. *Case 2:* CRBBB was found in Day 1. He was also treated with albumin and methylprednisone and discharged in Day 4 with CRBBB. He was readmitted to hospital for slow pulse rate in Day 6. The ECG showed high AVB, ventricular escape rhythm and CRBBB. he was retreated with methylprednisone. ECG were CLBBB and I degree AVB in Day 8 and were incomplete LBBB and RBBB in Day 14. He was underwent VSD repair and occluder removal in Day 16. The ECG was incomplete RBBB in Day 2 after surgery and he was discharged in Day 5 post-operation. During 6 months follow-up, the patients recovered well and ECG did not occurred with LBBB.
Conclusions: LBBB complicated with transcatheter closure of pmVSD would be close follow-up even if ECG recovered normal after treatment. If not, it is better to withdraw the occluder as soon as possible.

ABSTRACTS

INTERESTING PAEDIATRIC CLINICAL CASE PRESENTATION COMPETITION

83

Removal of a Pacemaker Lead in an Infant Through Left Subclavicular Vein

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Background: The removal of pacemaker electrode in infant was rarely tried. Case: An 8 months old and 8 kilogram weight infant with permanent pacemaker implantation who suffered from complete atrioventricular block after surgery for Tetralogy of Fallot was admitted to our hospital on September last year. During three months after the implantation of the pacemaker, the pacing output was instable, which was upregulated to 5 Volts/ 0.1 ms with the pacing threshold fluctuated at 2-3 Volts with pulse width at 0.4 ms.
Decision-making: The heart cavity is very small in such an infant. To implant a new electrode with the problem electrode remaining in the cardiac chamber is not feasible. We decided to remove the pacemaker lead then. The direct pulling, unscrewing back the inner core of the electrode and unscrewing back the outer edge of the electrode were adopted respectively to release the electrode from the myocardial tissue and then pull out the electrode. In situ puncture of left subclavian vein was made to erect a track along which the sheath was loaded into. A new ventricular electrode was implanted and linked to the original pacemaker and sutured in situ pouch. During the follow-up the pacemaker programming was did to monitor the parameter.
Conclusion: The direct pulling was not able to pull out the electrode. Unscrewing back the inner core of the electrode and unscrewing back the outer edge of the electrode at the same time released the electrode from the ventricle tissue and then was pulled out slightly. During the follow-up the pacing threshold were 1.75 volts with pulse width at 0.4 ms. No complications such as vascular laceration, cardiac perforation, pericardial effusion, massive hemorrhage, pacemaker infection and impaired wound healing relevant to the removal of pacemaker lead and re-implantation of electrode occurred after the operation. If the indications were strictly grasped and under careful operation, the removal of electrode implanted within the short term should be safe.

93

Pulmonary Venous Channel Stenosis Accompanying Thrombus after the Senning Procedure in a Child

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Background: Obstructions in newly created atria are well-known complications after the Senning operation. Venous stenosis can be present at the superior vena cava channel, inferior vena cava channel, or PV-channel after a Senning operation
Case: We present a case of pulmonary venous channel stenosis accompanying thrombus in a 8-year-old female 3 months after a Senning operation for levo-TGA. On postoperative day 7, we found a slight acceleration of the blood flow at the PV channel in the newly created left atrium derived from the incision on the original left atrium by transthoracic echocardiography. At 3-month follow-up, a large thrombus surrounding the opening of left the pulmonary vein and the severe acceleration of the blood flow at the PV channel.
Decision-making: On 1-month follow-up, diuretic and anticoagulant therapy was given as her face swelling occurred frequently. And thoracentesis was performed for treating pleural effusion. Unfortunately, the patient died 3 months after the surgery.
Conclusion: The complication of pulmonary venous channel stenosis can appear just after the surgery. Therefore, it is important to recognize that the PV channel is predisposed to venous obstruction. Transthoracic echocardiography is the only reliable tool for detecting the presence of a pulmonary venous and the complications.

ABSTRACTS

INTERESTING PAEDIATRIC CLINICAL CASE PRESENTATION COMPETITION

99

Anomalous Origin of Left and Right Coronary Artery Result from Pulmonary Hypertension due to Heart Failure

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Background: Congenital coronary artery anomalies (CCAAs) are abnormalities in the origin, course or structure of these arteries, and their incidence varies from 0.2% to 5.6%. CCAAs may cause myocardial ischemia and sudden cardiac death. Anomalous origin of the left coronary artery from the pulmonary artery (ALCAPA) is more common in CCAAs.
Case: Our case was a thirty eight day old female infant born by normal vaginal delivery. She was asymptomatic till 30th day of life when parents noticed that baby had a cough with wheezing. Chest X-ray showed enlargement of cardiac shadow, echocardiogram revealed enlargement of left atrium and ventricle with severe LV dysfunction in local hospital. She was admitted to our hospital for endocardial fibroelastosis. In our hospital, the ECG displayed normal sinus rhythm, abnormal Q (q) waves in high lateral wall with QRS waveform of anterior lateral wall fragmentation, and prolonged QT interval. On 2D echo a similar echo of LMCA was seen to be arising from pulmonary artery, RCA was visible from aorta and its starting position was about 1 o'clock. However, color Doppler antegrade flow was seen in the left coronary artery. It was discussed CT angiogram (CTA) could help to demonstrate diagnosis. Baby was put on oxygen inhalation, cardiotonic drug and diureticum in the during. After 3 days CTA demonstrated that RCA originated from the left side of the ascending aorta, and LMCA originated from the pulmonary artery. Transthoracic echocardiogram was done. Interestingly this time showed the right-to-left bi-directional shunt in the left coronary artery.
Decision-making: Correction of abnormal origin of coronary artery, expansion of pulmonary artery patch and ECMO placement were performed in the baby. Unfortunately, due to the cardiac function recovered poorly during post-operation and ECMO assisted period. On the 7th day after operation, the baby died.
Conclusion: We are reporting a case of abnormal position of RCA and ALCAPA with severe LV dysfunction with normal-flow pattern in left coronary artery and demonstration of right-to-left bi-directional shunt on anti-heart failure treatment. It is result from pulmonary hypertension due to left ventricular heart failure. Pulmonary artery pressure decreased after treatment, so the third time echocardiogram was seen the right-to-left bi-directional shunt in the left coronary artery

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109

Catecholaminergic Polymorphic Ventricular Tachycardia with Complex Arrhythmia: A Case Report

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Background: Catecholaminergic polymorphic ventricular tachycardia (CPVT) is an uncommon severe inherited arrhythmia syndrome. However, the diagnostic process of CPVT remains very challenging due to normal resting ECG and cardiac imaging.
Case: A 6-year-old boy with complex arrhythmias and syncope was referred to the Division of Pediatric Cardiology in August 2018. In 2015, when he was 4 years old, the patient was found to have sinus bradycardia and normal cardiac imaging. No further examination and treatment were given. In 2018, the patient suffered a sudden syncope while sleeping. His ECG and 24-h ambulatory ECG revealed sinus bradycardia, sinus arrest, atrial tachycardia, atrial fibrillation, atrial flutter, premature ventricular contraction and VT alternately. His echocardiogram showed mildly enlarged left ventricular with left ventricular internal diastolic diameter (LVIDd) of 49 mm and cardiac dysfunction with left ventricular ejection fraction (LVEF) of 23%. The treatment of gamma globulin, methylprednisolone and amiodarone was ineffective. His ECG monitoring showed that complex arrhythmias persisted with heart rates between 30 and 200 bpm. Bidirectional and polymorphic VT were detected. Tachyarrhythmia frequently occurred during emotional stress at daytime, whereas sinus bradycardia persisted at night.
Decision-making: Low dose beta-blocker (0.9 mg/kg/d split into 3 doses) was initiated. The patient responded to propranolol and presented with sinus bradycardia within a heart rate of 37 to 82 bpm, meanwhile, no sinus arrest and tachyarrhythmia were detected. Due to sinus tachycardia, the patient underwent implantation of permanent pacemaker pacing at 80 ppm. The dose of propranolol was increased to 3 mg/kg/d gradually under continuous blood pressure. Ventricular pacing rhythm was present for 95.8% of the time with heart rates 80 to 90 bpm, and atrial tachycardia within 1 to 5 minutes occasionally occurred during emotional stress. During a follow-up of 6 months, no syncope occurred. His LVID reduced to 45 mm, LVEF increased to 55%. The results of his genetic testing revealed a missense mutation, H4762Y (C14284T transition in the exon n99 of RYR2) which is strongly associated with CPVT.
Conclusion: CPVT can present with exercise or emotional stress-induced ventricular and/or atrial tachyarrhythmia, and with sick sinus syndrome. The pediatrician should pay attention to this clinical feature and avoid misdiagnosis or a delay to diagnosis of CPVT.

ABSTRACTS

INTERESTING PAEDIATRIC CLINICAL CASE PRESENTATION COMPETITION

146

Two Cases Report of Sinus Rhythm Restored after Surgical Removal of the Occluder for Late Complete Left Bundle Branch Block Developed Post-occlusion of Perimembernous Ventricular Septal Defect

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Background: To investigate the treatment, outcome and prognosis of delayed left bundle branch block after percutaneous perimembernous ventricular septal defect occlusion in paediatric patients.
Methods: Retrospectively reviewed the clinical characteristics and outcomes of two patients developed late complete left bundle branch block (CLBBB) after 1-month post-procedure of percutaneous closure of perimembranous ventricular septal defect (pmVSD), to discussed the therapeutic methods of these patients.
Results: Both cases with a pmVSD and a history of recurrent respiratory infections, were referred to us for percutaneous closure of the defect, which measured 5 mm and 4 mm by left ventricular angiogram. Qp / Qs were 1.84 and 1.78 respectively and there was no pulmonary hypertension. HeartRTM and CeraTM VSD devices were chosen, which the diameter of the occlude was 6 mm symmetrical and 8 mm asymmetrical (large-left-disc) respectively for closure in November 2017 and October 2018. The EKG recorded 24 hr after the procedure both showed normal sinus rhythm. Two-dimensional TTE examination showed the devices were both in the proper position and there was neither residual shunting nor regurgitation of the aortic, tricuspid, and mitral valves before discharged. But they developed asymptomatic late CLBBB at one-month follow-up post-procedure. The first case, a 2.5-year-old boy weighing 12.5 kg, detected CLBBB at 35-day follow-up. Operators decided to definitively retrieve the device and to send the patient to surgery. Therefore, at 42-day after interventional treatment, he underwent surgical removal of the occluder and repaired the pmVSD simultaneously in November 2018. Sinus rhythm restored at 5-day examination after the surgical procedure and was stable.at one-month follow-up. The second case, a 3.5-year-old boy weighing 15.5 kg, also detected CLBBB at 1-month after the procedure. Holter monitoring showed the CLBBB was intermittent. Oral prednisone 1.5 mg/kg/d treatment was ineffective for 1 month. Left ventricular end diastolic diameter (LVEDD) enlarged gradually to 45 mm and the left ventricular ejection fraction (LVEF) decreased to 48% at 12-month follow-up by TTE. Tissue doppler showed that the left ventricular wall was systolic dyssynchrony The boy underwent surgical removal of the occluder and repaired the pmVSD simultaneously in December 2018. CLBBB was still noted at 10-day after the surgical repair before discharged. It was lucky that sinus rhythm restored at 1-month after hospital discharge, with the LVEDD restored to 38mm and LVEF increased to 65%.
Conclusion: The device should be removed as soon as possible when occurred CLBBB.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

7

The Clinical, Electrocardiographic, Echocardiographic Profile and In-patient Outcomes of Adult Filipino Patients with Methamphetamine Drug Use Associated Cardiomyopathy at a Tertiary Hospital: A Prospective Study

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Background: Methamphetamine (MAP) abuse is a sociopolitical-medical issue causing cardiac toxicity (cardiomyopathy, arrhythmias, myocardial infarction). Review of literature showed dearth of information on the clinical profile, diagnostic data and outcomes of Filipinos with MAP cardiovascular events and we aim to fill this knowledge gap.
Objective: A 1 year prospective-descriptive study on consecutive patients admitted with a diagnosis of MAP induced cardiomyopathy presenting with Heart Failure (HF) with a positive urine MAP test and/or use of MAP based on history.
Methods: This is a prospective descriptive study on adult patients admitted at the UP PGH emergency room with a clinical diagnosis of MAP induced cardiomyopathy presenting with symptoms and signs of Heart Failure (HF) based on the New York Heart Association Functional Classification (NYHA FC) with a documented positive urine MAP test and/or use of MAP based on history. Patients with known cardiac or systemic comorbidities known to cause cardiomyopathy have been excluded. Convenient sampling method (total enumeration) was employed in the study. Descriptive statistics were reported.
Results: Twenty-two patients were enrolled. 40% were MAP users for >10 years, 77% were smokers, 82% were alcoholic and 5% had cocaine abuse. 30% had a previous HF hospitalization. 35% were urine MAP positive. Six of 10 patients were in NYHA FC II-III and 30% were in cardiogenic shock. Mean duration of HF symptoms is 1.3 mo. ECG profiling revealed 82% in sinus rhythm, atrial fibrillation(14%) and complete heart block(5%). 40% were tachycardic, 14% had wide QRS complex, 55% had LVH, 45% had left atrial abnormality, 41% had low voltage complexes, 36% had significant Q waves, 18% had acute STEMI, 27% had evidence of ischemia and 23% had fragmented QRS. Echocardiography revealed multi-chamber dilatation, with reduced ejection fraction (60%). Mean duration of hospitalization is 9 days. Majority (95%) were discharged improved. One patient died due to ventricular fibrillation.
Conclusions: To our knowledge, this is the first prospective study detailing the clinical, electrocardiographic and echocardiographic features as well as in patient outcomes of adult Filipino patients with MAP CM that can guide Filipino and Asian cardiologists/internists in the early recognition and prompt management of this escalating sociopolitical and clinical concern in Asia.

8

The Evolving Clinical and Echocardiographic Profile of Patients Admitted for Acute Cardioembolic Stroke at a Tertiary Hospital in the Philippines

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Background/Introduction: One of 5 ischemic strokes is cardioembolic in nature. Despite the robust data on cardioembolic stroke (CES) in western literature, there is scarcity of local data on Asians. Higher prevalence of rheumatic heart disease (RHD) in developing countries and the growing availability of NOACs may contribute to an evolving patient profile. This study aims to define the profile, management and in hospital acute outcomes of Filipino patients with CES.
Methods: A 2-year retrospective study of patients with CES admitted at UP-PGH. Data were obtained through review of records using a standardized data collection form. One hundred and twenty-six patients were enrolled. Mean age was 59.9 years. Majority (88%) had a CHADS-VASC Score of >2. Atrial fibrillation remains the most common rhythm abnormality (67%) and 20% has RHD (mitral stenosis). On echo, 92% had LVH and 58% had left atrial enlargement. Interestingly, only 5% had thrombus and merely 8% had rheologic stasis. Majority had moderate-large artery territory infarctions with 40% hemorrhagic conversion within 4 days. Two of 3 patients were given initial anticoagulation. Only half of those who survived were discharged on oral anticoagulation. Only 10% of patients were given NOACs. Mean HASBLED score was 1.9±0.96. Bleeding complications was 6%. CES were associated with longer hospital stay (16 days) and development of nosocomial pneumonia (46%).
Discussion: To our knowledge this is the largest Filipino cohort with CES reported in local literature. The profile of Filipino CES patients was similar to the previous international studies in terms of the patients' age, neuroimaging findings, rate of hemorrhagic conversion, and low anticoagulation rate. Contrary to western data, what is interesting is that Filipino CES patients are younger, with majority of them having RHD in contrast to degenerative.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

10

"Fatal Eosinophilic Myocarditis" from Hypereosinophilic Syndrome and Intestinal Parasitism Mimicking Acute Coronary Syndrome in a 39 Year Old Filipino Female

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Introduction: Eosinophilic myocarditis (EM) is an under recognized disease (0.5% of autopsy series) leading to progressive myocardial damage, heart failure and death. Although parasitism is a common in developing countries, marked eosinophilia from trichuriasis causing myocardial infiltration and progressive heart failure is rare.
The Case: An interesting case of a healthy 39 years old post-partal multigravid Filipina, came in for chest heaviness. She was diagnosed case of uncontrolled bronchial asthma. She had ascariasis as a child. She came in with a two week history of fever followed by chest heaviness, diaphoresis and heart failure symptoms. She was hypotensive, tachycardic with signs of congestion on admission. EKG showed sinus tachycardia, left axis deviation and complete left bundle branch block. The patient was managed as a case of acute coronary syndrome and was thrombolysis with inotropic support. Serial ECGs showed evolution with low voltage QRS complexes on limb leads and recent anteroseptal wall infarct. Troponin I was > 10X elevated. Echo revealed concentric left ventricular remodelling with multi-segmental wall motion abnormalities and an EF 30% with doppler evidence of restrictive filling pattern. She had leukocytosis (27,940) with an absolute eosinophil count of 16,700. There was persistent marked eosinophilia on serial CBCs. EM was considered. Work up for hypereosinophilic syndrome was requested. Patient underwent coronary angiography (CA) with endomyocardial biopsy (EB) on the 3rd hospital day. CA showed normal coronary arteries. An EB was done. Post procedure, patient developed progressive hypotension and transient 3rd degree AV block. A temporary pacemaker was inserted. Post procedure echo did not show pericardial fluid nor tamponade. Hypotension progressed leading to death. EB showed fibromuscular tissue with florid infiltrating eosinophils and lymphocytes. BMA biopsy did not show acute leukemia. Post mortem fecalysis showed Trichuris trichura infestation. Unfortunately, due to the rapid demise of the patient, high dose steroids were only started post biopsy.
Discussion: Eosinophilic myocarditis causes diffuse myocardial inflammation from eosinophilic infiltration. Trichuriasis is shown to be a cause of EM in 1 case report its relative tissue invasion (Ames et.at.). Over 99% of trichuriasis leads to asymptomatic infestation. Blood eosinophilia rarely exceeds 1500/ul in asthma despite respiratory tract eosinophil infiltration. The combination of these two pathologies might have given rise to a marked reactive hypereosinophilia causing eosinophilic degranulation leading to increased tissue permeability, platelet activation and inhibition of cardiac mitochondrial respiration. EM may mimic symptoms of ACS, nonspecific ECG and echocardiographic findings with increased cardiac enzymes. If there is a strong clinical suspicion of EM, there is a need to perform a prompt EM in order to arrive at a diagnosis and to initiate empiric high-dosage corticosteroid therapy without waiting for definite diagnosis.

11

The Efficacy of Oral Trimetazidine In Preventing Contrast-Induced Nephropathy Among Patients Undergoing Elective Coronary Procedures: A Meta-Analysis of Randomized Controlled Trials

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Background: Contrast-induced nephropathy (CIN) is a serious but preventable complication of coronary procedures. Trimetazidine (TMZ) has recently been explored for use in preventing post-procedural CIN due to its cellular anti-ischemic and antioxidant properties. Research Question Among adult patients undergoing elective percutaneous coronary procedures, how effective is oral TMZ in addition to standard therapy in preventing contrast-induced nephropathy?
Objectives: To assess the efficacy of oral TMZ in the prevention of contrast induced nephropathy during elective coronary angiography and PCI.
Methods: We searched the Cochrane Central Register of Controlled Trials, Pubmed/MEDLINE, EMBASE, clinicaltrials.gov for articles published until June 2016 for randomized controlled trials examining the effects of adding oral TMZ to standard therapy in preventing CIN. Outcome measures were incidence of CIN, defined as a 0.5 mg/dl or ≥25% increase in serum creatinine 48-72 hours after contrast exposure, and incidence of dialysis-requiring CIN. Validity of studies was assessed through a risk assessment tool available from Cochrane. Treatment effect was estimated by calculating the Mantel-Haenszel-weighted risk ratio (RR) using a fixed-effects model available from RevMan 5.3.
Results: A total of four studies comprising 714 patients (TMZ group = 352, Control group = 362) were included in the final analysis. Pooled results revealed the TMZ group was associated with significantly fewer incidences of CIN compared to control (RR 0.33, 95% confidence interval [CI], 0.20, 0.53; P<0.00001), with a relative risk reduction of 67% and an absolute risk reduction of 11.04% (NNT= 9). No dialysis-requiring CIN was observed in the included studies. Our analysis included mostly patients with mild to moderate renal impairment. We are unable to generalize results to patients with more severe renal impairment.
Conclusion: The addition of oral TMZ to standard hydration confers a significant benefit in preventing CIN after coronary procedures among patients with mild to moderate renal impairment. We recommend the addition of TMZ to standard prevention strategies. However, a large well-designed trial should be conducted to determine its effect on other outcomes such as prevention of dialysis-requiring CIN and mortality.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

13

The Spectrum of Cardiovascular Involvement in Hypereosinophilic Syndrome Among Filipinos: A Case Series and Review of Literature

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Introduction: Hypereosinophilic syndrome(HES) is an under-recognized disease (0.5% of autopsy series) leading to progressive myocardial damage, heart failure, thrombosis and death. At present, there are only about 30 individually published cases internationally. Given its peculiarity, the diagnosis is often delayed due to its myriad presentations. Eosinophilic myocarditis(EM) occurs in 60% of HES patients, however, there is paucity of Philippine data regarding this entity. We report 4 Filipino patients with documented HES focusing on their cardiovascular presentation, work up, management and clinical outcomes from 2 tertiary institutions.

Summary of Cases: All patients were between 19-42 years old with good functional capacity with no comorbidities. A history of atopy was strong in 50%. Common causes of explained hypereosinophilia (i.e. parasitism and drug allergy) were absent in 75%. Two cases presented with severe chest pain mimicking ACS, 1 case presented as acute limb ischemia (ALI) of the upper extremity while 1 patient presented with chronic heart failure. Half presented with classic findings of heart failure and only 25% had skin findings suggestive of hypereosinophila. ECG revealed regular sinus rhythm (100%), normal axis (75%), and nonspecific ST T wave changes (50%). Half of patients had baseline ECG findings simulating ischemia, but later resolved upon resolution of hypereosinophilia. Echocardiographic findings showed concentric left ventricular remodelling to hypertrophy (75%), preserved EF (75%), multi-segmental hypokinesia (50%) and Grade III diastolic dysfunction (75%). Cardiac MRI revealed findings of myocarditis in 25%. Troponin was elevated (10-1000x) in 50%. Coronary angiogram revealed normal coronaries (100%). Baseline mean absolute eosinophil count (AEC) was 12,752 (normal value 30-350 cells/uL). Bone marrow biopsy consistent with HES was present in 75%. Endomyocardial biopsy done in 1 patient was consistent with EM. Histologic evidence of other organ involvement was documented in 75%. Majority (75%) received high dose prednisone and anti-histamines. All patients with HF received standard HF regimen. Half were initially managed as ACS until the diagnosis was ruled out. One underwent embolectomy with anticoagulation. Dramatic improvement in HF symptoms was documented in 50% after steroid initiation. The patient who presented with ALI showed resumption of arterial flow with collateral formation. Majority (75%) showed dramatic improvement in hyperosinophilia on 6 month follow up (mean AEC: 318 cells/uL). One patient died of fatal arrhythmia and cardiogenic shock.

Discussion: While regarded as an extremely rare myelopoietic disease, in 4 cases from 2 institutions in the Philippines. EM appears to be the more common presentation in 75% of our cohort. EM mimics ACS in symptomatology, ECG/echocardiographic findings and elevated cardiac enzymes making the diagnosis elusive. There is a robust role of cardiac imaging in clinching HES, detecting typical findings of myocarditis and obviating the need for cardiac biopsy. HES promotes hypercoagulability leading acute upper limb ischemia (<1%). After exhaustive search for common causes of persistent eosinophilia, timely initiation of corticosteroids and antihistamines improves clinical outcomes without waiting for the final histologic diagnosis. To our knowledge, this is the only Filipino HES cohort, the largest of all international case series reporting the diverse cardiovascular manifestations. By knowing the varied cardiovascular presentation of this disease among Filipinos, physicians can be better equipped in recognizing this elusive diagnosis promptly.

15

The Reproducibility of Myocardial and Liver T2* for Iron Load Quantification – A Dual-center Multi-platform Study

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Background: T2* relaxation refers to the decay of transverse magnetization caused by spin-spin relaxation and magnetic field inhomogeneity, with an inverse relationship to intracellular iron stores. The measurement of ventricular function and T2* levels in the myocardium and liver are hence essential in the management of the iron-overload. This is particularly important in transfusion-dependent thalassaemia major, a disease common in Asia. Patients may sometimes be treated at more than one centre, and the reproducibility of T2* is paramount in tailoring the appropriate treatment regimen.

Methods: Clinical data was retrospectively collected from 50 patients who underwent magnetic resonance imaging (MRI) for iron quantification (myocardium and liver) at two major tertiary referral radiology departments in Hong Kong – namely, Queen Mary Hospital (QMH) and Prince of Wales Hospital (PWH). The QMH group had 25 patients with MRI performed on the Siemens 1.5T MAGNETOM Aera scanner (Siemens Healthcare, GmbH ©2018). The PWH group had 25 patients with MRI performed on the Philips 1.5 T Ingenia scanner (Koninklijke, Philips N.V. 2004-2018). Acquired T2* values from the QMH group were compared between those obtained from the syngo®. via workstation and values obtained on CMRtools™ (Cardiovascular Imaging Solutions Ltd). Acquired T2* values from the PWH group were compared between those obtained from the Philips IntelliSpace Portal workstation and values obtained on CMRtools™. Intra and inter-observer agreement were also assessed in the data collected from the QMH group.

Results: Bland-Altman analysis for the quantification of agreement between the various quantitative platforms for T2* measurements of the myocardium and liver demonstrated good agreement in both the QMH and PWH groups. Excellent intra-class correlation coefficient values were obtained for intra and inter-observer agreement by both measurement platforms in the QMH group.

Conclusions: T2* measurements are reproducible and consistent on multiple platforms in our dual-center study, with excellent intra and inter-observer agreement.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

16

Histone Deacetylase 1 (HDAC1) Was Involved in Regulation of Placental Multidrug Resistance-associated Protein 2 In Vitro and Vivo: Possible Implications for Congenital Heart Disease Prevention

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Background: Environmental origins of congenital heart disease (CHD) highlights the significant role of heart-placenta connection. Multidrug resistance-associated protein 2 (MRP2), an efflux transporter at the apical surface of syncytiotrophoblast, is indispensable for fetal protection from xenobiotics and teratogens. Histone deacetylase (HDAC) 1/2/3, core epigenetic enzymes for deacetylation modification, are abundantly expressed in trophoblast cells. We have recently found that these three HDACs inhibition induced MRP2 expression in placental cells. The purpose of this study was to validate the specific HDAC subtypes regulating placental MRP2 expression and function in vitro and vivo, illuminating epigenetic implications for CHD prevention in terms of fetal protection.
Methods: BeWo cells (human placenta choriocarcinoma) were transfected with HDAC1/2/3 specific siRNA. Real time PCR, Western-Blot, immunofluorescence and fluorescent dye efflux assay were utilized tor evaluate placental MRP2 expression, localization, and efflux function after transfection, respectively, aiming to identify the HDAC subtype regulating placental MRP2 in vitro. Next, siRNA for the identified HDAC was intraperitoneally injected to pregnant mice every 48 h from E7.5~E15.5. Pravastatin, a well established drug substrate of MRP2, was administered at 20 mg/Kg by gavages 2 h prior to euthanasia at E16.5. Dams were sacrificed via cervical dislocation, and samples were collected. Expression and localization of HDAC1/2/3 and MRP2 in placentas were detected by real time PCR, Western-blot and immunohistochemistry, respectively; pravastatin concentration in maternal plasma and fetal-unit were analyzed by high-performance liquid chromatography/mass spectrometry (HPLC-MS) assay.
Results: In vitro, knockdown of HDAC1 expression enhanced placental MRP2 mRNA and protein production, without alteration of its intracellular localization, which corresponded with an decrease in cellular uptake of the MRP2 substrate-5 (and 6)-carboxy-2',7'-dichloroflourescein (CDF). HDAC1 siRNA exhibited similar effect on MRP2 expression in mouse placentas, accompanied with reduced pravastatin transplacental rate, while insignificant changes in fetal weights, placental weights, and maternal plasma pravastatin concentrations were noted.
Conclusion: Inhibition of HDAC1 could enhance placental MRP2 expression and function in vitro and in vivo, which might have possible implications for prevention of CHD in the context of fetal protection from environmental contributors.

29

High-Density Mapping of Atrial Tachyarrhythmia in Complex Congenital Heart Diseases – Single Tertiary Centre Experience in Hong Kong

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Background: High-density electroanatomical mapping is increasingly employed in complex arrhythmia ablation. The use of the technology in Chinese population for congenital heart disease (CHD) is not well reported.
Methods: Retrospective review of consecutive transcatheter ablation of atrial tachyarrhythmia (AT) using high-density mapping was conducted for CHD patients from 2017 to 2019, in the only tertiary congenital heart centre in Hong Kong. Orion mapping catheter in RhythmiaTM system (Boston Scientific) was used to create activation and voltage maps. Parameters including mechanism of arrhythmia, acute procedural success, and follow-up data were recorded.
Results: Eight patients with CHD (moderate complexity) were identified (mean age 38.0±9.0 years) who underwent transcatheter ablation of AT (focal atrial tachycardia-1; intra-atrial reentry tachycardia (IART)-3; both-4). More than one reentry circuits of IART were identified in 5 patients. The median collected electrograms per tachycardia was 15,745 (IQR 14,242 to 17,989). Six out of the seven patients with IART had cavo-annulus isthmus dependent IART. Acute success can be achieved in all patients (Partial success in 2). There was recurrence of AT in 3 patients (37.5%). Targeted substrate ablation with aid of voltage mapping was performed in 6 patients with multiple IART circuits.
Conclusion: We report the high success rate in the use of high-density mapping system to aid transcatheter ablation of AT in complex CHD. Multiple IART circuits were usually identified. Over 10,000 eletrograms per tachycardia could be collected. Voltage map could be created to guide substrate ablation.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

31

Establishment of Open Descending and Thoracoabdominal Aortic Surgery in Hong Kong

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Background: Open surgeries for descending and thoracoabdominal aorta were known their high mortality and high invasiveness. Although thoracic endovascular aortic repair (TEVAR) has evolved in the recent years, there are still anatomically un-favorable pathologies that TEVAR fails to address. Since 2017, we introduced a new approach adopted from a high volume Japanese Aortic Center. In this study, we examined and summarized our early results of open descending and thoracoabdominal aortic surgery.
Methods: We retrospectively reviewed consecutive patients who underwent open descending and thoracoabdominal aortic replacement in Prince of Wales Hospital from February 2017 to February 2019. Patients' demographics including sex, age, indications of operation, intra-op parameters and post-operative outcomes are collected and analyzed.
Results: From February 2017 to February 2019, we performed 20 cases of open descending and thoracoabdominal aortic surgery. Mean age was 52.1 year-old. All patients were male. Connective tissue disorder was noted in 4 cases (Marfan's syndrome; 3 cases, Ehlers-Danlos; syndrome 1 case). There were 18 cases of chronic aortic dissection. Ruptured or impending rupture were 9 cases. All cases were discussed in aortic multi-disciplinary team and deemed not suitable for TEVAR. Among the 20 cases, 14 cases were descending aortic surgery and 6 cases were thoracoabdominal aortic replacement. As for extracorporeal circulation, we used partial cardio-pulmonary bypass (10 cases), left heart bypass (6 cases), and circulatory arrest (4 cases). One operative death due to retrograde ascending aortic dissection and 1 in-hospital death due to residual vertebral aneurysm rupture were noted. One patient got permanent paraplegia after emergent surgery for ruptured descending aortic aneurysm, otherwise the other patients were discharged home on foot (17 cases of 18 survival cases).
Conclusion: Our open descending and throacoabdominal aortic surgery has shown excellent early outcomes since the system was induced to our center. We believe open aortic surgery is still the gold standard for descending and thoracoabdominal aortic pathologies in the era of TEVAR.

33

Left Ventricular Stiffness in Adolescents and Young Adults after Arterial Switch Operation for Complete Transposition of the Great Arteries

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Aims: We tested the hypothesis that left ventricular (LV) myocardial stiffness is altered in complete transposition of great arteries (TGA) patients after arterial switch operation (ASO) and explored its associations with myocardial calibrated integrated backscatter (cIB) and LV systolic and diastolic myocardial deformation.
Methods: A total of thirty-one patients and twenty-two age-matched controls were retrospectively recruited. LV myocardial stiffness was assessed by diastolic wall strain (DWS) and stiffness index including E/e/LV end-diastolic dimension (LVEDd), (E: global longitudinal early diastolic strain rate)/end-diastolic volume (EDV), and (E: global circumferential early diastolic strain rate)/EDV. Myocardial cIB was measured as a maker of fibrosis. LV systolic and diastolic myocardial deformation was determined by conventional and speckle tracking echocardiography.
Results: Patients had lower DWS, higher stiffness index and greater myocardial cIB (all $P<0.05$). The mitral annular s velocity, global longitudinal and circumferential systolic strain and strain rate were lower in patients (all $P<0.05$). Worse LV diastolic mechanics in patients was noted evidenced by greater transmitral E velocity, higher E/A ratio, shorter E deceleration time, lower mitral annular a velocity, higher E/e ratio, lower global longitudinal and circumferential early and late diastolic strain rate (all $P<0.05$). DWS correlated inversely with average myocardial cIB, positively with mitral annular s velocity, mitral annular a velocity, global longitudinal systolic strain and strain rate, early and late diastolic strain rate, global circumferential systolic strain and late diastolic strain rate (all $P<0.05$). Stiffness index correlated inversely with mitral annular s velocity, mitral annular a velocity and global longitudinal early diastolic strain rate (all $P<0.05$).
Conclusions: LV myocardial stiffening occurs in adolescents and young adults with TGA after ASO, and is associated with impairment of both ventricular systolic and diastolic myocardial deformation, and myocardial fibrosis.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

37

"Detaching Knowledge vs Advancing Technology" - The Need of CIED training for Frontlines in an Acute Hospital

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Background: In 21st century, Cardiovascular Implantable Electronic Device (CIED) had become bumping important in cardiac disease management and dramatically enhanced both patient quality and quantity of life. Number of new CIED implantation in Hong Kong has been doubled since 2000, and the population is still accumulating with over a thousand new cases annually in Hong Kong (CDARS). Meanwhile, advancing technology are emerging, such as leadless pacemaker, subcutaneous implantable cardioverter-defibrillator (SICD) and MRI conditional CIED. Frontline healthcare professionals should equip updated knowledge, as mishandling of CIED may lead to unnecessary suffer and increase potential risk, for example: pre- and post-operation or MRI management.
Objectives: To explore the training need of CIED care for frontline healthcare professionals in acute hospital. To enhance staffs' competence on CIED care.
Methods: A 2-day programme "Cardiac In-service Training on CIED Care" was launched in 2018, with 3-hour theoretical input by cardiologists and nurses specialized on CIED care. Frontline nurses from all specialties and allied health professionals in cardiac rehabilitation team (n=35) were recruited. Design of Pre-/Post-test was employed illustrating candidates' knowledge on CIED care. 4 multiple-choice questions about basic concepts of CIED, living with device and perioperative care were selected by cardiac nurse who was a certified cardiac device specialist. Evaluation survey based on content and candidates' satisfaction was conducted.
Results: A noteworthy knowledge gap on CIED care was demonstrated in the Pre-/Post-test. In the Pre-test correct responses ranged from 20.7% to 58.6% only, while prominent improvement in correct responses was demonstrated in the Post-test ranging from 69.2% to 92.3%. Among the programme evaluation, candidates agreed that the programme achieved its objectives rated 4.29 (using a 5-point Likert scale). They acknowledged that the content was practical in workplace rated 4.33. They were overall satisfied with the course rated 4.29. The programme was highly recommended by candidates.
Conclusion: Our programme illustrated significant knowledge detachment of frontline healthcare professionals on CIED care. Coping with the rising population with CIED and advancing technology, and with such remarkable learning experience and enhanced competence of candidates, there is a crucial need of continuous training on CIED care for frontline healthcare professionals.

48

Generation and Characteristic of UCs-iPS-derived Cardimyocyte from Patient with Noncompaction of Ventricular Myocardium

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Background: To generate cardiomyocytes using urinary cell-derived-IPS from patients with noncompaction of the ventricular myocardium (NVM) and identify the genetic characteristics of the cardiomyocytes.
Methods and Results: Urinary cell-derived-IPS and cardimyocyte (CMs) were obtained from a NVM patient and a normal. The immunofluorescence assay indicated the iPS cells expressed stem pluripotent genes (Oct4, SSEA-4, TRA-1-82 and SOX2). Alkaline phosphatase (AP) staining displayed high AP activity of the iPS cells. Karyotype analysis showed the iPS cells had a normal karyotype. Embryonic body (EB) formation showed their abilities for differentiating into three germ layers. IPS-CMs showed robust spontaneous beating and electrophysiological studies revealed functional cardiac-specific voltage-gated Na+ currents and action potentials. TNNT2 and α-actinin are specific markers for cardiomyocytes and were indicated in our immunocytochemical analysis. WES and bioinformatics analysis revealed similar genetic profiles between the blood samples, iPS cells, and the iPS-CMs of the NVM patient. Notably, potential pathogenic genes related to NVM were also found in this analysis.
Conclusion: Collectively, these results demonstrated that iPS cells and iPS-CMs were generated from the NVM patient. Moreover, these cells had a similar genetic profiles to the patient, which will provide a sound basis for the future study of the genetic mechanisms of NVM.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

49

Mutant Cardiac Troponin I Down-regulate Phosphodiesterase 4d Via Epigenetic Regulation in Cardiomyocytes

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Background: Restrictive cardiomyopathy (RCM) is a genetically heterogeneous heart disease and has been linked to mutations in the thin filament regulatory protein cardiac troponin I (cTnI). However, the pathogenesis of RCM from genotype to clinical phenotype is not fully understood. Our previous studies showed that low expression of Phosphodiesterase 4d (PDE4d) associated with histone acetylation modification in cTnIR193H mutation hearts might be one of the causes of RCM. This study was designed to investigate the relationship between the mutated cTnI and decrease of PDE4d.
Methods: We over expressed wild type cTnI, cTnIR193H and HDAC1 respectively in primary culture of cardiomyocytes. Western blot was performed to detect PDE4d expression. Chip assays was performed to detect the level of HDAC1 binding and H3K4 acetylation near the promoter of PDE4d. Co-IP assays was performed to detect the interaction between cTnI/cTnIR193H and HDAC1.
Results: Our study shows that histone deacetylase HDAC1 could reduce the expression of PDE4d via repressing the level of H3K4 acetylation near the promoter of PDE4d. over expression of cTnIR193H could reduce PDE4d. Compared with wild type cTnI cTnIR193H is more likely to combine with HDAC1 and enhance its activity. As a HDAC1 inhibitor, EGCG could reverse low-expression of PDE4d in cardiomyocytes over expressing cTnIR193H via inhibition of HDAC1 activity and the interaction between HDAC1 and cTnIR193H.
Conclusion: Our data indicate that cTnIR193H could cause PDE4D low expression via interaction with HDAC1. These findings provide new insights into epigenetic mechanisms of a mutant thin filament protein, which may contribute to the understanding of RCM pathogenesis.

75

Family of Calcium-dependent Potassium Channels in CABG Grafts: Distribution Profile and Contribution to Vasorelaxation

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Background and Research Aim: Calcium-dependent potassium channels (KCa) are involved in the regulation of vascular tone. This study examined the expression, distribution, and contribution to vasodilatation of the members of KCa family, including large (BKCa), intermediate (IKCa), and small (SKCa) conductance-KCa in human internal mammary artery (IMA) and saphenous vein (SV), with the aim of providing a comprehensive understanding of the role of KCa in the grafts commonly used for coronary artery bypass surgery (CABG).
Methods: The mRNA and protein levels of KCa subtypes in the IMA and SV tissue were determined by q-PCR and Western Blot. Immunohistochemistry was applied to examine the distribution of KCa subtypes in the endothelial and smooth muscle layer. Individual KCa subtype-mediated vasorelaxation was studied using wire myography.
Results: Both IMA and SV expresses all three subtypes of KCa, with distribution of each subtype observed in both endothelium and smooth muscle. In IMA, BKCa is the most abundantly expressed subtype and SKCa is the least ($p<0.01$, BKCa or IKCa vs. SKCa, $p<0.05$ BKCa vs. IKCa). In comparison, the abundance of KCa subtypes in SV is insignificantly different although SKCa tends to be less than BKCa ($p=0.081$). Further analysis of the distribution of each KCa subtypes showed that in IMA BKCa is more abundantly expressed in smooth muscle cells than in endothelial cells while SKCa exhibits more abundance in the endothelial layer. The difference of IKCa distribution was observed in SV revealing a more pronounced localization in the endothelium than in the smooth muscle. Relaxant responses of IMA and SV to the BKCa agonist and the IKCa and SKCa opener were similar in terms of the maximal response. The EC50 of the BKCa agonist was lower for SV compared to IMA (-5.8±0.1 vs. -5.4±0.1 Log M, $p<0.05$). The contribution of BKCa to acetylcholine-induced relaxation was more significant than IKCa and SKCa in both IMA and SV.
Conclusions: KCa family is abundantly expressed in IMA and SV and plays a significant role in the relaxation of these vessels. By revealing for the first time the distribution profile and the individual contribution of KCa subtypes to vasorelaxation in IMA and SV, this study clarified the differences between arterial and venous grafts and added knowledge to the physiological significance of KCa family in the human vasculature.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

81

Distribution of CYP2C19 Polymorphism Related to Clopidogrel Metabolism in Patients with Coronary Artery Disease in Tianjin and Clinical Significance

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Purpose: As an antiplatelet drug, clopidogrel is widely used clinically. CYP2C19 is a key enzyme in the metabolism of clopidogrel. In this study, CYP2C19 gene polymorphism was detected in patients with coronary artery disease undergoing percutaneous coronary intervention in order to provide personalized treatment and to accurately guide patients with clopidogrel dose.
Methods: Whole blood of 861 patients with coronary heart disease in Tianjin were obtained and polymorphism of CYP2C19 *2, *3, *17 (more common in Chinese population) was detected by real-time PCR with fluorescent probes.
Results: The distribution of CYP2C19 gene polymorphism was *1/*1 (343 cases, 39.84%), *1/*2 (333 cases, 38.68%), *2/*2 (87 cases, 10.1%), *1/*3 (44 cases, 5.11%), *2/*3 (27 cases, 3.14%), *1/*17 (18 cases, 2.09%), *2/*17 (7 cases, 0.81%), *3/*3 (2 cases, 0.23%). According to the metabolic type, attention was paid to ultra-rapid metabolizers (*1/*17) for bleeding risk under routine dose administration while extensive metabolizers (*1/*1) were given conventional dosage. The intermediate metabolizers (*1/*2, *1/*3 & *2/*17) were either given increased dose or the drug was changed. The slow (poor) metabolizers (*2/*2, *2/*3 & *3/*3) may produce clopidogrel resistance and required change of the drug.
Conclusion: The present study analyzed the distribution of CYP2C19 gene polymorphism for patients with coronary heart disease, particularly the patients undergoing PCI in Tianjin, China. The result will provide a scientific basis for personalized medicine by detecting CYP2C19 gene polymorphism and guide the use of antiplatelet drugs.

82

Baicalin Attenuates Myocardial Ischemia-reperfusion Injury Through Akt/NF-κB Pathway

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Background: The aim of this study was to investigate baicalin attenuates myocardial ischemia-reperfusion (I/R)-induced injury in heart and revealed the underlying mechanism.
Methods and Results: Male rats were subjected to Ligation of left anterior descending branch (LAD) for 30min followed by reperfusion for 24 h to establish I/R model. Baicalin was intragastric administration after ischemia onset, and the animals were randomly divided into five groups: I, sham; II, I/R; III, 50 mg/kg; IV, 100 mg/kg; and V, 200 mg/kg baicalin. Our results showed that baicalin could significantly improvement left ventricular ejection fraction (EF), Left ventricular systolic pressure (LVSP), the maximum velocity of LV contraction (dP/dtmax) and the maximum velocity of LV diastole (dP/dtmin). Histology and immunohistochemistry results showed that the infarct size and apoptosis of cardiomyocyte were significantly decreased, the vessel density was increased in the groups III, IV and V as compared with group II. Furthermore, qRT-PCR results showed that the mRNA levels of inflammation factors TNF-α, IL-1β, IL-6, IL-8 and antiapoptotic gene Bcl2 were down-regulated, but the anti-inflammation factor of IL-10, the proapoptotic genes caspase-3 and the ratio of Bax/Bcl2 were up-regulated was up-regulated when the I/R rats were treatment with baicalin. Moreover, treatment with baicalin could significantly up-regulation the protein expression of PI3K, p-Akt and Akt, but down-regulation of NF-κB p65 in myocardial tissues
Conclusion: Taken together, these findings suggested that baicalin inhibits I/R-induced myocardial injury with a dose-dependent through activates PI3K/Akt signaling and suppression NF-κB signaling.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

87

Initial Experience with the Micra® Leadless Pacemaker at a Regional Hospital in Hong Kong

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Background: The advent of leadless pacemakers revolutionized the management of patients who are at high risk of complications from traditional pacemakers. We describe our initial experience with the Micra® Transcatheter system (Medtronic, Minnesota) including its safety, efficacy and indications.
Methods: Clinical data of patients who received the Micra® pacemaker from July 2017 to February 2019 was retrieved and retrospectively analyzed, including demographics, acute pacing parameters after implantation, pacemaker position, and pacing threshold one month after implantation.
Results: Twenty-three patients, in whom thirteen (56%) were female and ten were male (44%), received the Micra® pacemaker during the specified period. Mean age was 81 years. The most common indication was sick sinus syndrome and atrial fibrillation with slow ventricular rate (96%); one patient received the device following a lead fracture of his conventional pacemaker implanted for complete heart block. Implantation was successful following one attempt in nineteen patients (82%), two attempts in three patients (13%), and three attempts in one patient (4%). No serious complications occurred. There were two deaths (8%), both unrelated to the procedure. At implantation, average R wave amplitude was 10.6 mV, average pacing threshold was 0.67V at 0.24 milliseconds. Two patients (8%) had pacing thresholds greater than 1V at implantation. At one month, only one patient had pacing threshold greater than 1V. All but one patients had their devices placed at the interventricular septum; the device was placed at the right ventricular apex in the remaining patient.
Conclusion: The Micra Transcatheter system is safe in patients considered high risk for traditional pacemakers. Implantation is successful with one attempt in most patients. It achieves excellent pacing thresholds both acutely and at one month.

88

Pre-operative Sildenafil for Patients with Pulmonary Hypertension Undergoing Mitral Valve Surgery: A Systematic Review and Meta-analysis

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Background: Pulmonary hypertension is a usual complication of long standing mitral valve disease. Perioperative pulmonary hypertension is a risk factor for right ventricular failure and is an important cause of morbidity and mortality in patients with pulmonary hypertension undergoing mitral valve surgery. Phosphodiesterase 5-inhibitors particularly Sildenafil citrate have proven clinical benefit for pulmonary arterial hypertension but have shown discordant results in group 2 pulmonary hypertension patients. We sought to determine the effect of pre-operative Sildenafil on the intra-operative hemodynamic parameters of these patients.
Inclusion Criteria: Studies were included if they satisfied the following criteria: 1) Randomized Controlled Trials; 2) Adult patients with pulmonary hypertension scheduled for elective mitral valve surgery; and 3) Reported data on changes in pre-, intra-, and post-operative hemodynamic parameters.
Methods: Using PUBMED, Clinical Key, Science Direct, and Cochrane databases, a search for eligible studies was conducted from September 1 to December 31, 2018. The quality of each study was evaluated using the Cochrane Risk of Bias Tool. The primary outcome of interest is on the effect of pre-operative Sildenafil on the improvement of intra-operative hemodynamic parameters such as systolic pulmonary artery pressure, mean pulmonary arterial pressure, mean arterial pressure, pulmonary and systemic vascular resistances. We also investigated its effect on the post-operative mortality, length of cardio-pulmonary bypass time, ventilation time, and inotrope support requirement. Review Manager 5.3 was utilized to perform analysis of random effects for continuous outcomes.
Results: We identified 3 studies involving 153 patients with pulmonary hypertension undergoing mitral valve surgery, showing that among those who received pre-operative Sildenafil there is a significant decrease in intra-operative systolic pulmonary arterial pressure [mean difference -11.19 (95% CI, -20.23 to -2.15) $p<0.05$] and post-operative systolic pulmonary artery pressure [mean difference -13.67 (95% CI, -19.56 to -7.78) $p<0.05$] without significantly affecting the mean arterial pressure [mean difference 1.94 (95% CI, -5.49 to 9.37) $p<0.05$]. The systemic and pulmonary vascular resistances were not affected as well.
Conclusion: Administration of pre-operative Sildenafil to patients with pulmonary hypertension undergoing mitral valve surgery decreases intra-operative and post-operative systolic pulmonary arterial pressure without significantly affecting other systemic hemodynamic parameters.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

89

Use of Bromocriptine for the Treatment of Peripartum Cardiomyopathy: A Meta-Analysis of Randomized Controlled Trials

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Background: Peripartum cardiomyopathy is a rare, pregnancy associated cause of left ventricular heart failure in previously healthy women. It remains an important cause of cardiac-related maternal morbidity and mortality worldwide. Half of the patients will recover left ventricular function after 6 months. However, in the remainder of patients who do not recover cardiac function, they will require advanced heart failure therapies. Bromocriptine, a dopamine agonist which inhibits prolactin release, has demonstrated improvement in left ventricular recovery and clinical outcome. We sought to determine the effect of adding Bromocriptine to standard heart failure therapy on the improvement and recovery of left ventricular function of these patients.
Inclusion Criteria: Studies were included if they satisfied the following criteria: (1) Randomized Controlled Trials; (2) Pregnant patients who fulfilled the criteria for diagnosis of peripartum cardiomyopathy and (3) Reported data on improvement in left ventricular ejection fraction and clinical outcomes.
Methods: Using PUBMED, Clinical Key, Science Direct, Scopus, and Cochrane databases, a search for eligible studies was conducted from June to December 31, 2018. The quality of each study was evaluated using the Cochrane Risk of Bias Tool. The primary outcome of interest is on the effect of Bromocriptine on the improvement of left ventricular function and clinical outcomes among these patients. Review Manager 5.3 was utilized to perform analysis of random effects for continuous outcomes.
Results: We identified 2 randomized controlled trials of 58 pregnant patients diagnosed with peripartum cardiomyopathy, showing that among those who received Bromocriptine on top of standard heart failure therapy, there is a significant improvement in the left ventricular ejection fraction at 6 months [mean difference 15.14 (95% CI, 6.53 to 23.75) $p < 0.05$] compared to standard heart failure therapy alone. It was also observed that those who received Bromocriptine had better clinical outcomes.
Conclusion: The addition of Bromocriptine on top of standard heart failure therapy significantly improved the left ventricular ejection fraction of patients with peripartum cardiomyopathy at 6 months post-partum. This novel therapy may be considered in the to improve the management of these patients.

90

Efficacy of Ivabradine in Patients with Acute ST-Elevation Myocardial Infarction Who Underwent Primary Percutaneous Coronary Intervention: A Systematic Review of Clinical Trials

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Background: Ivabradine is a heart rate reducing agent which enables longer diastolic perfusion time and reduced myocardial oxygen consumption without detrimental changes in blood pressure and ventricular contractility. It is currently used and added to conventional therapy for stable angina pectoris and chronic heart failure patients to improve clinical outcomes. However, its used in acute ischemic patients has not been established. This study aims to investigates its potential role in acute ST-elevation myocardial infarction.
Inclusion Criteria: Studies were included if they satisfied the following criteria: (1) Randomized clinical trials; (2) Adult patients with ST-elevation Myocardial Infarction (STEMI) who underwent primary percutaneous intervention (PCI) and treated with Ivabradine on top of standard guideline directed medical treatment; and (3) Reported data on mortality, major adverse cardiovascular events (MACE), heart rate reduction, and improvement in both left ventricular ejection fraction (LVEF) and infarct size.
Methods: A search for eligible studies was conducted from November 1, 2018 to January 31, 2019. The quality of each study was evaluated using the Cochrane Risk of Bias Assessment Tool. Given the significant methodological and statistical differences between published studies, combining the data using meta-analysis methods was not appropriate. Our primary outcome of interest was all-cause or cardiovascular (CV) mortality. We also investigated the effect of Ivabradine on major adverse cardiovascular events (MACEs), heart rate reduction, and improvement in left ventricular ejection fraction.
Results: We identified 7 studies involving 1097 STEMI patients who were treated with Ivabradine on top of guideline directed medical therapy. Six studies showed significant heart rate reductions in the Ivabradine group without any detrimental effect in blood pressure. Significant LVEF improvement with concomitant decrease in LV end systolic and end diastolic volumes in the Ivabradine group was reported by three studies. However, two studies did not demonstrate significant differences in mortality and MACEs between the two treatment groups.
Conclusion: This systematic review revealed that the addition of Ivabradine to standard guideline directed medical therapy causes significant heart rate reductions with a concomitant improvement in LVEF among STEMI patients. Further dedicated large scale trials in STEMI patients with defined clinical endpoints are still needed to improve clinical decision making.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

96

The New SHSMA® Patent Ductus Arteriosus Occluder: Single Center Experience

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Background: The new type SHSMA® patent ductus arteriosus (PDA) occluder is novel, self-shaping Nitinol wire device with nano fabric patches integrated into the shank of the device to assure a better obturation of the ductus. The SHSMA® PDA occluder has undergone animal test. This report presents our experience to evaluate the feasibility, safety, and efficacy of the SHSMA® PDA occluder for closure of PDA.
Methods: A prospective, randomized pilot study was started in August 2014. 13 patients were included until June 2017. Patients weighing less than 6kg or those with associated cardiac anomalies that required surgery were excluded. All patients were followed up by transthoracic echocardiography, electrocardiogram, and chest radiographs at 24 hours, 30, 90, 180, 360 and 720 days after implantation. All occluders were delivered via 7-9F long sheaths and PDA closures were performed following standard techniques.
Results: Thirteen patients (6 nano fabric patches single-rivet, 7 double-rivet), were included. All the 13 patients were closed successfully using SHSMA® ductal occluder, 5 patients (83.3%) in nano fabric patches single-rivet group, and 7 patients (100%) in double-rivet group had immediate and complete closure on angiography. Within 24 hours, color Doppler revealed complete closure in all 13 patients,100% at 30 days, and in 100% of patients at 2 years. There was no device embolization, hemolysis, or obstruction to the pulmonary artery or descending aorta.
Conclusion: The new type SHSMA® PDA occluder is feasible, safe and effective.

111

A Retrospective Study on the Predictors of Outcome in Patients with Infective Endocarditis

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Background: Infective endocarditis (IE) is associated with significant mortality and morbidity. Recent western studies have demonstrated a change in epidemiology in the past decade but the local data is sparse. This study aims to provide an update on the epidemiology of IE and to identify predictors of adverse outcome of IE in the Chinese population in Hong Kong.
Methods: The Clinical Data Analysis and Reporting System was searched for all cases with a diagnosis of IE in Princess Margaret Hospital in the period 2002-2016. All cases which fulfilled the modified Duke's criteria for IE were recruited. Primary outcome was defined as in-hospital mortality. Secondary outcomes included 1-year mortality, valvular surgical intervention, heart failure, stroke and systemic embolization.
Results: A total of 196 patients with 166 definite (84.7%) and 30 possible (15.3%) IE were included in the study. The median age was 60.2 (IQR 45.4-72.1) years and 90.3% of patients had native valve IE. 32% of cases were classified as health care-associated IE (HCAIE). The overall incidence (event per 100,000 person) of IE was 2.26 and had remained stable. An increasing trend of HCAIE (p for trend = 0.04) was observed during the study period. Staphylococcus aureus was the most frequently isolated organism in the overall study population (37.8%) and among intravenous drug users (85.2%). The most common complications were heart failure (43.4%), systemic embolization (19.4%) and stroke (18.9%). Early surgery was performed in 8.6% of patients before discharge. In-hospital mortality remained high (29.1%) and was independently associated with higher Charlson Comorbidity Index (OR 1.24, p=0.001), heart failure (OR 5.65, p<0.001) and the presence of large vegetation ≥1 cm (OR 4.67, p<0.001). IE due to Streptococcus viridans was associated with a better outcome (OR 0.40, p=0.048). The crude survival rate at one-year follow-up was 89.2% but up to 10% of survivors suffered an episode of relapse or recurrence at 1 year.
Discussion: The present study showed that the incidence of IE remained stable during 2002-2016. There was an increasing proportion of HCAIE and Staphylococcus aureus has become the most common causative organism. The diagnosis of IE was associated with high mortality and morbidity. Independent predictors for in-hospital mortality were patient's medical comorbidity, large vegetation size and heart failure, while infection by Viridans group streptococci was associated with decreased risk.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

112

Nurse-led Chest Pain Clinic: Safe and Effective

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Background: There are many causes of chest pain, some of which are benign with a non-cardiac origin, while others are potentially life-threatening, such as acute myocardial infarction (AMI) and coronary heart disease (CHD). In Princess Margaret Hospital (PMH), long waiting time for the first cardiology consultation, slow progress to definite diagnosis or treatment and clinic overtime has reached critical point. Such prolonged duration of time to diagnosis inadvertently put patients to a greater risk.
Methods: The nurse-led out-patient Chest Pain Clinic (CPC) was established in June 2017 in PMH. Patients with atypical chest pain, and suspected to have CHD, having a general medical appointment exceeding 12 months, would be invited to attend the CPC. An objective risk stratification algorithm based on symptomology and Framingham risk scores were used to classify patients into low, moderate and high-risk groups. After the comprehensive assessment, further investigations with protocol guided would be prescribed. The nurse evaluated patients' symptoms and explained the results to them during the follow-up consultation. Lastly, patients were referred to Cardiologist for the decision of case closed. The records were reviewed retrospectively to evaluate management outcome by nurse-led CPC versus the usual care. Patients were randomly chosen from usual pathway with both sex and age (+/-1) matched from CPC. The revision of treadmill result was counted as the study endpoint.
Result & Outcome: From June 2017 to April 2018, there were 29 patients attended the CPC. One (3.4%) high-risk patient received early invasive intervention. Thirteen (10.3%) patients defaulted the medical follow up after investigations result was reviewed by nurse. Thirteen (44.8%) of them did not show any evidence of CHD with case closed after first medical consultation. The remaining 12 (41.4%) patients continued medical followed up due to other medical diseases were suspected. The total episodes of medical consultation was 26 (median 1) in CPC versus 147 (median 5.5) in usual pathway. The follow-up duration (months) per patient from the first consultation to case closed was greatly shorten from median 18.5 (7-23) in usual pathway to median 4 (3-8) in CPC. Result also showed that advanced patients to CPC can greatly reduce accident & emergency department (AED) utilization from 24.5% to 3.4% with 6 months at study endpoint. Moreover, there was no acute cardiac event or unplanned admission reported. The nurse-led CPC is safe and more cost effective than the usual care in managing patients with atypical chest pain.

113

Establishment of Minimally Invasive Mouse Transverse Aortic Constriction Model without Mechanical Ventilation

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Background: The transverse aortic constriction (TAC) model is widely used in research of heart failure. In the past, tracheal intubation and mechanical ventilation were mostly used to establish this animal model. Endotracheal intubation is time consuming in mice, and the classic TAC surgery is highly traumatic, resulting in a high mortality rate in mice. The aim of this study was to establish TAC model by inhalation anesthesia via mask without endotracheal intubation.
Methods: (1) SPF class c57 mice aged 3 months were randomly divided into sham operation group (Sham), mechanical ventilation TAC group (MVT) and non-mechanical ventilation TAC group (NMVT) to establish the TAC models. In MVT group, the classic TAC surgery was performed under mechanical ventilation with endotracheal intubation. In NMVT group, minimally invasive TAC surgery was performed without endotracheal intubation; In Sham group, the surgical procedure was the same as that of the NMVT group except contraction of aortic arch. (2) Four weeks after operation, left ventricular anterior wall (LVAW), left ventricular internal dimension (LVID) and left ventricular posterior wall (LVPW) were detected respectively by high frequency ultrasound, and the left ventricular EF was calculated. (3) The myocardial tissue of mice in all the groups were collected after surgery four weeks later, and ultrastructure of myocardium was observed by microscope after HE staining.
Results: (1) The operating time (10.86±2.36 min, including endotracheal intubation time) of the NMVT group was significantly reduced compared with that of the MVT group (24.44±3.55 min) ($P<0.05$), the survival rate of mice was improved (93.3% versus 73.3%) ($p<0.05$). (2) There was no significant differences in arterial arch diameter and blood flow velocity, LVAW, LVID, LVPW and LVEF among sham group, MVT group and NMVT group before operation. Postoperatively, MVT group and NMVT group showed statistically differences in theose above indicators compared with themselves preoperatively and the Sham group postoperatively, and there was no statistically significant differences between the two groups postoperatively ($p<0.05$). (3) Compared with the sham group (14.11± 1.90 mm), diameter of cardiac myocytes in the MVT group (21.28± 3.17 mm) and the NMVT (21.12±2.84 mm) group were enlarged ($p<0.05$).
Conclusion: (1) The pressure overload TAC model can be established successfully by minimally invasive surgery without mechanical ventilation. (2) Minimally invasive TAC without mechanical ventilation in mice can reduce operation time and improve survival rate.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

119

Gene Therapy for Hypertrophic Cardiomyopathy Targeting Myh7 Based on CASAAV

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Objective: To investigate the role of Myh6 and Myh7 in cardiomyocyte maturation and the hypertrophic procedure. Besides, try to get the basic understanding of related gene therapy based on Cas9-AAV system.
Methods and Results: We developed CASAAV (CRISPR/Cas9-AAV9-based mutagenesis), a platform in which AAV9 delivers tandem guide RNAs targeting a gene of interest and cardiac troponin T promoter (cTNT)-driven Cre to RosaCas9GFP/Cas9GFP and Calcineurin+RosaCas9GFP/Cas9GFP mice. Two single guide RNA had been designed in to AAV9-U6-gRNA-TnT-Cre to delete Myh6 and Myh7. When directed against Myh6 with high dose AAV, which is a gene described as main isoform postnatally in RosaCas9GFP/Cas9GFP mice, we achieved efficient, rapid, and CM-specific Myh6 depletion. After that, all the mice demonstrated severe heart dysfunction and death within 1 month. So, we used low-dose AAV injection to delete Myh6 and preserve normal heart function. In this situation, CMs lacking Myh6 had severely disrupted sarcomere and T-tubules with a much smaller CM area, especially in width. Interesting, high-dose AAV9 ablated Myh7 in 75% neonatal CMs and would still cause lethal heart failure in 5 months as Myh7 is a gene considered as useless after birth in normal condition, whereas low-dose AAV9 ablated Myh7 in 25% CMs and preserved normal heart function. In the context of preserved heart function, CMs lacking Myh7 developed T-tubules that were nearly morphologically normal, indicating that Myh7 does not have a major, essential, cell-autonomous role in Sarcomere and T-tubule formation. However, it still made some roles in the total heart function maturation. And if Myh7 had been deleted from P28, there was no heart dysfunction and mice death observed. The we injected AAV-Myh7-TnT-Cre into Calcineurin+RosaCas9GFP/Cas9GFP mice at P28 to explore whether such kind of gene therapeutic method could reverse the hypertrophic morphology. After deletion Myh7 in Calcineurin+RosaCas9GFP/Cas9GFP mice, normal sarcomere and T-tubule formation had been identified. And almost normal cell size and morphology could be observed among such mice with a better heart function in 6 months compared to non-treated Calcineurin+RosaCas9GFP/Cas9GFP mice.
Conclusions: Myh6 could be a major isoform in maintain heart function and morphological maturation in mice postnatally. However, Myh7 still plays a crucial role in preserving heart function in very early stage after birth, and makes no contribution after 1 month. So that, if we knock out Myh7 at P28 using CASAAV system in hypertrophic mice could help it to preserve heart function and reverse the hypertrophic morphology.

121

Computed Tomography Pictorial Review of Coronary Artery Anomalies

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Background: Computed Tomography Coronary Angiogram(CTCA) is a non-invasive approach in preliminary investigation of heart condition with high accuracy. This pictorial review aims to identify and illustrate the findings from CTCA done in NDH.
Materials and Methods: It is a retrospective study of coronary angiogram done in North District Hospital from 2008 to 2018. All scans were performed on two 64-slice CT scanner (GE Medical System, Lightspeed VCT, 64x0.625 mm and Siemens SOMATOM Definition AS), under electrocardiographic (ECG)-gated. Contrast medium(Omnipaque 350) was injected into venous system at 5 ml/s with saline chase. The findings were categorized and images being post-processed with Siemens Syngo.via platform.
Results: 424 CTCAs were done on average annually in NDH. Rare coronary artery anomalies were identified, including abnormal origin of vessel, hypoplasia, ectopic ostium, fistulae, myocardial bridging, tortuous enlarged vessel and aneurysm.
Conclusion: CTCA is a useful tool to identify coronary artery conditions.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

123

Impact of Vagal Denervation on Recurrence of Atrial Fibrillation after Pulmonary Vein Isolation

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Background and Objectives: Besides elimination of pulmonary vein trigger, vagal denervation is one of mechanisms of atrial fibrillation prevention after pulmonary vein isolation (PVI). We sought to evaluate (1) vagal denervation as assessed by change of sinus cycle length (SCL), AV block cycle length (AVBCL) and refractory period of AV node (AVNERP) after PVI and impact of vagal denervation on recurrence of AF in (2) paroxysmal AF and (3) persistent AF patients.
Methods: A total of 50 consecutive paroxysmal AF (PAF) patients who underwent their first PVI was selected from our prospective AF registry. All patients underwent measurement of SCL, AVBCL, AVNERP before and after PVI. Additional 103 patients with persistent AF patients underwent measurement of SCL, AVBCL, AVNERP after PVI. Systematic follow-up for recurrence of atrial fibrillation was done in all patients.
Results: (1) SCL, AVBCL and AVNERP decreased by 231±143, 87±75, 98±137 ms respectively after PVI in PAF patients. (2) AF recurred in 14 patients (28.0%) within 3 months after PVI in PAF patients. There was no difference AVBCL, AVNERP between PAF groups with and without recurrence. The SCL post PVI was the only significant different between no recurrence and recurrence group (762±96 ms vs 683±101 ms, P=0.015). Optimal cut-off post-PVI SCL for predicting the early recurrence was 693 ms. During the median follow up period 220 days, AF recurred in 12 patients. There was no difference in SCL, AVBCL, AVNERP after PVI, delta SCL, delta AVBCL, delta AVNERP between groups with AF recurrence and without recurrence in PAF group. (3) Post ablation SCL, AVBCL, AVNERP was not different in persistent AF patients with and without both early and late recurrence.
Conclusions: Vagal denervation was observed in majority of AF patients undergoing PVI. However, markers of vagal denervation were not associated with recurrence of AF in paroxysmal and persistent AF patients.

124

Pulmonary Vein Isolation Using High Power (50 Watts) Radiofrequency Energy in Patients Undergoing Atrial Fibrillation

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Background and Objectives: High power-short duration (50 W/5s) radiofrequency (RF) energy has been used in a few centers for atrial fibrillation (AF) ablation. We sought to evaluate efficacy and safety of high power RF energy in patients undergoing AF ablation.
Methods: Of prospective AF ablation registry 44 patients who underwent high power ablation were included in this study. All patients underwent PV isolation using a contact force catheter with automatic annotation module. The primary efficacy outcome was any recurrent atrial arrhythmia after index ablation. The safety outcome was any complication related to the procedure.
Results: Total procedure time, ablation time and fluoroscopy time was 143±39, 29±10 and 8±3 minutes, respectively. During the 3 months period, any atrial arrhythmia recurred in 16 patients (36.4%). Among initial 30 patients in whom RF energy was delivered for 5 seconds per lesion, atrial arrhythmias recurred in 13 (43.3%). After prolongation of RF time to 10 seconds in anterior and superior antrum, atrial arrhythmias occurred in 3 patients (21.4%). Cardiac tamponade or stroke did not occur in any patient. Among 38 patients who underwent upper gastrointestinal endoscopy after ablation, superficial esophageal ulcer was found 1 patient.
Conclusions: High power RF ablations for pulmonary vein isolation was associated with short procedural and RF time. It was effective and safe. Efficacy outcome beyond 3 months will be presented.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

126

Burden of CVD in Very Young Patients Admitted in a Tertiary Care Hospital, Bangladesh

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Background: Coronary Heart Disease (CHD) remains a major cause of death in Bangladesh. CHD in younger age is not, simply a problem of sufferers but a huge emotional & economical loss to the family. This study looked at the demographic data & risk profile of very young patients presenting to a busy tertiary PCI centre in Dhaka, Bangladesh.
Methods: Prospective data was collected on patients who underwent coronary angiography over a 6-month period from January-June 2018. "Young" was defined as ≤35 years of age.
Results: Young patients comprised of 15.4% (n=60) of all patients in this period. Mean age was 32.1±3.1 years & only 15% (n=9) were obese. Male sex (70%), hypertension (41.7%), dyslipidaemia (30%) & smoking (23.5%) were the major conventional risk factors followed by diabetes mellitus (23.3%). Family history of pre mature CHD were seen in 12.9%. Mean ejection fraction was 52.4±12.3%. Clinical presentation was STEMI in 24 (40%) patients, NSTEMI in 5 (8.3%) & UA in 9 (15%) patients. 8.3% (n=5) received thrombolytic therapy. Angiography was performed via the right radial access in 90% & via left radial access in 10% patients. SVD was seen in 20 (33.3%) young patients while 12 (20%) & 2 (3.3%) patients had double vessel & triple vessel disease respectively. Normal coronaries were noted in 18 (30%) patients while 4 (6.7%) had recanalized IRA & 1 (1.6%) had pure ectasia. LAD was main artery involved in 28 (46.6%) patients while LCx & RCA were involved in 11 (18.3%) & 15 (25%) patients respectively. Twenty-seven of the young patients required coronary revascularization. Twenty-four (33.3%) were performed percutaneously with DES & 3 (5.0%) had surgical revascularization. Of the PCI cohort, 3 (12.5%) patients underwent primary PCI & 1 (4.1%) underwent POBA. Nineteen (79.2%) patients required 1 stent while 5 (20.8%) patients required 2 stents during PCI. Mean stent diameter & length were 2.7±0.2 & 21.0±8.4 mm respectively. There were no in-hospital deaths, MI or cerebrovascular events.
Conclusion: Very young adults had significant CAD which warrants extremes of preventive steps and also revascularization to prevent reoccurrence of fatalities due to CAD.

127

Outcome of PCI to CTO Lesion Through Transradial Approach Using 5Fr vs. 6Fr Guiding Catheter with Least Hardware

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Background: Treating CTOs by antegrade approach needs skill and appropriate devices. Guide catheter is an important factor for success. 5 F guide catheter for treating CTO is an alternate choice for diabetic population with narrow caliber radial artery.
Methods: In an absolute radial center like ours, PCI to CTO lesion for last 1 year since July 2017 to June 2018 were evaluated retrospectively by antegrade approach through transradial access. Total 147 CTO lesions were attempted by this period of time. Using 5 F or 6 F guide catheter was operator's choice.
Results: Out of 147 CTOs in diabetic patients, 66 (45%) was by 5 F guide catheter and 81 (55%) was by 6 F guide catheter. Success rate in both group was almost similar (63.6% vs 65.4%, p=0.82). Smaller profile balloon support was needed in both groups in similar number (66.7% vs 69.1%, p=0.75). Workhorse CTO guide wire in our lab was thin hydrophilic PT2 (Boston) and used in similar percentage (94% vs 89%, p=0.28). Only in 5 cases each, micro catheter was used. CTO of LAD was more in 5 F group (45.5% vs 34.6%). CTO lesion of RCA was 35% vs 40%. Contrast volume is lower in 5F group though not statistically significant (152 vs 165 ml, p=0.26). Fluoroscopy time was similar in both groups.
Conclusion: Backup support of guide catheter is an important prerequisite for PCI to CTO. "Active back up support" by 5 F guide catheter is better in our experience especially for left system. Other than using bulky devices like IVUS catheter and rotablation, 5 F guide catheter can be feasible comfortable choice for CTO PCI.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

129

Seasonal Variation of the 12-lead ECG, Cardiac Structure and Function on 2D and Speckle Tracking Echocardiography in the Elite Senior Rugby League Athlete

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Background: Pre-Participation cardiac screening (PPCS) of rugby league players (RLP) competing in the English Superleague is mandatory and may be undertaken at any time during the season. We aimed to assess ECG and echocardiography in RLP at clearly defined stages of the season.
Methods: 20 elite male RLP from a single club underwent PPCS using ECG, 2D echocardiography and speckle tracking echocardiography (STE) at four sequential time points across RLP season; 1) End of pre-season training (ENDPRE), 2) mid-season competition (MIDSEAS), 3) end-season competition (ENDSEAS) and 4) End of off-season detraining (ENDOFF). Training loads for each time point were determined. A one-way ANOVA with post-hoc Bonferroni assessment were used for statistical analyses.
Results: There were no differences in RLP demographics and heart rates across the season. Average daily training during pre-season training (ENDPRE) was significantly higher (more than double) compared to all other points (P<0.001) with no differences between MIDSEAS and ENDSEAS. Training-related ECG changes (normal on International Criteria) were commonly seen and the percentage of RLP presenting with one, two or three training-related changes did not vary significantly throughout the season. There were no abnormal (non-training related) changes at any of the time-points. There were no differences across the season in LV, RV or atrial structural parameters or conventional functional indices. Although LV and RV global strain (ε) and strain rate (SR) were similar across all three planes of contraction (P>0.05), LV apical rotation and derived twist were higher in ENDPRE (9.83° and 16.55°), compared to MIDSEAS (6.13° and 12.62°; P=0.004 and P=0.027 respectively), ENDSEAS (5.84° and 12.12°; P=0.002 and P=0.0009) and ENDOFF (6.60° and 12.35°; P=0.019 and P=0.017).
Conclusion: Despite seasonal variation in training load, there were no significant changes in ECG and cardiac structure in elite RLP indicating that PPCS can be performed at any time point throughout the season. Cardiac function was also unchanged with exception of LV twist which was higher during periods of higher training loads. Twist may be a more sensitive marker to acute training effects in RLP and may provide additional diagnostic value in the setting of PPCS to aid the differentiation from cardiomyopathies.

139

10-year outcomes of isolated Coronary Artery Bypass Grafting in Hong Kong

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Background: Isolated coronary arterial bypass grafting (CABG) was one of the most commonly performed procedures in cardiac surgery. However, long term clinical results are not available in Hong Kong. In this study, we examined and summarized 10-years results after isolated CABG.
Method: We retrospectively reviewed consecutive patients who underwent isolated CABG in Prince of Wales Hospital from January to December 2008. Patients' demographics including sex, age, intra-operative parameters, and post-operative outcomes and long-term results are collected and analyzed.
Results: From January to December 2008, we performed 158 cases of isolated CABG. Mean age was 62.1 year old. One hundred twenty-two patients (77.2%) were male. One hundred thirty-nine (88.0%) patients underwent elective operation and 19 (12.0%) underwent non-elective operation. Sixty-three patients (39.9%) had significant left main trunk disease. One hundred and two (64.6%) patients had angina, 56 (35.4%) patients had previous myocardial infraction and 16 patients (10.1%) had prior coronary intervention. Mean pre-operative Canadian Cardiovascular Society(CCS) classification was 2.55±0.78. On-pump CABG was performed in 155 patient (98.1%). Numbers of revascularised vessels were 2.87±0.62. There were no in-hospital death, and mean hospital stay after operation was 7.2±5.5 days. Mean CCS classification was 1.08±0.29 post-operatively. Mean follow up months were 113.6±27.9 months. Survival rate by Kaplan-Meier analysis and MACCE (Major Adverse cardiac and cerebrovascular events) free rate at 1-, 3-, 5-, 7-, and 10-years was 98.1%, 95.6%, 91.8%, 86.1% and 75.9%; and 96.2%, 91.8%, 86.0%, 78.9% and 65.2% respectively. Follow-up rate was 99.6%.
Conclusion: Our isolated CABG is a well-established procedure and proven to have excellent long-term clinical outcomes.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

140

Role of Statins for the Prevention of Anthracycline-Induced Cardiomyopathy: A Meta-analysis

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Background: Anthracyclines are key components of many chemotherapeutic regimens, having demonstrated efficacy in lymphomas and many solid tumors. However, a major factor limiting their use is a cumulative, dose-related cardiotoxicity which ultimately leads to asymptomatic and symptomatic heart failure. Oxidative stress is considered as a major mechanism in anthracycline-induced cardiomyopathy. Statins have been shown to possess anti-oxidative, pleiotropic effects besides their anti-inflammatory and lipid-lowering effects. This study evaluated the potential role of statin for the prevention of anthracycline-induced cardiomyopathy.
Methods: Using MEDLINE, EMBASE, ScienceDirect, Scopus, Google Scholar, ClinicalKey, Cochrane Database of Systematic Reviews, clinicaltrials.gov, and Cochrane Central Register of Controlled Trials databases, a search for eligible studies was conducted until December 2018. Included studies were evaluated based on the Cochrane Collaboration's tool for assessing risk of bias. Our primary outcome of interest was the development of anthracycline-induced cardiomyopathy. We also investigated the mean change in LVEF pre- and post-chemotherapy with anthracycline. Review Manager (RevMan) 5.3 was utilized to compute for relative risk and mean change in LVEF. A random effects model was applied for all meta-analyses.
Results: We identified 3 studies involving 332 cancer patients, showing that in cancer patients undergoing anthracycline-based chemotherapy, pre-treatment with statins was associated with a lower risk of developing anthracycline-induced cardiomyopathy (RR 0.33, 95% CI 0.14-0.79, $p<0.05$). There was a significant decrease in LVEF among patients who were not treated with statins (Mean difference -6.25, 95% CI -11.68 - (-) 0.82, $p=0.02$)
Conclusions: Pre-treatment with statins on cancer patients undergoing anthracycline chemotherapy may prevent the development of anthracycline-induced cardiomyopathy and reduction in LVEF. This will expand the utility of statin as a medication for the prevention and treatment of cardiovascular diseases.

141

Follow-Up of Percutaneous Transcatheter Closure of Pulmonary Arteriovenous Fistulas: Experiences from a Single Center

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Background: Percutaneous transcatheter occlusion is an alternative therapy for pulmonary arteriovenous fistulas (PAVFs). However, the evidence related to the efficacy and safety of transcatheter closure of PAVFs is still lacking due to the rarity of this condition. We aimed to evaluate at our center the efficacy, safety, and prognosis of transcatheter closure of PAVFs.
Methods: The medical records of patients who underwent heart catheterization or (and) transcatheter closure of PAVFs between April 2006 and April 2015 at Guangdong Cardiovascular Institute (Guangdong, China) were reviewed.
Results: Thirteen consecutive patients (median age: 22.3±15.7 years; range: 1-55 years) with PAVFs underwent heart catheterization and ten patients had successful transcatheter closure. Three patients were diagnosed with a PAVF that was associated with hereditary hemorrhagic telangiectasia. During a mean follow up of 7.1±2.7 years (range: 3-12 years), two patients (2/10) underwent a re-intervention procedure. One patient (1/10) underwent a lobectomy due to recanalization, and two patients underwent reperfusion from an untreated adjacent pulmonary feeding artery. The recanalization and reperfusion rates were 30% (3/10), respectively. Three patients with closure or without closure developed pulmonary hypertension (PH) during the follow-up. Two patients developed central nervous system complications from cerebral infarction. The rate of complications such as cerebral infarction, PH, recanalization, and even death during the follow-up that was associated with PAVF was 46% (6/13).
Conclusions: Percutaneous transcatheter is an effective and safe therapeutic method for PAVFs in both adult and pediatric populations. The occurrence rate of complications associated with occlusion and (or) PAVF and the recanalization rate were relatively high. Therefore, patients with a PAVF need more prudent treatment and more rigorous follow-up.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

142

Growth Differentiation Factor–15 Predicts Major Adverse Cardiac Events in Patients Undergoing Percutaneous Coronary Intervention: A Systematic Review and Meta-analysis

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Background: Recent studies have shown Growth differentiation factor-15 (GDF-15) might be a potential predictive cytokine for the prognosis of coronary heart disease (CHD). The aim of this study was to systematically evaluate Major Adverse Cardiac Events (MACEs) following Percutaneous Coronary Intervention (PCI) in patients with high GDF-15 through a meta-analysis.

Methods: Publication searches of the Ovid MEDLINE, EMBASE and Cochrane Central databases were performed without any time or ethnicity restrictions. The inclusion and exclusion criteria were clearly addressed. Two authors independently screened studies for inclusion, consulting with a third author where necessary to resolve discrepancies. Data analysis was performed by computing the hazard ratios (HR) with 95% confidence interval (CI). Publication bias was tested using funnel plots and the Egger test.

Results: We identified five eligible studies including a total of 8743 CHD patients undergoing PCI following the inclusion criteria. The maximal duration of follow-up ranged from 6 months to 5 years. Random effects models were used for the analysis and we found that high GDF-15 was associated with a higher risk of the MACEs in patients undergoing PCI (hazard ratios (HR), 1.69; 95% confidence interval (CI), 1.26-2.28).

Conclusion: Compared with low plasma GDF-15 levels, high plasma GDF-15 levels are associated with an increased risk of the MACEs in patients undergoing PCI. It suggests that plasma GDF-15 levels should be evaluated to prevent MACEs events after coronary revascularization.

144

Non-acute Myocardial Infarction Patients with Chronic Renal Failure May Not be Benefit from Myocardial Revascularization

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Background: Patients with chronic renal failure (CRF) have been excluded from many trials on myocardial revascularization, hence its benefits remains controversial.

Aim: To investigate whether myocardial revascularization will lead to decreased mortality in non-acute myocardial infarction patients with CRF.

Method: A total of 1440 consecutive non-acute myocardial infarction patients with CRF undergoing coronary angiography (CAG) or percutaneous coronary intervention (PCI) were divided into a PCI group (n=970) and a non-PCI group (n=470) depending on whether they have PCI or not. CRF was defined as estimated glomerular filtration rate (eGFR) <90 mL/(min×1.73 m^2). The endpoint was all cause mortality, which was defined as any death recorded after the date of enrollment. Multivariable logistic regression and Cox proportional hazards regression analyses were performed to identify the association between myocardial revascularization and long-term mortality.

Result: Overall, during the mean follow-up of 3.34±0.02 years, mortality was 5.1 (n=49) and 5.7% (n=27) in PCI group and non-PCI group, respectively. Multivariable logistic regression analysis showed that CRF stage IV (eGFR 15-30 mL/min/1.73 m^2), diabetes mellitus, pre-procedure hypotension, heart failure and the use of beta blocker were significantly associated with long-term mortality [HR of 7.043 (3.385-14.656), HR of 1.849 (1.119-3.053), HR of 2.498 (1.099-5.677), HR of 2.460 (1.475-4.102) and HR of 0.428 (0.261-0.701), respectively]. There was no difference in all cause mortality between PCI group and non-PCI group. [HR of 1.594 (0.927-2.739)].

Conclusion: Myocardial revascularization may not be associated with decreased mortality in non-acute myocardial infarction patients with chronic renal failure.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

148

Variations in Pulmonary Artery and Systemic Blood Pressures During the Induction Period of General Anesthesia in Elderly Patients: A Pilot Study

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Background: Aging is a predictor of hypotension during the induction of general anesthesia. However, the potential mechanisms underlying this association are scarcely investigated. The present study aims to correlate aging, increased pulmonary artery pressure (PAP) and the reduction of mean arterial blood pressure (MABP) during anesthetic induction in elderly patients.

Methods: 180 elderly patients, receiving surgeries under general anesthesia were recruited. They were allocated into different age groups (n=60, each group): 65-74 years old, 75-84 years old, and 85 years old groups. Systolic and mean PAP (PASP, PAMP) was invasively measured using a right heart floating catheter before induction, and MABP was measured using an invasive radial artery catheter, at one minute before and within five minutes after anesthetic induction.

Results: PASP and PAMP both increased with aging (PASP: 23.25±3.58, 28.15±4.70, and 31.27±3.22 mmHg; PAMP: 14.32±1.12, 19.22±2.15, and 23.62±1.85 mmHg; for 65-74 years old, 75-84 years old, and ≥85 years old, respectively, $P<0.05$). MABP at one minute before induction significantly increased with aging (92±10.8, 108±11.2, and 116±12.8 mmHg), while MABP measured at 1, 3 and 5 minutes after anesthetic induction were significantly decreased with aging ($P<0.05$). MABP was significantly and inversely correlated with the PASP before anesthesia induction ($r= -0.54$).

Conclusion: Our study highlights the significant correlation between the reduction of MABP and age-related increased PAP, during the induction period of general anesthesia in elderly patients.

149

Clinical Outcome of Percutaneous Coronary Intervention on Chronic Total Occlusion , Single Centre Experience

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Background: In this study, consecutive patients with chronic total occlusions (CTO) undergoing percutaneous coronary intervention (PCI) in Grantham Hospital between 1 Jan 2015 and 31 Jan 2019 were recruited. Their clinical outcomes were analyzed.

Method: Patients' data were retrospectively collected from percutaneous coronary intervention records. Demographic data was retrieved from our clinical records. Patients' baseline parameters including clinical presentation, age, gender, smoking status, left ventricular ejection fraction, previous history of cardiovascular disease, previous coronary intervention, comorbidities including diabetes mellitus, hypertension, hyperlipidaemia, peripheral vascular disease, renal impairment and medications prescribed were collected. Intervention data including target vessel, intervention technique and outcome were collected. Clinical outcomes data were retrieved from the computer based clinical record. Major adverse cardiac events (MACE) were defined as a combined endpoint of cardiac death, target lesion revascularization (TLR) and myocardial infarction.

Results: A total of 201 patients were included. The mean age was 64.6±11.0. The mean follow up time was 22.3±12.8 months. Thirty two patients have reattempt PCI to target CTO lesion. One hundred and fifty five (77.1%) CTO lesions were successfully treated. Among the successful PCI cases, 121 cases were achieved by antegrade approach and 34 cases were achieved by retrograde approach. MACE were seen in 22 patients (11%) over a mean time of 15.8±12.6 months. Nine patients (4.5%) had cardiac death. Seven patients (3.5%) had myocardial infarction. Six patients (3.0%) had target lesion revascularization.

Conclusion: With the advent of new intervention technique and devices, most of the chronic total occlusive lesions can be successfully treated with PCI.

ABSTRACTS

Abstracts for Poster Presentations:

BEST POSTERS PRESENTATION

150

Antegrade Dissection Reentry Device in Chronic Total Occlusion Intervention

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Background: Crossboss Catheter and Stingray Balloon System are interventional devices designed for the treatment of coronary chronic total occlusion (CTO). We report our early experience in the use of these devices in our centers. In this study, consecutive patients with chronic total occlusions (CTO) undergoing percutaneous coronary intervention (PCI) in Princess Margaret Hospital and Grantham Hospital between 1 January 2015 and 31 March 2019 were recruited. Their clinical outcomes were analyzed.
Methods: Patients' data were retrospectively collected from percutaneous coronary intervention records from both hospitals. Demographic data was retrieved from our clinical records. Patients' baseline parameters including clinical presentation, age, gender, smoking status, left ventricular ejection fraction, previous history of cardiovascular disease, previous coronary intervention, comorbidities including diabetes mellitus, hypertension, hyperlipidaemia, peripheral vascular disease, renal impairment and medications prescribed were collected. Intervention data including target vessel, intervention technique and outcome were collected. Clinical outcomes data were retrieved from the computer based clinical record. Major adverse cardiac events (MACE) were defined as a combined endpoint of cardiac death, target lesion revascularization (TLR) and myocardial infarction.
Results: A total of 9 patients were included. The mean age was 67.0±10.5. The mean follow up time was 13.9±14.7 months. Seven cases were reattempt PCI to CTO. Eight CTO lesions (88.9%) were successfully treated. One patients (11.1%) required target lesion revascularization 14.7 months after the index procedure. There was no cardiac death nor myocardial infarction.
Conclusion: Our experience showed that antegrade dissection reentry device has reasonable successful rate in the treatment of chronic total occlusion.

ABSTRACTS

Abstracts for Poster Presentations:

CASE POSTER PRESENTATION

1

Not as Smooth as Expected - From ECPR, Impella Venting, Shifting from ECMO to Impella, to Impella Weaning

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Background: A case of ECPR with an Impella added for left ventricular venting with subsequent VA-ECMO shifted to full Impella support was presented. Impella has complex interaction with ECMO, and its application, however physiologically sound, could cause adverse haemodynamic effects.
The case: A 50 year-old man developed cardiac arrest during primary PCI for anterior STEMI. E-CPR was performed and revascularization was complete. The total down time was 30 minutes. The left ventricle was stunted and the patient developed acute pulmonary edema. An Impella-CP was inserted to vent the left ventricle with 1.2 L/min flow at P2 revolution. The optimal Impella flow needed careful titration as it interacted closely with the ECMO and afterload. While too low flow led to inadequate venting, excessive venting resulted in collapse of left ventricle, triggering suction alarm and potential irritation to the myocardium. The Impella position also drifted and needed readjustment when the ECMO or the Impella flow was changed. His heart function gradually recovered. He was however complicated by tricuspid valve Bacillus infective endocarditis, and respiratory failure, likely from septic embolization. We suspected catheter related infection and decided to remove the mechanical devices as soon as possible. We planned to decannulate the VA ECMO and shifted it to VV configuration, while stepping up the Impella flow upon removing VA-ECMO. We planned to wean off Impella subsequently. However, upon ECMO decannulation, the patient developed recurrent ventricular fibrillation. No obvious 5H5T was revealed. Empirical MgSO4 was given in view of long QTc. The Impella suction alarm rang and echocardiography was performed, showing the Impella was drifted with its tip at the aortic valve level. The VF storm terminated after Impella repositioning. There was no more arrhythmia for the coming 2 days and we decided to wean off Impella. We shifted to P2 and confirmed the Impella position by echocardiography. The patient developed recurrent VF again, all initiated by ventricular ectopics. The Impella was urgently decannulated and there was no more VF afterwards.
Decision-making: Among causes for his VF, stimulation of the vulnerable left ventricle by the Impella was believed to be significant. This was especially marked during haemodynamic changes when the Impella could drift. Clinicians should always do echocardiography to confirm Impella position and prepare for need for position adjustment, when the haemodynamic changes.
Conclusion: Due to the complex physiology of ECMO and Impella and their interaction, close monitoring and repeated echocardiographic assessment are paramount.

22

Double Trouble (MI in Trouble?): Ventricular Septal Rupture Complicating Acute Myocardial Infarction: A Case Report

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Introduction: Ventricular Septal Rupture (VSR) is rare with 0.2% to 0.34% incidence and remains to be a lethal complication of acute myocardial infarction.
Case: A 76 year-old female, hypertensive for 10 years non diabetic, non asthmatic, with no history of kidney or thyroid diseases, presented with sudden onset of acute anterior chest heaviness, squeezing in character non-radiating with associated diaphoresis to the Emergency Department. Patient has familial history of hypertension and Diabetes Mellitus. She is non smoker and non alcoholic drinker. She was admitted as a case of ST Elevation Myocardial Infarction. On the third hospital day, was noted to have a new onset murmur. Patient was in respiratory distress with no hypotensive episodes. Physical examination revealed distended neck veins and coarse crackles on lung bases. The cardiac apex was displaced with grade 3/6 harsh holosystolic murmur at the lower left sternal border between the 4th and 5th ICS. No edema, cyanosis or clubbing noted. Chest Xray revealed pulmonary congestion with infiltrates on the right cardiac boarder. Cardiac enzymes were 3x elevated. ECG revealed Sinus Rhythm with ST elevation on Anterolateral wall. Transthoracic ecocardigram revealed VSR with aneurysmal apical wall with segmental wall motion abnormality and depressed systolic function (EF 49%). Coronary Angiogram revealed 70% proximal stenosis and totally occluded mid segment of the LAD.
Decision-making: With the history, physical examination, and TTE findings, a multidisciplinary team approach was called in directing the management of the patient. With the decision of the team, surgery was done on the 7th hospital day and 10th post MI day with the aim of reducing the end organ damage. Intraoperative TEE was also a tool in identification of the specific anatomic classification (landmark and location) and the diameter of the VSR. Intraoperatively, there was note of a 1 cm x 1.5 cm ventricular septal rupture at the apex with note of friable tissues. Minimal amount of thrombus was also seen attached to the ventricular septal wall.
Conclusion: VSR management remains to be complicated requiring substantial critical care, imaging, interventional and surgical expertise. VSR repair carries a high operative mortality.

ABSTRACTS

Abstracts for Poster Presentations:

CASE POSTER PRESENTATION

50

Up Against the Tide

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A 58-year-old gentleman with history of hypertension and hyperlipidaemia was admitted for anterior STEMI. Primary PCI was activated. Pre-operative Echo showed LVEF ~20% with global hypokinesia. Coronary angiogram showed triple vessel disease, distal left main bifurcation lesion with Medina Classification 1:1:1. IABP supported PCI was started but patenet progressively developed acute pulmonary edema and then cardiac arrest. ECMO was initiated and PCI to LM-LAD/LCx bifurcation was done. However, patient's LVEF was stunned post-operatively to 5-10%, and echo showed poor aortic valve opening. LV was distended with spontaneous echo contrast. LV venting was needed. Therefore, Impella device was implanted to vent the LV and patient's LV recovered post-operatively and serial echo showed LVEF improved to 40%. ECMO, Impella and inotropes were weaned off on post-op D10. Unfortunately patient developed hospital accquired pnuemonia and died of pneumonia on post-op D31. This case discuss the current management of post-cardiac arrest care, the pros and cons of ECMO for heart recovery and methods to overcome its limitation.

52

Echocardiography Diagnosis of Aortic Arch Pseudoaneurysm

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Clinical Presentation: A 47-year-old woman was admitted to our hospital with back pain for 3 months, cough and hoarseness for one month. Two-dimensional transthoracic echocardiography showed a 2.3×3.7 cm echolucent structure and a "mass" measuring 5.5×6.5×4.7 cm, adjacent to the aortic and pulmonary artery roots. The pulmonary artery was compressed by them. The echolucent structure seems to originate from the small curved side of aortic arch. Blood flow within it revealed that blue blood flow on color Doppler imaging. To better delineate the origin of the blue blood flow, an intravenous ultrasound contrast agent (3 mL; Bracco Group, Milan, Italy) was administered. After contrast agent injection, aortic arch, echolucent structure and a rupture (0.8 cm) can be clearly displayed. In addition, no contrast agent was found in the "mass". RT-3D with contrast the allowed visualization of more detailed morphologic information about the pseudoaneurysm. CT with contrast and surgery confirmed the diagnosis.

Imaging Findings: Preoperative imaging. A, TTE showed an echolucent structure and a "mass" (pentagram) adjacent to the small curved side of aortic arch. B, color Doppler imaging revealed blue blood flow in echolucent structure. C, A rupture was displayed by CEU (yellow arrow). D and E, TTE showed pulmonary artery compression. F RT-3D of CEU. G, CT with contrast showed pulmonary artery compression (red arrow). H, CT with contrast showed the rupture (black arrow). (AAO: ascending aorta; DAO: Descending; AO: aorta; PA: pulmonary artery; LPA: left pulmonary artery; RPA: right pulmonary artery)

Summary: As a fast, convenient and non-invasive examination method, echocardiography plays an important role in the screening and diagnosis of aortic arch pseudoaneurysm. In addition, combined contrast-enhanced ultrasound can make up for the deficiency of conventional ultrasound in vascular exploration and provide more basis for diagnosis.

ABSTRACTS

Abstracts for Poster Presentations:

CASE POSTER PRESENTATION

60

"The Tear of Death": An Extensive Type A Aortic Dissection Successfully Managed Medically: A Case Report

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Background: A known collective term for life threatening aortic condition is Acute Aortic Syndrome.
Clinical Presentation: A 33-year-old male who presented at the Emergency Department due to sudden onset of severe tearing chest pain (Pain scale of 10/10) radiating to the back with associated shortness of breath which occurred few minutes prior to admission. Patient is a known hypertensive maintained on Candesartan 8 mg/tab OD with usual BP of 130/80 mmHg and the highest recorded was 220/100 mmHg. Work up done for Primary Causes of hypertension was unremarkable. Familial history revealed hypertension on maternal side. No other pertinent heredo-familial disease noted. Patient is a call center agent, denied illicit drug use with unremarkable sexual history. Patient is awake, restless, and in severe pain. Patient is obese with no noted marfanoid features. Was hypertensive with BP of 220/100 mm Hg on all extremities. There is no carotid bruit and lungs are clear. Heart sounds are distinct with no murmurs and no extra heart sounds. No edema, cyanosis or clubbing noted, pulses are full and equal on both upper and lower extremities. ABI was normal. There were no marfanoid features noted. Normal neurologic examination.Chest X-ray revealed cardiomegaly with no pulmonary congestive changes. Mediastinum is widened with clear lung fields. Electrocardiograph showed regular sinus rhythm, left axis deviation with non specific ST T wave changes. Transthoracic Echocardiogram (TTE) revealed Concentric Left Ventricular Hypertrophy, good wall motion and overall systolic function. Aortic root dimensions are normal with no flap noted. CT-Aortogram revealed dissection from aortic root involving the entire aorta: innominate, left carotid and subclavian arteries down to both femoral arteries. Patient was managed as a case of Hypertensive Emergency, Aortic Dissection, De Bakey Type 1; Stanford Type A.
Decision-making: Upon arriving at the diagnosis, surgical and Interventional approach were offered to the patient but due to limited funds was not done. Hence, maximal medical management with IV Beta Blocker (Esmolol drip) for rate and pressure control, Vasodilator (Nitroglycerine drip) and Pain reliever (Morphine) were given. Patient was discharged and improved on the eight day and was advised on close follow up.
Conclusion: Aortic Dissection should always be included in the differential diagnosis of patients with acute chest pain on all age group. Diagnostics should be immediately done in suspected patient to maximize urgent care and outcome.

62

Takotsubo Cardiomyopathy ("Takot-s-Ubo") from Tussaphobia: A Case Report

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Introduction: It was in 1990, when Takotsubo Cardiomyopathy was first recognized in Japan. Reported cases were triggered by physical or emotional stress.
Clinical Presentation: A 69-year-old hypertensive female, who developed severe anxiety to cough after her history of intubation due to Pneumonia few years back, presented at the emergency department with 8 days history of cough and dyspnea. Patient was initially admitted as a case of Pneumonia. On the third hospital day, was intubated for progressive dyspnea. Physical examination revealed hypotension, distended neck veins, and coarse crackles on lung bases. The cardiac apex was displaced, but heart sounds were distinct with no murmurs. No edema, cyanosis or clubbing noted. X-ray revealed minimal pleural effusion with hazy infiltrates on the right lower lung, fibrotic densities on right upper lobe, increased vascular markings, and cardiomegaly. ECG showed sinus rhythm with ST-segment elevation at the Infero-anterolateral wall. Troponin was 2x elevated. TTE revealed apical ballooning of the left ventricle, with associated segmental motion abnormality. Coronary angiography has no obstructive coronary lesions. Left ventriculogram confirmed the ballooning configuration, with hypokinesia of left ventricular apex and relative hyperkinesia of the base. Repeat TTE showed resolution of previously noted ballooning of LV and wall motion abnormalities.
Decision-making: Diagnosis of Myocardial infarction with nonobstructive coronary artery was a dilemma in this case after fulfilling the diagnostic criteria. However, LV gram showed the classic finding of apical ballooning pointing to the diagnosis. The proposed diagnostic criteria of Mayo Clinic such as transient hypokinesia or dyskinesia in the left ventricular mid segments with or without apical involvement, the regional wall motion abnormalities; a stressful trigger often present, the absence of obstructive coronary disease, new ECG abnormalities either ST segment elevation and/or T wave inversion or modest elevation of cardiac troponins were seen and fulfilled in this case. Patient was managed as a case of Takotsubo Cardiomyopathy, Pneumonia High Risk and Hypertension.
Conclusion: Taskotsubo Cardiomyopathy should be considered in the setting of a historical predisposition to emotional or physical stress, transient LV geometry changes, and angiographically normal coronaries. Early clinical consideration is crucial in properly directing management and patient education.

ABSTRACTS

Abstracts for Poster Presentations:

CASE POSTER PRESENTATION

69

Infectious Endocarditis After Device Closure of Perimembranous Ventricular Septal Defect with a Residual Shunt

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Backgrounds: Transcatheter closure of perimembranous ventricular septal defect (PmVSD) has been proved to be a safe and effective alternative to surgery in selected patients. Theoretically, residual shunt could increase risk for post-interventional IE via endothelial damage resulting from mechanical lesions provoked by turbulent blood flow across the defect.
Case: A three-year old female weighing 10.5 Kg, with a PmVSD and a history of recurrent lower respiratory tract infections, was referred to at the Department of Pediatrics in West China Second University Hospital of Sichuan University (WCSUH-SCU) for transcatheter closure of the defect. The procedure was undertaken under general anesthesia. Dynamic ECG monitoring was applied during and after the procedure for 3 days. Right and left cardiac catheterization was performed via percutaneous transfemoral route. Hemodynamics of the pulmonary vessels were measured and pulmonary vessel resistance was evaluated before the final occlusion. Real-time TTE imaging was performed during the procedure to assess the profile VSD in the left ventricular long-axis oblique view. The defect measured 5.0 mm on left ventricular angiography and an 8-mm modified symmetric double-disk occluder (SHAMA) was chosen. Heparin (100 U/kg) was administered after successful femoral artery access. Antibiotics were infused intravenously for 3 days, including the procedure day and 2 postoperative days.
Decision-making: The device was released despite a small residual shunt was noted immediately after the procedure. After procedure, oral administration of aspirin (50 mg daily) was initiated. Two months later, the child had a persistent fever up to 41°C for 11 days. Transthoracic echocardiography (TTE) demonstrated a vegetation (13×9 mm) attached to tricuspid valve and the occluder, and a small residual shunt. Staphylococcus aureus was isolated from all three-blood cultures. Defervescence occurred in 20 days following dosage adjustment of vancomycin. After 6 weeks of treatment, the vegetation disappeared with no sign of valvular dysfunction. Three weeks later, a second device was implanted to abolish persistent residual flow. Unfortunately, the child was ultimately transferred to surgical department due to severe hemolysis after the second device implantation. During the surgical procedure, the occluders were removed, VSD was closed with a pericardial patch and tricuspid valvuloplasty was also performed.
Conclusion: The present report was of clinically amount significance for illustrating the need to reassess the prognostic implications of non-significant residual shunt after PmVSD device closure and consider the most reasonable therapeutic regimen.

80

Very Late-onset Endocarditis Complicated by Aortic Regurgitation After Device Closure of Perimembranous Ventricular Septal Defect

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Backgrounds: Transcatheter closure of perimembranous ventricular septal defect (PmVSD) has been proved to be a safe and effective alternative to surgery in selected patients. Aortic regurgitation (AR), attributable to impingement of device on aortic valve, was recognized as a major, but rare complication after device closure for PmVSD, and could increase risk for post-interventional infectious endocarditis (IE).
Case: A fifteen-years old male was admitted into emergency department of West China Hospital in January 2019 due to persistent fever for 16 days and nonresponse to 2-weeks course of amoxicillin and cefoxitin. The child had received transcatheter closure of a 6.4 mm sized PmVSD with a 9-mm modified symmetric double-disk occluder (SHAMA) 11 years ago in our Hospital. A new-onset mild eccentric AR was noted on transthoracic echocardiography (TTE) examination one-year post procedure, without progression until latest follow-up in January 2018.
Decision-making: On admission, the child was conscious with temperature of 39°C. Physical examination was only remarkable for a diastolic murmur in auscultation area of aortic valve. Laboratory tests revealed an elevated white blood cell count of 15.89×109/L, neutrophil percentage of 80.1%, C-reactive protein of 36.3 mg/L, erythrocyte sedimentation rate of 62.0 mm/h, and mild anemia (hemoglobin: 116 g/L). Transesophageal echocardiography (TEE) demonstrated a vegetation (14×4 mm) attached to tricuspid valve, an anechoic area (8×7 mm) on left upper side of ventricular septum and below right aortic sinus, and severe eccentric AR. The diagnosis of IE was established. Staphylococcus aureus was isolated from all three-blood cultures. Treatment with vancomycin was continued since the isolates were resistant to penicillin but sensitive to vancomycin. The patient ultimately underwent surgical intervention because of recurrent fever and a new-onset complete atrioventricular block 12-days later. During the procedure, contracture of right aortic valve, fusion of upper margin of occluder with right aortic valve, perforation of interventricular septal abscess below right aortic valve and vegetation on tricuspid valve were documented. Removal of vegetation, abscess and occluder, closure of VSD with a pericardial patch, tricuspid valvuloplasty (TVP) and aortic valvuloplasty (AVP) were performed. The child continued with antibiotic therapy up to six weeks post operation. The temperature gradually returned to normal with alleviation of AR (mild) and heart block (first degree).
Conclusion: Given the worldwide acceptance and increasing utilization of device closure for Pm VSD, there are likely additional patients with delayed incorporation that could present a late risk for AR and IE. Reassessing long-term prognostic implications of non-significant post-procedure AR is necessary.

ABSTRACTS

Abstracts for Poster Presentations:

CASE POSTER PRESENTATION

138

Infected Sinus of Valsalva Pseudoaneurysm Replaced with Hand-sewn Composite Root Graft with Everted Cuff

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Background: Surgery for aortic root pathologies often impose significant challenge in terms of technique and hemostasis, especially when tissue quality is poor. We present a case of infected Sinus of Valsalva (SoV) pseudoaneurysm treated by aortic root replacement with hand-sewn composite graft and coronary artery bypass grafting (CABG).
Case: A 55-year-old lady presented with fever and orthopnea. Blood culture grew Streptococcus bovis and a murmur was heard. Echocardiogram showed bicuspid aortic valve with severe aortic stenosis, in addition to two collections at aortic root. Computer tomography (CT) demonstrated two contrast out-pouches near aortic valves, measuring up to 4.8 cm and 1.4 cm respectively, highly suspicious of SoV aneurysms. She was treated as infective endocarditis with intravenous antibiotics. Initially we intended to perform Bentall procedure, however upon exposing the aortic root, it was noted that the infective cavity of pseudoaneurysm involved both coronary ostia, rendering the coronary buttons unhealthy for anastomosis, thus decided for CABG. The pseudoaneurysm cavity including part of the aortic annulus and left ventricular outflow tract was repaired with Bovine pericardium. A size 22 hemashield graft was everted and hand-sewn to a size 19 Regent mechanical aortic valve, after which the cuff of everted graft was unfolded to anastomose with the neo-aortic root. The distal anastomosis was performed under circulatory arrest and antegrade cerebral protection. CABG to all 3 major coronary vessels was performed. The patient had an uneventful recovery.
Decision-making: The difficulty of the case lies in the uncertain anatomy of the infected aortic root, thus pre-operative trans-esophageal echocardiogram and ECG-gated computer tomography of the region was pertinent to the planning of operation. We also have a choice to use commercially available composite root grafts versus a hand-sewn composite graft. We chose the latter because the graft diameter and length, and the type of valve can be complete controlled. More importantly, by everting the graft during sewing of valve and subsequently unfolding the everted part to serve as cuff for anastomosis, it prevents tearing of the fragile reconstructed infected aortic annulus, and much reduces the risk of bleeding and subsequent rupture.
Conclusion: In cases with complex aortic root anatomy, it is crucial to have detailed pre-operative planning and quick intra-operative decision making to ensure a smooth operation. The hand-sewn composite root graft with everted cuff is an important armamentarium for anastomosis with fragile annulus tissue.

151

A Complicated Case of de Winter Syndrome

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Background: This is a case of de Winter syndrome complicated with electrical storm, treated successfully.
Case: A 51 years old man admitted for substantial chest pain for 3 hours, he had experienced cardioversion due to "ventricular tachycardia" in another medical facility. He has HTN for 5 years; Smoking index 600; Hyperlipidemia for 5 years. His ECG is a typical de Winter pattern with 2 mm horizontal ST segment depression in leads I, AVL; 4-6 mm J point depression and 4-8 mm upsloping ST segment depression in leads V2-V6; poor R wave progression in precordial leads; 1 mm dome-shaped ST segment elevation in lead AVR. Lab results are TnI 0.10 ng/ml (3h after onset of chest pain), BNP 21.87 pg/ml, D-dimer 600.87 ng/ml, K+ 4.1 mmol/L, Normal liver and kidney function.
Decision-making: Recognizing the case a de Winter syndrome which suggests a proximal LAD occlusion. It is a STEMI equivalent case. So we decided to manage with a loading dose of Aspirin 300 mg and Ticagrelor 180 mg followed by urgent CAG.
Diagnostic finds of CAG are:
Right Dominant
LM: 80%
LAD: Occlusion
Prox LCX: 90%
Mid RCA: 80%.
We found the Infarct-related vessel: LM-LAD. We inserted IABP and performed PCI in LM-LAD
Prox LAD: Firebird 3.5*33 mm DES
LM: Firebird 4.0*33 mm DES.
The medication after PCI are

Tirofiban	0.1 ug/Kg/min
Aspirin 100 mg	qd
Ticagrelor 90 mg	bid
Atorvastatin 20 mg	qd
Ezetimibe 10 mg	qd
Enoxaparin 0.6 ml	q12h.

Patient had electrical storm on day 2. ACLS was provided, we sought the cause for the storm, ECG and AED record revealed Polymorphic ventricular tachycardia with prolonged QT. Cardiac Biomarkers did not suggest Acute stent thrombosis, Hypokalemia, Hypomagnesemia and hypocalcemia are excluded. Other than the medications above, no med would prolong the QT. Ischemia was likely the cause. We managed the storm with (1) Temporary pacemaker, pacing rate 80 bpm; (2) Lidocaine 2 mg/min, mexiletine 150 mg tid; (3) Potassium and magnesium supplementation. Outcome was satisfactory. Patient is on Secondary prevention of CAD, he had No angina or arrhythmia since.
Conclusion: Success of managing the case: (1) Prompt recognition of de Winter syndrome as a STEMI equivalent condition, leading to urgent, appropriate revascularization; (2) Managing ES with overdrive pacing, potassium, magnesium and antiarrhythmic agents. However, the key was successful revascularization.

ABSTRACTS

Abstracts for Poster Presentations:

PAEDIATRIC CARDIOLOGY

5

The Application of "Left Innominate Vein-aortic Branches View" in Prenatal Diagnosis of Congenital Cardiovascular Anomalies

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Background: Sonographic screening of fetal heart includes a series of standard views, which focus on the structure of cardiac chambers and great vessels. But little attention is paid to aortic branches and innominate veins. However, variations of these vessels can occasionally be detected and may provide a clue to diagnose certain congenital heart diseases (CHDs). In order to demonstrate the aortic branches and innominate veins, we suggest a new additional ultrasound plane in fetal heart screening, that is "left innominate vein-aortic branches (LINV-AoB) view". This study aims to explore its value in the diagnosis of fetal CHDs.
Methods: From October 2016 to October 2017, 2011 fetuses underwent echocardiography in our hospital. Based on 3VT view, moving the transducer slightly cranially to demonstrate the long axis of LINV and short axis of aortic branches, which is "LINV-AoB view". The number, course, dimension, relative position, flow direction of LINV and aortic braches were carefully observed in "LINV-AoB view". Meanwhile, other related intracardiac anomalies were also evaluated.
Results: A total of 227 (227/2011, 11.29%) fetuses demonstrated abnormal findings in "LINV-AoB view" during the detailed echocardiography, including 131 cases (131/227, 57.71%) of LINV anomalies and 115 cases (115/227, 50.66%) of aortic branching anomalies. LINV anomalies included 103 cases of absent LINV (double SVC), 25 cases of anomalous courses of LINV (including 1, 10 and 14 cases of intrathymic LINV, subaortic LINV and PLSVC with absent RSVC, respectively), 3 cases of supracardiac-type APVC. Aortic branching anomalies included 37 cases of aberrant right subclavian artery, 42 cases of right aortic arch with aberrant left subclavian artery, and 36 cases of RAA with mirror-image branching. Nineteen fetuses (19/227, 8.37%) had multiple LINV and aortic branching anomalies. Fetal cardiac conventional views combined with "LINV-AoB view" had obvious advantage in the demonstration of subaortic/intrathymic LINV.
Conclusion: "LINV-AoB view" plays a vital role in the prenatal diagnosis of congenital cardiovascular anomalies, it can help us detect different variations of LINV and aortic branches. Fetal cardiac conventional views combined with "LINV-AoB view" can improve the detection rate of subaortic/intrathymic LINV. We recommend to add this view into the routine fetal cardiac screening.

21

Echocardiography in Diagnosis and Prognosis of Vascular Sing

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Background: Vascular ring is a rare congenital disease that leads to variable degrees of respiratory problems. We aimed to analyze the diagnosis and prognosis of different types of vascular rings by echocardiography.
Method: Patients with vascular rings confirmed by multi-slice spiral computed tomography (MSCT) between January 2010 and July 2017 in our hospital, were retrospectively assessed by echocardiography. The clinical symptoms, demographic characteristics, and images of the patients with vascular rings were evaluated. Operative data and postoperative follow-up data of echocardiography, and outcomes were also collected in details.
Result: Seventy-eight patients confirmed as vascular rings by MSCT. Male versus female was 45 to 33, and the median age was 7 months old ranging from 1 day old to 9 years old. Among these patients, 56.4% (n=44) cases had pulmonary artery sling, 25.6% (n=20) cases had double aortic arch, and 18. 4% (n=14) cases were other types, including seven cases of left-sided aortic arch with aberrant right subclavian artery, six cases of right-sided aortic with aberrant left subclavian artery, and one case of right-sided aortic arch with left patent ductus arteriosus. Echocardiography diagnosed 95% of pulmonary artery sling, 55% of double aortic arch, and 14% of other types. Totally, forty-eight cases underwent surgery. Before operation, three cases of pulmonary artery sling died, and five cases of pulmonary artery sling died of respiratory failure after surgery. Other operated cases were followed-up by echocardiograghy and with good prognosis.
Conclusion: Echocardiograpy is a convenient and safety tool which can be the preliminary diagnosed tool for vascular ring. It could make diagnosis of pulmonary artery sling with carefully screening, while the sensibility of other vascular ring is poor. The prognosis of pulmonary artery sling may be the worst of all vascular ring.

ABSTRACTS

Abstracts for Poster Presentations:

PAEDIATRIC CARDIOLOGY

32

Follow Up Outcomes and Risk Factors of Complete Atrioventricular Block After Transcatheter Closure of Perimembranous Ventricular Septal Defect in Children

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Backgrounds: Complete atrioventricular block (cAVB) still remains the main issue of concern following transcatheter closure of perimembranous ventricular septal defect (VSD). Data regarding the incidence, risk factors and prognostic implications of post-procedure cAVB is limited, particularly in children.
Objectives: The present study intended to determine the overall incidence, risk factors and follow up outcomes of cAVB after transcatheter closure of perimembranous VSD in children.
Methods: All available clinical and follow-up data of children with cAVB (n=13) after transcatheter closure of perimembranous VSD using modified symmetric double-disk occluders between January 2005 and December 2017 were retrospectively reviewed, and were compared with that of children without arrhythmias (n=1572).
Results: cAVB after transcatheter closure of perimembranous VSD occurred in 13 cases, with an incidence of 0.61% (13/2114). Eleven cases developed cAVB within 2 weeks post procedure. Late-onset cAVB was noted in two cases, with one occurring at eighteen days and the other occurring at four years post procedure. Reversible cAVB were observed in one case. Nine of 13 cases recovered to normal conduction or reverted to other types of bundle branch block three weeks post operation after steroids treatment. Two patients were ultimately transferred to surgical department for occluder removal due to unresponsiveness of steroid therapy for three weeks and restored the sinus rhythm following operation. Persistent cAVB was presented in two cases. One of them suffered from recurrent syncope and received permanent pacemaker implantation. The other case was followed up regularly owing to asymptomatic and pacemaker refusal. Larger occluder size was identified as risk factor for both occurrence and persistence of cAVB.
Conclusions: The overall incidence of cAVB after transcatheter closure of perimembranous VSD was relatively low and the outcome was satisfactory. Close follow-up needs to be applied since late-onset and reversible cAVB could occur. Oversized occluder should be avoided.

39

Cardiac MRI Improves Diagnostic Accuracy and Characterization in Children with Cardiomyopathy

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Background: Recent advances in cardiac magnetic resonance imaging (cMRI) have made this scan an important tool for evaluating heart disease. The objectives of this study were to evaluate the role of cMRI in the diagnosis of children cardiomyopathy.
Methods: Images of 53 pediatric patients with cardiomyopathy were retrospectively evaluated. Several morphological characteristics of the various cardiomyopathies were observed with cMRI.
Results: cMRI could accurately display the characteristic morphological changes of cardiomyopathy, and late gadolinium enhancement on cMRI might suggest myocardial fibrosis, which had obvious advantages in the diagnosis of cardiomyopathy than Echo. In hypertrophic cardiomyopathy (HCM) patients, cMRI showed diffuse left-ventricular (LV) myocardial wall thickening, mainly involving the interventricular septum and LV anterior wall at central and base parts, which was often accompanied by a significant LV cavity narrowing and LV outflow tract stenosis. In patients with dilated cardiomyopathy (DCM), cMRI showed LV or double-ventricle dilatation, normal or thin myocardial wall thickness, and reduced LV ejection fraction (EF) and stroke volume, and segmental or whole abnormal ventricular movement was observed. In patients with restrictive cardiomyopathy (RCM), cMRI showed atrial enlargement, vena cava and portal vein expansion, and single- or double-ventricle diastolic dysfunction. In patients with left-ventricular noncompaction (LVNC), cMRI may reveal prominent multiple trabecular subendocardial and deep trabecular fossae communicating within the LV cavity. Diffuse subendocardial myocardial delayed enhancement (MDE) was noted in 2 patients with RCM, suggesting the fibrosis formation.
Conclusion: Cardiomyopathy is a common cardiac disease during childhood with a poor prognosis. The establishment of an early diagnosis and early treatment initiation are critical. Our data demonstrate that cMRI can accurately visualize morphological changes as well as functional alterations in pediatric patients with cardiomyopathy.

ABSTRACTS

Abstracts for Poster Presentations:

PAEDIATRIC CARDIOLOGY

41

Neurological Involvement in Kawasaki Disease

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Background: Kawasaki disease is an acute febrile systemic vasculitis affecting multiple organ and tissues, with coronary artery lesions as the most serious sequelae. Although neurological involvement as a complication of Kawasaki disease has been recognized, pediatricians lacked a recognition of the background, course, clinical characteristics, diagnostic and treatment issues, prognosis of neurological involvement in Kawasaki disease. Importantly, it still remains unknown whether the neurological involvement in Kawasaki disease is a marker of more severe disease and put patients at a higher risk of intravenous immunoglobulin resistance and coronary artery lesions. Herein, we carried out this study to systemically analyzed neurological involvement in Kawasaki disease, aiming to assess its relationship with intravenous immunoglobulin resistance and coronary artery lesions.
Method: Kawasaki disease patients at West China Second Hospital of Sichuan University were retrospectively reviewed between January 2013 and December 2017. The profiles of patients who had neurological symptoms (group A, n=80), were compared with that of gender- and admission date-matched patients without neurological involvement (group B, n=512).
Results: A total of 80 Kawasaki disease patients had neurological involvement, with a constituent ratio of 5.1% (80/1582). The neurological manifestations were diffuse, presenting as headache (13/80, 16.3%), convulsion (14/80, 17.5%), somnolence (7/80, 8.8%), extreme irritability (21/80, 26.3%), positive sign of meningeal irritation (15/80, 18.8%), bulgin fontanel (7/80, 8.8%), dispirited (33/80, 41.3%), facial palsy (1/80, 1.3%). 47.5% (38/80) patients had neurological symptoms as the initial and/or predominant presentation. The patients from group A had higher incidence of intravenous immunoglobulin resistance combining with higher level of inflammatory markers in comparison with patients from group B. However, it demonstrated that neurological involvement was not an independent risk factor of intravenous immunoglobulin resistance and coronary artery lesions in Kawasaki disease.
Conclusions: The incidence of neurological complications in Kawasaki disease patients was relatively low. No delayed diagnosis and intravenous immunoglobulin treatment were observed, but this complication developed a higher incidence of intravenous immunoglobulin resistance in Kawasaki disease patients for a severe inflammatory burden.

42

Grisel Syndrome in Kawasaki Disease

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Background: 50%-75% Kawasaki disease patients present cervical lymphadenopathy associated with deep neck inflammation, which might result in Grisel syndrome defined as a rare non-traumatic, atlantoaxial subluxation. However, this disorder with Kawasaki disease has not been systemically discussed in previous literatures for limited available data. Therefore, we carried out this study to describe Grisel syndrome with Kawasaki disease comprehensively, aiming to develop pediatricians' recognition and awareness.
Methods: A computerized search without language restriction was carried out via PubMed, Google Scholar, Scopus and China Medical website. An article was considered eligible for inclusion in the systematic review if it reported data on patient(s) with Grisel syndrome in Kawasaki disease. Our patients were also retrospectively recruited.
Results: Ten articles reporting fourteen Kawasaki disease patients with Grisel syndrome were considered. Four patients were identified in our population, with the incidence of 0.3% (4/1582). Totally, this disorder affected 6 males and 12 females (M/F ratio was 0.5), aged from 4 to 9 years old. The duration before the identification of this disorder with Kawasaki disease ranged from 3 to 22 days. Cervical lymphadenopathy was identified with all patients. Grisel syndrome with Kawasaki disease all presented Fielding classification type 1, manifesting tilted position (5/18, 27.8%), torticollis (9/18, 50.0%), neck pain (7/18, 38.9%) and stiffness (5/18, 27.8%). They had no coronary artery affected. After conservation treatment, neurological impairment was not observed with these patients.
Conclusions: Grisel syndrome is a rare complication of Kawasaki disease, with a incidence of 0.3%. It mainly affects older children with dominant females. Prompt and adequate recognition of this disorder in Kawasaki disease remains a well prognosis.

ABSTRACTS

Abstracts for Poster Presentations:

PAEDIATRIC CARDIOLOGY

44

Application Values of Transesophageal Echocardiograghy in Hybrid Therapy for Pulmonary Atresia with Intact Ventricular Septum in Younger Infants

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Objective: To explore application values of transesophageal echocardiograghy (TEE) in the hybrid therapy to balloon pulmonary valvuloplasty for younger infants of pulmonary atresia with intact ventricular septum (PA/IVS).
Methods: 25 younger infants with PA/IVS were diagnosed by transthoracic echocardiography (TTE) before operation. After general anesthesia with endotracheal intubation, all patients were inserted TEE probe to evaluate development of pulmonary valve annulus and right ventricle and instruct the surgeon to select the appropriate balloon. Pulmonary valve was punctured by needle, and then sheath and balloon were inserted with the guidance of TEE. All patients were performed by the balloon pulmonary valvuloplasty monitored by TEE, and the effect of valvuloplasty was evaluated by TEE immediately.
Results: All patients were performed successfully for balloon pulmonary valvuloplasty with the guidance of TEE, and no severe complications occurred during the operation. The forward flow of pulmonary valve was unobstructed in 88.0% of the patients., and 80.0% of the patients had mild pulmonary valve insufficiency; The degree of tricuspid valve insufficiency was significantly reduced in 80.0% of the patients. The pulmonary valve blood flow velocity in the three patients was more than 3.0 m/s after surgery, who had to need right ventricle outflow tract reconstruction 10~25 months after balloon pulmonary valvuloplasty.
Conclusions: TEE accurately make preoperative evaluation for the patients with PA/IVS, real-time monitor the placement of sheath and balloon during operation, and may evaluate the effect of dilation. immediately. TEE is a safe and effective guidance technique for the hybrid therapy of young infant patients with PA/IVS.

61

Congenital Heart Defects and Other Congenital Anomalies in Situs Inversus Totails: A Hospital-based Study

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Background and objective: Few studies have assessed the comorbid diseases in situs inversus totalis (SIT) comprehensively. The aim of this study was to provide insight into the spectrum and prevalence of congenital heart defects and other congenital anomalies in SIT.
Methods: Children ≤18 years of age with SIT were enrolled in this retrospective observational study. Situs status and comorbidities were independently confirmed by 2 physicians, based on review of radiologic and ultrasonic examination, operative records, and case notes.
Results: A total of 150 children (median age: 1.23 years; range: 1 day-17.8 years) confirmed to have SIT were recruited between January 2009 and December 2018. Associated conditions were diagnosed in 115 children (76.7%). Among them, 27 children (18.0%) had multiple anomalies affecting two or more organ systems. The most commonly associated conditions were congenital heart defects (n=75, 50.0%), followed by primary ciliary dyskinesia (n=15, 10.0%), renal disorders (n=12, 8.0%), biliary atresia (n=9, 6.0%), skeletal dysplasia (n=8, 5.3%) and mental retardation (n=4, 2.7%). Other comorbidities included dwarfism, hernia, cleft lip and palate, hypospadias, precocious puberty and so on. These comorbid diseases highly overlap with the typical phenotypes of ciliopathy.
Conclusion: A substantial proportion of children with SIT have comorbidity with ciliopathy-like phenotypes, which is suggestive of the important role of cilia in left-right asymmetry development.

76

Comparison of Amplatzer Duct Occluder II and Modified Symmetric Double-disk Occluder in Transcatheter Closure of Small Perimembranous Ventricular Septal Defect

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Aims: The present study was carried out to compare the effectiveness and mid-term follow up results following transcatheter closure of perimembranous ventricular septal defect (PmVSD) using Amplatzer duct occluder II (ADO-II) and modified symmetric double-disk occluder in children.
Methods: All available clinical and follow-up data of children with PmVSD sized below 6.5 mm receiving transcatheter closure with ADO-II (n=121) or modified symmetric double-disk occluder (n=133) from January 2016 to December 2018 in our hospital were retrospectively reviewed and compared.
Results: The mean age (3.7±2.4y vs 3.4±1.6y, P=0.205) and mean diameter of defect (2.37±0.76 vs 2.51±0.57, P=0.100) were not comparable, while the transfersheath size (4.45±0.53F vs 5.79±0.61F, P<0.001) and occluder size (3.55±0.80 vs 4.59±0.53, P<0.001) were significantly different between the two groups. Operation time seemed slightly longer and the cost was higher in ADO-II group compared with symmetric double disk occluder group (37.96±16.80 min vs 30.85±11.88 min, P<0.001; 45000¥ vs 37000¥). However, retrograde transcatheter closure was successful with ADO-II in 42 patients. No severe complications including death, new-onset significant aortic valve regurgitation, complete or high-degree heart block and infectious endocarditis were observed in both groups. The incidence of post-procedure arrhythmias (38/121(31.40%) vs 46/133(34.59%); 21/99(21.21%) vs 24/107 (22.43%); all P>0.05) and mild valve insufficiency (5/99(5.05%) vs 5/107(4.67%), P>0.05) were similar in both groups.
Conclusion: Transcatheter closure of small type PmVSD using ADO-II was safe and effective with simple manipulation and small delivery sheath, but appeared to be not obviously superior to modified symmetric double-disk occluder owing to its higher costs and similar post-procedure complications.

ABSTRACTS

Abstracts for Poster Presentations:

PAEDIATRIC CARDIOLOGY

84

Effect of Human Cytomegalovirus UL135 Protein on Vascular Endothelial Cell and Its Mechanism in Kawasaki Disease

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Background: Kawasaki disease (KD) is an acute febrile self-limited disease, whose complication typically refers to severe coronary artery damage. The ULb 'region which encodes 133-138 genes of human cytomegalovirus (HCMV) is the specific sequence of clinical viral strains associated with the infection and damage to endothelial cells. This study aims to investigate the effect of UL135 protein in HCMV ULb 'region on human vascular endothelial cells and its mechanism.

Methods: The serum titer levels of UL135 protein was detected by ELISA in Kawasaki patients, fever children and healthy children. HCMV UL135 protein was expressed in vascular endothelial cells with eukaryotic expression vector. Cell proliferation was detected by CCK8 assay, cell migration by both cell scratch and Transwell assay, apoptosis and cell cycle by flow assay, and angiogenesis was conformed by tube formation. Related protein interacting with UL135 protein was explored by immunoprecipitation and thereafter verified by western blot. SiRNA interference technology was applied to explore the function of CD2AP protein on endothelial cells. Homologous recombination was adopted to construct plasmids with different mutation to further the mechanism.

Results: The UL135 antibody titer was significantly higher in Kawasaki children than that in healthy children ($P<0.05$) and fever children ($P<0.05$). Endothelial cells have expressed UL135 protein, whose proliferation and migration was inhibited, along with unaffected apoptosis and cell cycle. According to immunofluorescence, the result indicated that UL135 protein mainly located in the perinuclear and cell membrane remodeled the actin cytoskeleton. The co-immunoprecipitation and western blot laid out the interaction between CD2AP and UL135 protein. SiRNA interferes with CD2AP, which promoted the proliferation and migration of endothelial cells. The inhibitory effect of UL135 protein on proliferation and migration was significantly reduced in 151-213 mutant.

Conclusion: Human cytomegalovirus UL135 protein antibody was detected to be specifically elevated in children with Kawasaki disease, suggesting HCMV is likely to incur and exacerbate endothelial damage to some extent. The study results demonstrate that human cytomegalovirus UL135 protein could inhibit the proliferation and migration of endothelial cells by binding CD2AP in its 151-213 region.

86

Interventional Treatment of Patent Ductus Arteriosus Combined with Congenital Bronchial Artery Pulmonary Arteriovenous Fistula: Clinical Outcomes and Follow-up

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Background: Congenital bronchial artery to pulmonary artery or vein fistula (BA-PAVF) is a rare abnormality which may induce recurrent pulmonary infection, fatal hemoptysis, and respiratory failure and it is even scarcely reported that BA-PAVF coexisted with patent ductus arteriosus (PDA). Therefore, BA-PAVF can be easily neglected or misdiagnosed in clinic without being treated timely.

Methods and results: In our study, 22 children were diagnosed with congenital BA-PAVF and PDA by cardiac catheterization and selective bronchial arteriography. For BA-PAVF which was greater than the horizontal adjacent bronchial artery, vascular plug, MicroNester embolization coils, and interlock fibered IDC occlusion system were respectively used to close BA-PAVF after the transcatheter closure of PDA. And the size, shape, number, tortuosity degree of the fistula, the location of the lesions, the specific complications and family economic status were seriously considered before the procedure. Two of the patients respectively existed small atrial septal defect (ASD) and small ventricular septal defect (VSD). Finally, 9 of them accepted transcatheter embolization (TCE) according to the size of the fistula. After intermediate to long-term follow-up, all patients have no abnormal discovery.

Conclusions: One-stage interventional closure of BA-PAVF and PDA can be used safely and effectively in children coexisted with BA-PAV and PDA and selective bronchial arteriography is an optimal examination to precisely localize BA-PAVF, but the establishment of specific therapy criteria needs more clinical data and summary.

ABSTRACTS

Abstracts for Poster Presentations:

PAEDIATRIC CARDIOLOGY

97

Research on Relevant Factors and the Value on Prenatal Ultrasound Diagnosis for Coarctation of the Aorta

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Background: Prenatal diagnosis for Coarctation of the Aorta (CoA) was very difficult. Both false-positive and false-negative diagnosis were common.
Objective: To improve the accuracy of prenatal diagnosis for CoA by comparatively analyzing the relevant factors and their application value.
Methods: 138 fetuses of disproportion of ventricles and great vessels were selected between January 2011 and May 2018 at Guangdong Cardiovascular Institute. Only liveborn fetuses with complete postnatal follow-up were included in the study. One hundred and twelve cases were retrieved and analyzed. Different fetal echocardiography parameters and features were selected to evaluate the diagnostic value. Logistic regression analysis was used to select the best predictors of CoA and optimal cut-offs for these parameters were identified by ROC analysis.
Results: We studied 112 cases, including 59 (52.9%) with CoA and 53 (47.3%) without. According to our analysis, the parameters most predictive of postnatal CoA and the cut-off values were: gestational age of the first diagnosis <34.5 weeks, Z-score of left ventricular diameter <-1.8, Z-score of aortic isthmic diameter <-2.7, diameter ratio of pulmonary/aortic valve >1.6. AUC yielded by these parameters in combination was 0.94 (95%CI: 0.89-0.99). The study group was divided into two subgroups by gestational age of the first diagnosis. The parameters and cut-off values in subgroups were selected by the same analysis as above: Group I (≤34.5 weeks), Z-score of right ventricular diameter >2.1, diameter ratio of pulmonary/aortic valve >1.6; Group II (>34.5 weeks), diameters ratio of pulmonary /aortic valve >1.7, diameters ratio of arterial duct/isthmus >2.3. Meanwhile, some ultrasound features (including aortic arch hypoplasia, retrograde blood flow of aortic isthmus) should also be considered to improve diagnostic accuracy.
Conclusions: Combined with the use of different ultrasound parameters and features at different gestational weeks can improve the accuracy of the prenatal diagnosis of CoA in the right heart dominant fetus.

98

Prenatal Ultrasound Diagnosis of Isolated Total Anomalous Pulmonary Venous Connection

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Background: Prenatal diagnosis of isolated total anomalous pulmonary venous connection (TAPVC) was important for appropriate prenatal counseling and perinatal management.
Objective: To explore the echocardiographic features of fetal TAPVC in order to assess accuracy of prenatal diagnosis.
Methods: 35 fetuses with suspected isolated TAPVC were observed between January 2011 and May 2018 at Guangdong Cardiovascular Institute. Fetal echocardiographic images, confirmed by pathology or postnatal assessment, were reviewed. We systematically analyzed echocardiographic features as follow: presence of a pulmonary venous confluence behind the left atrium or a vertical vein, the complete pulmonary venous return pathway (obstructive or not), ventricular disproportion, the left atrium-descending aorta distance and Doppler flow patterns.
Results: Within the study period, 35 fetuses were diagnosed with suspected isolated TAPVC at a mean gestational age of 27.5±4.5 weeks (range from 22 to 38 weeks). Twenty-three cases were terminated and their diagnosis was confirmed by autopsy. Twelve cases were born and 9 of them were diagnosed with TAPVC by postnatal assessment, whereas the rest were considered as false-positive cases. The direct and indirect signs of ultrasonography were summarized. Pulmonary venous confluence was detected in 100% (32/32) of the cases, while a complete pulmonary venous return pathway in 90.6% (29/32), an obstructed venous return in 77.8% (7/9), and a vertical vein in 88.9% (16/18). We found a dilatation of vein (including vena cava or coronary sinus) in 100% (32/32), and ventricular disproportion in 34.4% (11/32). There was no correlation between right ventricular dominance and gestational age, TAPVC subtype, pulmonary venous obstruction or the size of oval foramen. An increased left atrium-descending aorta distance was observed in 73.3% (22/30). This might due to the location of the pulmonary venous confluence. Color Doppler was useful for ensuring the continuity of common pulmonary vein and left atrium. Low-flow color mapping to identify individual pulmonary vein could be a valuable tool for diagnosis.
Conclusions: Fetal echocardiography permits prenatal diagnosis of isolated TAPVC. Leading sonographic features were very useful for the estimate of subtype and obstruction site.

ABSTRACTS

Abstracts for Poster Presentations:

PAEDIATRIC CARDIOLOGY

103

The Surgical Outcomes of TAPVD and the Pre-operation Risk Factors

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Backgrounds: The surgical outcomes of total anomalous pulmonary venous drainage (TAPVD) has been improved. However, the mortality rate of some critically ill neonates is still high.
Methods: A retrospective review was conducted for all neonates and infants (n=287) who underwent operations for isolated TAPVD from 2008 to 2018.
Results: Median weight was 4.6 kg, median age at operation was 36d. Thirty-five (12.19%) patients were diagnosed with infracardiac TAPVD and 15 (5.23%) patients were diagnosed with mix type. There were 14 (4.88%) early death. Age, LVDD, poor status, infracardiac or mix type, pulmonary venous obstruction (>2 m/s), ventilation support before operation were associated with higher mortality by univariable anlysis. Pre-op PVO (aHR 2.006, p=0.027), infracardiac type (aHR 2.154, p=0.035), mix type (aHR 3.368, p=0.004) and ventilation support (aHR 1.002, p=0.028) were the pre-operation risk factors of early mortality after surgical repair by multilevel mixed-effect model analysis.
Conclusion: The operation of isolated TAPVD is associated with high mortality in neonates and infants with pre-operation risk factors.

104

Identification of Risk Factors for Arrhythmias Following Transcatheter Closure of Perimembranous Ventricular Septal Defect with Amplatzer Duct Occluder II

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Backgrounds: Amplatzer duct occluder II (ADO-II) has recently been used for transcatheter closure of small to moderate perimembranous ventricular septal defect (PmVSD). Data regarding incidence of post-procedure arrhythmias and associated risk factors are limited. We aimed to determine the general incidence and associated risk factors for arrhythmias following transcatheter closure of PmVSD with ADO-II.
Methods: All available clinical and follow-up data of children with PmVSD receiving transcatheter closure using ADO-II (n=163) from March 2016 to December 2018 in our hospital were retrospectively reviewed. The demographic and clinical data were compared between the arrhythmias group (n=47) and the control group (n=116). Logistic regression analysis was applied to determine the independent factors for post-procedure arrhythmias.
Results: A total of 46 cases suffered from post-procedure arrhythmias, with a general incidence of 28.83% (47/163). Most of them occurred during the first two weeks after the procedure, but late-onset arrhythmias were still observed. No complete or high-degree atrioventricular block (AVB) was noted. Complete left bundle branch block (CLBBB) was noted in five cases, with one case of incomplete left bundle branch block (ILBBB), three cases of complete right bundle branch block (CRBBB), five cases of left anterihemiblock (LAH), seventeen cases of incomplete right bundle branch block (IRBBB), one case of LAH & IRBBB, two cases of first degree atrioventricular bock (AVB) and four cases of ventricular premature beats and nine cases of junctional escape rhythm. Most of them (21/47, 44.68%) recovered to normal after steroids treatment. Longer operation time (OR:1.023, 95% CI:1.002~1.045, P=0.032) were identified as the risk factors of arrhythmias after transcatheter closure of PmVSD using ADO-II.
Conclusion: The incidence of arrhythmias after transcatheter closure of PmVSD using ADO-II was acceptable since no complete or high-degree AVB was noted and most of them were transient. Longer operation time should be avoided. Longer follow-up with periodic electrocardiography examination may be mandatory as late-onset arrhythmias could occur.

ABSTRACTS

Abstracts for Poster Presentations:

PAEDIATRIC CARDIOLOGY

137

Rare Variants in GATA4 Diminish the Interaction with ZFPM2 in Congenital Heart Defect Patients

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Background: Congenital heart defect (CHD) is one of the most common pediatric cardiovascular diseases increasing the burden of society and family. Both genetic and environmental factors contribute a lot to early elaboration of the pathogenesis of this disease. Although the underlying mechanism of abnormal cardiac development remains unclear, increasing evidence reveals that genetic factors play a pivotal role in pathogenesis of CHD.
Methods: We recruited eight sporadic patients to perform whole exome sequencing and verified the variants with Sanger sequencing. Co-IP/WB and immunofluorescence were carried out to evaluate the interaction between GATA4 and ZFPM2. Two candidate pathogenic variants were screened in 226 critical congenital heart disease patients via Sanger sequencing.
Results: We found three missense and three synonymous variants of GATA4 by whole exome sequencing and confirmed using Sanger sequencing. Function studies showed that missense variants of GATA4 influence the status of interaction between GATA4 and ZFPM2. Protein GATA4 with P163S or P408Q variant may decrease the interaction with ZFPM2. What's more, immunofluorescence confirmed that P163S and P408Q variant diminished the co-localization between GATA4 and ZFPM2 protein contrast to WT protein. However, we didn't find P163S and P408Q in 226 critical congenital heart disease patient.
Conclusion: This study indicates that two rare variants of GATA4 might disturb its own interaction with ZFPM2, which possibly explains abnormal cardiac morphogenesis partly.

145

Stent Implantation in Severe Left Pulmonary Artery Stenosis Developed After Surgery of Complex Congenital Heart Defects

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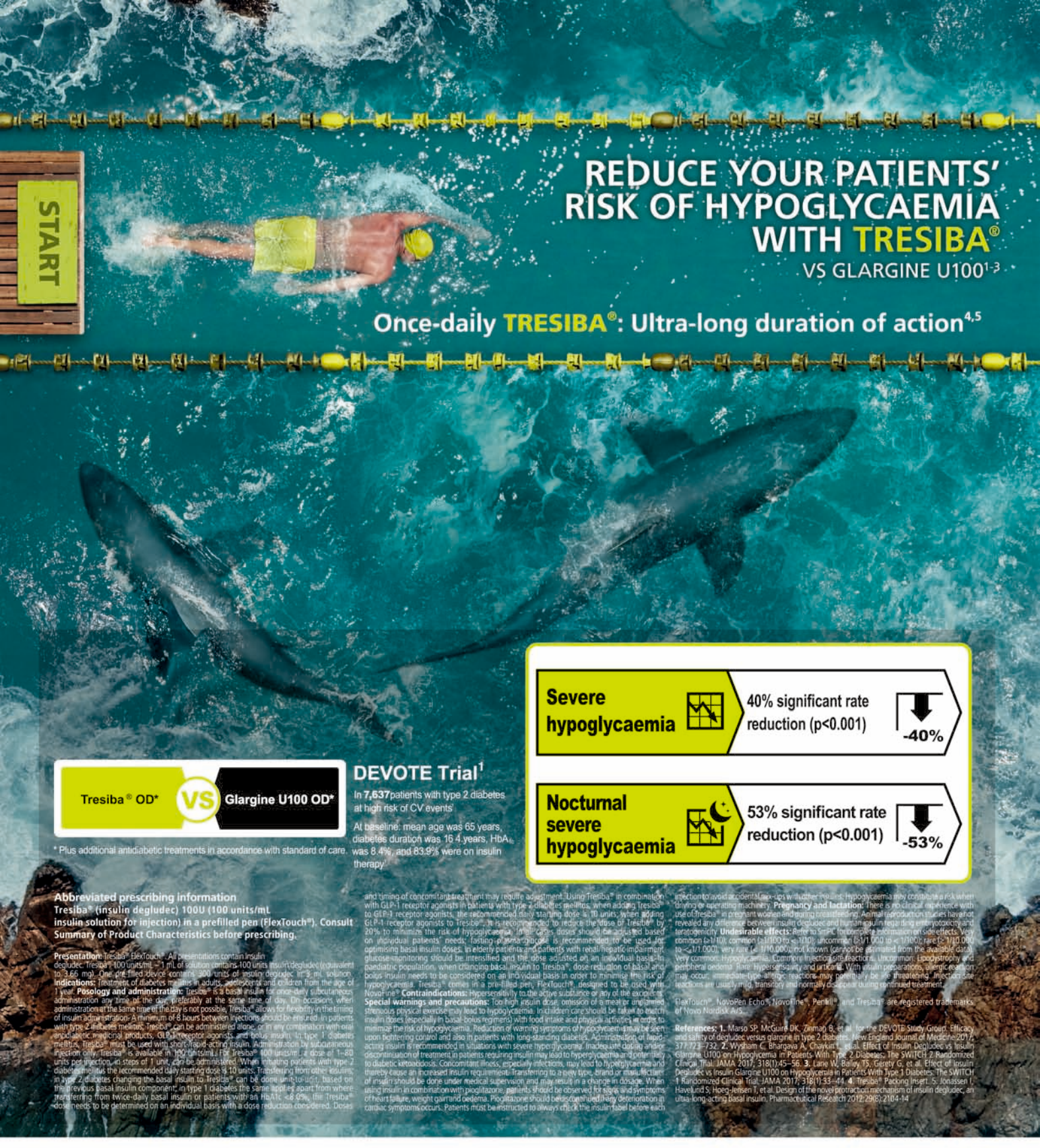
Background: Patient had complex congenital heart defects and underwent two times of surgical repairs about 3 years ago. Recently he had found severe stenosis of left pulmonary artery (LPA) and finally corrected by implantation of stent.
Case: Patient was a 3-year-old boy with the weight of 14 kg. He had found to have aortic coacration, ventricular septal defect, atrial septal defect and patent ductal arteriosus and received surgical repair in February 2016. Half year later in August 2016, patient had another surgical repair because of stenosis of aortic anastomosis. This year in Mar, patient had found of severe stenosis in the origin of LPA and it seemed nearly atresia in cardiac CT. In order to make definite diagnosis and therapeutic plan, patient was scheduled to have cardiac catheterization and angiography. It demonstrated that marked dilation of main pulmonary artery and right pulmonary artery. The beginning of LPA was narrow and about 1.2 mm in measurement. Fortunately, the distal part of LPA was still well developed. It was considered good indication to place stent. Firstly, a coronary dilation balloon (4.5 mm*15 mm) was used to pre-dilate the stenotic origin. Then, a stent of 10 mm*37 mm was placed. After stent implantation, a repeat cardiac catheterization and angiography showed excellent result, with the pressure of right ventricle decreasing from 106/1 mmHg pre-procedure to 39/2 mmHg after procedure and improving blood supplying of left lung.
Decision-making: Balloon dilation and stent implantation are effective therapeutic strategies of branch pulmonary artery stenosis developing after surgical repair of congenital heart defects. It could avoid reoperation and reduce injury to patients. It was suitable for stent implantation in those cases with well-developing distal pulmonary artery branches. Coronary balloon dilation could be performed in extremely narrow vessel, in order to further place the stent.
Conclusion: Balloon dilation and stent implantation are effective therapeutic strategies of branch pulmonary artery stenosis developing after surgical repair of congenital heart defects.



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DEVOTE Trial[1]

In **7,637** patients with type 2 diabetes at high risk of CV events

At baseline: mean age was 65 years, diabetes duration was 16.4 years, HbA_{1c} was 8.4%, and 83.9% were on insulin therapy

Abbreviated prescribing information

Tresiba® (insulin degludec) 100U (100 units/mL insulin solution for injection) in a prefilled pen (FlexTouch®). Consult Summary of Product Characteristics before prescribing.

Presentation: Tresiba® FlexTouch®. All presentations contain insulin degludec. Tresiba® 100 units/mL – 1 mL of solution contains 100 units insulin degludec (equivalent to 3.66 mg). One pre-filled device contains 300 units of insulin degludec in 3 mL solution. **Indications:** Treatment of diabetes mellitus in adults, adolescents and children from the age of 1 year. **Posology and administration:** Tresiba® is a basal insulin for once-daily subcutaneous administration any time of the day, preferably at the same time of day. On occasions when administration at the same time of the day is not possible, Tresiba® allows for flexibility in the timing of insulin administration. A minimum of 8 hours between injections should be ensured. In patients with type 2 diabetes mellitus, Tresiba® can be administered alone, or in any combination with oral antidiabetic medicinal products, GLP-1 receptor agonists and bolus insulin. In type 1 diabetes mellitus, Tresiba® must be used with short-/rapid-acting insulin. Administration by subcutaneous injection only. Tresiba® is available in 100 units/mL U-100 Tresiba® 100 units/mL at dose of 1–80 units per injection, in steps of 1 unit, can be administered. When initiating patients with type 2 diabetes mellitus the recommended daily starting dose is 10 units. Transferring from other insulins: in type 2 diabetes changing the basal insulin to Tresiba® can be done unit-to-unit, based on the previous basal insulin component; in type 1 diabetes the same applies apart from when transferring from twice-daily basal insulin or patients with an HbA1c <8.0%, the Tresiba® dose needs to be determined on an individual basis with a dose reduction considered. Doses and timing of concomitant treatment may require adjustment. Using Tresiba® in combination with GLP-1 receptor agonists in patients with type 2 diabetes mellitus: when adding Tresiba® to GLP-1 receptor agonists, the recommended daily starting dose is 10 units; when adding GLP-1 receptor agonists to Tresiba®, it is recommended to reduce the dose of Tresiba® by 20% to minimize the risk of hypoglycaemia. In all cases doses should be adjusted based on individual patients' needs; fasting plasma glucose is recommended to be used for optimising basal insulin doses. In elderly patients and patients with renal/hepatic impairment, glucose monitoring should be intensified and the dose adjusted on an individual basis. In paediatric population, when changing basal insulin to Tresiba®, dose reduction of basal and bolus insulin needs to be considered on an individual basis in order to minimise the risk of hypoglycaemia. Tresiba® comes in a pre-filled pen, FlexTouch®, designed to be used with NovoFine®. **Contraindications:** Hypersensitivity to the active substance or any of the excipients. **Special warnings and precautions:** Too high insulin dose, omission of a meal or unplanned strenuous physical exercise may lead to hypoglycaemia. In children care should be taken to match insulin doses (especially in basal-bolus regimens) with food intake and physical activities in order to minimize the risk of hypoglycaemia. Reduction of warning symptoms of hypoglycaemia may be seen upon tightening control and also in patients with long-standing diabetes. Administration of rapid-acting insulin is recommended in situations with severe hyperglycaemia. Inadequate dosing and/or discontinuation of treatment in patients requiring insulin may lead to hyperglycaemia and potentially to diabetic ketoacidosis. Concomitant illness, especially infections, may lead to hyperglycaemia and thereby cause an increased insulin requirement. Transferring to a new type, brand or manufacturer of insulin should be done under medical supervision and may result in a change in dosage. When using insulin in combination with pioglitazone, patients should be observed for signs and symptoms of heart failure, weight gain and oedema. Pioglitazone should be discontinued if any deterioration in cardiac symptoms occurs. Patients must be instructed to always check the insulin label before each injection to avoid accidental mix-ups with other insulins. Hypoglycaemia may constitute a risk when driving or operating machinery. **Pregnancy and lactation:** There is no clinical experience with use of Tresiba® in pregnant women and nursing mothers. Animal reproduction studies have not revealed any difference between insulin degludec and human insulin regarding embryotoxicity and teratogenicity. **Undesirable effects:** Refer to SmPC for complete information on side effects. Very common (≥1/10); common (≥1/100 to < 1/10); uncommon (≥1/1,000 to < 1/100); rare (≥1/10,000 to <1/1,000); very rare (< 1/10,000); not known (cannot be estimated from the available data). Very common: Hypoglycaemia. Common: Injection site reactions. Uncommon: Lipodystrophy and peripheral oedema. Rare: Hypersensitivity and urticaria. With insulin preparations, allergic reaction may occur. Immediate-type allergic reactions may potentially be life threatening. Injection site reactions are usually mild, transitory and normally disappear during continued treatment.

FlexTouch®, NovoPen Echo®, NovoFine®, Penfill® and Tresiba® are registered trademarks of Novo Nordisk A/S.

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