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**CARDIOLOGY**



Including Abstracts of  
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# Management of Hypertension in Older People

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**WIN and TEO: Management of Hypertension in Older People:** Systolic hypertension above >160 mmHg is associated with cardiac, renal and cerebrovascular complications. In older people, treating hypertension offers cardiovascular benefits. Reduced salt intake and weight loss for obese older people improves blood pressure without any risk of adverse drug reactions. Blood pressure reduction is more important than the type of antihypertensive for cardiovascular risk reduction. The recommended drugs to start an older patient with isolated systolic hypertension are thiazides, calcium-channel blockers or angiotensin II receptor blocker. Studies were performed on relatively fit older patients, so benefits may not be generalisable to frail elderly. Alpha-blockers and beta-blockers are not recommended for first line therapy of hypertension but may be considered if there are other indications for their use. (*J HK Coll Cardiol* 2017;25:1-8)

*Drugs, elderly, hypertension, medication*

## 摘要

收縮壓高於160 mmHg的高血壓，與心臟、腎臟及腦血管併發症相關。在老年患者之中，治療高血壓可提高對心血管的效益。對肥胖的老年人，減低體重及鹽攝入量可改善血壓且沒有任何藥物不良反應的風險。降低血壓比減低抗高血壓心血管疾病風險類型更重要，對只有收縮壓高的老年高血壓患者，建議藥物可先使用噻嗪類、鈣通道阻滯劑或血管緊張素 II 受體阻斷劑。研究在相對比較健康的老年患者中進行，所以此效益可能不適用於體弱的老年患者。 $\alpha$  受體阻滯劑和  $\beta$  受體阻滯劑則不建議作為高血壓的一線治療，但如果有其他適應症，則可考慮使用。

關鍵詞：藥物、老年、高血壓、藥物治療

## Introduction

Older people are less likely to receive treatment for hypertension. Hypertension is also more difficult to control with age, particularly in women.<sup>1,2</sup> In United States, although increasing awareness among patients

and physicians may have improved treatment and control between 1988 to 2008, it was still disproportionately less for those age 60 years and over.<sup>3</sup> These high rates of hypertension and inadequate treatment and control for older people was also found in low and middle income countries.<sup>4</sup>

The prevalence of hypertension increases with age. There is also a step-wise increase in risk of major cardiovascular events with each hypertension stage. For patients age 80 years and older, the Framingham Heart Study found a 9.5% risk with normal blood pressure to 19.8%, 20.3% and 24.7% in pre-hypertension, Stage 1 and Stage 2 hypertension respectively.<sup>1</sup> Therefore, further study was required to assess whether hypertension treatment in older people attenuated this risk.

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The potential benefit of treating hypertension in older people was identified since the 1980s. Coope and Warrender found reduced stroke risk when hypertensive patients between 60 to 79 years old were treated, mostly with atenolol and bendrofluazide.<sup>5</sup> The European Working Party on High Blood Pressure in the Elderly trial (EWPHE) identified reduced cardiac mortality and a trend towards improved stroke mortality when treating those above 60 years with hydrochlorothiazide and triamterene.<sup>6</sup>

When EWPHE subgroup analysis was performed, although participants 70 years and older had similar improved outcomes as those between 60 to 69 years, there appeared little benefit for patients over 80 years old.<sup>7</sup>

The Swedish Trial in Old Patients with Hypertension (STOP-Hypertension) further extended the evidence for treatment to 84 years. Participants aged 70 to 84 from primary health care who received treatment with beta-blockers and diuretics had reduced stroke, myocardial infarction, cardiovascular death, stroke mortality and all-cause mortality.<sup>8</sup>

The Hypertension in Very Elderly Trial (HYVET) then specifically reviewed people aged 80 years and older. Treatment with indapamide and perindopril as required reduced strokes and stroke mortality, cardiac failure, cardiovascular mortality and all-cause mortality.<sup>9</sup>

These studies offer cumulative evidence that age alone is not an appropriate reason to withhold treatment. Management considerations for treating hypertension are discussed subsequently based on studies specifically of older people.

### **Hypertension Guidelines: The Need To Individualise Treatment**

Table 1 summarises the recommendations from three major recent guidelines on hypertension treatment for older people (NICE, ESH/ESC, JNC8).<sup>10-12</sup> There are subtle differences between them, reflecting uncertainty in some aspects of management. All studies performed also enrolled ambulatory older people with isolated systolic hypertension so these recommendations may not be generalisable to frail older people or those

with multiple medical conditions.

There is consensus that systolic blood pressure above 160 mmHg should be treated to a target of below 150 mmHg.<sup>10-12</sup> The Systolic Blood Pressure Intervention Trial (SPRINT) challenges this as patients 75 years and older had lower rates of major cardiovascular events and all-cause mortality with intensive (<120 mmHg) rather than standard (<140 mmHg) treatment.<sup>13</sup> A meta-analysis of studies on blood pressure targets may help clarify this issue. Whether benefits of intensive treatment without adverse events can be replicated outside trial settings with close supervision is uncertain.

While awaiting a consensus after the SPRINT trial, the guideline recommendations remain clear. Treatment is appropriate above systolic blood pressure of 150/90. The intensive or standard target should be individualised to tolerability of antihypertensive treatment and the general health of the patient i.e. fitter, independent older patients may benefit more from the intensive approach.

NICE guidelines<sup>10</sup> additionally gives targets for ambulatory or home blood pressure monitoring of 135/85 for under 80 years and 145/85 for above 80 years. For practical purposes, we would advocate for clinic blood pressure targets, with ambulatory or home blood pressure monitoring only if there was a concern regarding white coat hypertension.

### **Non-pharmacological Therapy: Reduced Salt Intake and Weight Loss (If Obese)**

A small trial of 47 people 60 to 78 years old found reduced salt intake resulted in blood pressure lowering for both normotensive and hypertensive subjects, similar to a thiazide treatment effect.<sup>14</sup> The findings were replicated in the Trial of Non-pharmacologic Interventions in the Elderly (TONE). When participants aged 60 to 80 years old reduced sodium intake or lost weight (if they were obese), there was improvement in blood pressure control compared to usual care. However, there was no reduction in cardiovascular events.<sup>15</sup>

As reduced salt intake and weight loss for obese older people improves blood pressure without any risk



**Table 1.** Summary of guideline recommendations specific for older patients

	<b>NICE 2011</b>	<b>ESH/ESC 2013</b>	<b>JNC8 2014</b>
When to Treat	<p>Stage 1 hypertension (SBP 140-159 mmHg or DBP 90-99 mmHg) if under 80 years old with one or more of the following: Target organ damage, established cardiovascular disease, renal disease, diabetes, 10 years cardiovascular risk of 20% or greater</p> <p>Stage 2 hypertension (SBP 160 mmHg or higher or DBP 100 mmHg or higher) at any age</p>	'Elderly' (not defined) SBP $\geq$ 160 mmHg	Age 60 years and older: SBP 150 mmHg or higher DBP 90 mmHg or higher
Blood Pressure Goals	<p>Age under 80 years: Clinic BP below 140/90 mmHg ABPM or HBPM below 135/85 mmHg during usual waking hours</p> <p>Age 80 years and over: Clinic BP below 150/90 mmHg ABPM or HBPM below 145/85 mmHg</p>	<p>SBP between 140 and 150 mmHg</p> <p>Age under 80 years: If fit, can consider SBP &lt;140 mmHg</p> <p>Age 80 years and over: SBP between 140 and 150 mmHg provided 'good physical and mental conditions'</p>	SBP lower than 150 mmHg DBP lower than 90 mmHg
Hypertension management when adverse reaction present e.g. orthostatic hypotension or falls	Measure postural blood pressure and if confirmed, review medications and consider referral to specialist care	SBP goals to be adapted to individual tolerability for 'fragile elderly' Decisions to be made by 'treating physician based on monitoring of clinical effects of treatment'	No specific recommendations
Cardiovascular Comorbidities	No specific recommendations	No specific recommendations	No specific recommendations
Cerebrovascular Comorbidities	No specific recommendations	'Elderly hypertensives with previous stroke or TIA, SBP values for intervention and goal may be considered to be somewhat higher'	No specific recommendations

(continued on page 3)



**Table 1.** Summary of guideline recommendations specific for older patients (cont'd)

	<b>NICE 2011</b>	<b>ESH/ESC 2013</b>	<b>JNC8 2014</b>
Renal Comorbidities	No specific recommendations	No specific recommendations	No evidence to support RAAS inhibition if older than 75 years - thiazide-type diuretic or CCB may be considered No evidence based recommendations for BP goal in those 70 years or older with GFR less than 60 mL/min/1.73 m <sup>2</sup> 'Should be individualised taking into consideration factors such as frailty, comorbidities and albuminuria'
Diabetic Comorbidities	No specific recommendations	Consider HBA1c target of 7.5 to 8.0% in 'fragile elderly' patients with a longer duration of diabetes, more comorbidities and at high risk of complications	No specific recommendations
Non-pharmacological	No specific recommendations	No specific recommendations	No specific recommendations
Pharmacological	Age over 55 years: Step 1: Calcium channel blocker If intolerance from oedema, evidence of heart failure or high risk of heart failure, thiazide diuretic  Thiazide like diuretic (Chlorthalidone, Indapamide) preferred over conventional thiazide diuretic (Bendroflumethiazide, hydrochlorothiazide)  Beta-blockers not preferred initial therapy for hypertension 'but may be considered in younger people'  'Offer people aged 80 years and over the same antihypertensive drug treatment as people aged 55-80 years, taking into account any comorbidities'	All antihypertensive agents are recommended and can be used in the elderly  'Diuretics and calcium antagonists may be preferred in isolated systolic hypertension'	Initial antihypertensive treatment should include thiazide type diuretic, calcium channel blocker, angiotensin converting enzyme inhibitor or angiotensin receptor blocker

NICE - National Institute for Health and Clinical Excellence; JNC8 - Eight Joint National Committee; ESH - European Society of Hypertension; ESC - European Society of Cardiology; SBP - Systolic Blood Pressure, DBP - Diastolic Blood Pressure; ABPM - Ambulatory Blood Pressure Monitoring; HBPM - Home Blood Pressure Monitoring; TIA - Transient Ischaemic Attack

of adverse drug reactions, this is recommended for hypertensive older people.

## Pharmacological Therapy

When comparing classes of antihypertensive agents, none have stood out as superior over others in terms of cardiovascular outcomes. The International Verapamil-Trandolapril Study (INVEST) randomised patients 50 years and over to calcium antagonist (Verapamil) or non-calcium antagonist strategy (Atenolol) with trandolapril and hydrochlorothiazide as required to achieve blood pressure targets. There was no difference between groups for blood pressure reduction, myocardial infarction, stroke, mortality or treatment related adverse events.<sup>16</sup>

The STOP-Hypertension-2 trial randomised 70 to 84 years old to beta-blockers and diuretics (active treatment in STOP-Hypertension trial), ACE Inhibitors or calcium channel blockers.<sup>17</sup> All three groups had similar reductions in systolic blood pressure, cardiovascular events and rate of treatment related adverse events. This suggests blood pressure reduction is more important than type of antihypertensive used.<sup>18</sup>

However, the three classes with most evidence-base for hypertension treatment of older people are thiazide-type diuretics, calcium channel blockers and angiotensin II receptor blockers.

### Thiazide-Type Diuretic

The Medical Research Council (MRC) trial compared outcomes for patients aged 65 to 74 years randomised to placebo or active treatment with either atenolol or diuretic (hydrochlorothiazide and amiloride combined). Active treatment reduced strokes and cardiovascular events but was more significant with diuretics.<sup>19</sup>

Participants aged 60 and older were randomised to treatment with chlorthalidone and atenolol or placebo in the Systolic Hypertension in the Elderly Program (SHEP). Active treatment for almost five years reduced strokes, major cardiovascular events and all-cause mortality.<sup>20</sup> Non-insulin dependent diabetics also had twice the absolute risk reduction in major cardiovascular

events with chlorthalidone compared to non-diabetics in SHEP.<sup>21</sup>

The Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT) reinforced the benefits of thiazide diuretics. Patients 55 years and above were randomised to receive chlorthalidone, amlodipine or lisinopril. There was no difference between groups in terms of coronary heart disease or all-cause mortality. However, amlodipine had a higher rate of heart failure and lisinopril a higher rate of combined cardiovascular disease, stroke and heart failure compared to chlorthalidone.<sup>22</sup>

The HYVET trial mentioned earlier demonstrated benefits of indapamide-based diuretic treatment for hypertensive patients 80 years and over.<sup>9</sup> Even with factoring in frailty using the frailty index, there was no interaction between treatment effect and frailty, as both frail and fitter subjects seemed to benefit with treatment.<sup>23</sup>

At the conclusion of HYVET trial, an open label active treatment extension was performed for a year, with both groups given indapamide (and perindopril if required). The treatment group had reduced cardiovascular and total mortality but no difference in stroke and cardiovascular events, suggesting older patients benefit from early initiation in addition to long term treatment.<sup>24</sup>

### Calcium-Channel Blockers (CCBs)

The Systolic Hypertension in Europe Trial (Syst-Eur) randomized patients 60 years and older to nitrendipine (with enalapril and hydrochlorothiazide if required) or placebo. Treatment was associated with reduced stroke rates, all cardiac endpoints and all cardiovascular endpoints with a trend to reduced cardiovascular mortality.<sup>25</sup>

This study was replicated in Systolic Hypertension in China Trial (Syst-China), except captopril was added instead of enalapril to nitrendipine-based treatment. Despite the smaller sample size, there were larger-scale benefits with reduced strokes, stroke mortality, cardiovascular endpoints, cardiovascular mortality and all-cause mortality.<sup>26</sup>

As there were concerns regarding CCB treatment with diabetes, post-hoc analyses were performed comparing outcomes in diabetic and non-diabetic

patients. For Syst-Eur, reduction in all cardiovascular events, cardiovascular mortality and total mortality was more significant in diabetics.<sup>27</sup> In Syst-China, diabetics had two to three-fold risk for all endpoints in the placebo group but nitrendipine-based treatment reduced this excess risk to a non-significant level.<sup>28</sup>

The Felodipine Event Reduction (FEVER) trial compared risk of stroke and cardiovascular events in Chinese patients between 50 to 79 years with hydrochlorothiazide monotherapy and addition of felodipine or placebo. Additional felodipine reduced blood pressure by 4/2 mmHg, with reduced in stroke rate, cardiovascular events, heart failure and all-cause mortality.<sup>29</sup> Subgroup analysis of FEVER confirmed benefits of felodipine in uncomplicated hypertensives, Grade 1 hypertensives and older patients.<sup>30</sup> The blood pressure reduction achieved is unlikely to be clinically significant to cause such beneficial effects, supporting use of calcium-channel blockers for older people regardless of hypertension severity.

### **Angiotensin II Receptor Blockers (ARBs)**

The Valsartan Antihypertensive Long-term Use Evaluation (VALUE) trial compared cardiac outcomes in patients age 50 and older randomized to valsartan or amlodipine. There were larger reductions in blood pressure especially earlier in the trial with amlodipine but no differences in myocardial infarction, stroke and all-cause mortality.<sup>31</sup> In VALUE, additional antihypertensive agents were added if required. When analysis was limited to those receiving monotherapy only, there were lower rates of cardiac failure and new-onset diabetes with valsartan.<sup>32</sup> The reduction in cardiac failure with valsartan was more apparent with a longer duration of monotherapy, suggesting a true treatment effect.

The Losartan Intervention For Endpoint reduction in hypertension (LIFE) study compared outcomes in patients aged 55 to 80 years randomised to losartan or atenolol-based therapy. Despite no differences in extent of blood pressure reduction, the losartan group had lower risk of myocardial infarction, stroke or death and less frequent episodes of new-onset diabetes.<sup>33</sup> This suggests losartan may confer benefits beyond blood pressure reduction.

The Study on Cognition and Prognosis in the Elderly (SCOPE) reviewed patients aged 70 to 89 years to candesartan or placebo with open label antihypertensive agents (mostly thiazides) as required. Most participants eventually ended up receiving antihypertensive agents but there was a greater 2.9 mmHg reduction in systolic blood pressure with candesartan, with associated reduced non-fatal strokes and a trend towards reduced all strokes. There were no differences in myocardial infarction, cardiovascular mortality, cognitive decline or incident dementia.<sup>34</sup>

When analysis was restricted to those with isolated systolic hypertension, which was about a third of the participants, there were no differences in blood pressure reduction but risk of fatal and non-fatal strokes became significant.<sup>35</sup>

### **Other Agents – Not Recommended as First Line Therapy for Isolated Systolic Hypertension**

#### *ACE Inhibitors (ACEI):*

Although ACEIs and ARBs appear to have similar benefits in younger patients, the evidence for ACEIs is less clear for older people. The Second Australian National Blood Pressure Study (ANBP2) randomized 65 to 84 years old to ACEIs or diuretics. Although enalapril and hydrochlorothiazide were the recommended agents, actual prescriptions were determined by the family practitioner. While both groups had similar reduction in blood pressure, ACEIs were associated with in reduced cardiovascular events or death, which was limited to male patients only.<sup>36</sup>

This contradicts ALLHAT which found diuretics superior to ACEIs (comparing chlorthalidone to lisinopril) in terms of cardiac failure and stroke.<sup>22</sup> With this uncertainty, ACEIs should not be used as first-line hypertension treatment for older people.

#### *Alpha-Blockers:*

ALLHAT initially included a doxazosin arm in addition to chlorthalidone, amlodipine and lisinopril. An interim analysis four years after recruitment identified that doxazosin was associated with a higher risk of stroke, combined cardiovascular risk and doubling of heart failure risk compared to chlorthalidone. Although

there were no differences in fatal or non-fatal MI or all-cause mortality, due to these identified risks, there were sufficient grounds to discontinue the doxazosin arm.<sup>37</sup>

Patients assigned to doxazosin had a higher mean systolic blood pressure of 3 mmHg than chlorthalidone. When patients with doxazosin monotherapy or additional antihypertensive medications were compared, risk of heart failure was not eliminated completely suggesting the systolic blood pressure difference does not account fully for this risk.<sup>38</sup> Therefore, alpha-Blockers are not recommended for hypertension treatment in older people.

### **Beta-Blockers:**

Several studies included beta-blockers in combination with diuretics so comparisons are not possible.<sup>5,8,21</sup> The LIFE study found losartan superior to atenolol despite similar blood pressure outcomes.<sup>33</sup> While this may be due to beneficial effects of ARBs, alternatively atenolol could contribute hazardous effects resulting in this outcome. As there are other preferred agents for hypertension in older people, beta-blockers should not be used as first-line treatment.

## **Conclusion**

Ambulatory older people with hypertension should be treated regardless of age, particularly if systolic blood pressure is above 160 mmHg. Treatment should be individualised according to frailty and comorbidities. Non-pharmacological treatment for hypertension in older people, including reduced salt intake and weight loss (if obese) should be recommended. The main drug classes for hypertension treatment in older people are thiazide diuretics, calcium-channel blockers and angiotensin II receptor blockers.

## **Declaration of Interest**

The authors have no conflict of interests to declare.

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# Hong Kong College of Cardiology



Twenty-Fifth Annual Scientific Congress

16 - 18 June 2017

Sheraton Hong Kong Hotel and Towers  
Hong Kong

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# Scientific Programme

## Friday, 16 June 2017

0800	3/F of Tang Terrace	Registration	
0900-1030	<b>Ching Room, 4/F</b>	<b>Free Paper Session</b> Percutaneous Coronary Intervention + Coronary Artery Disease Heart Failure	
	<b>Ming II Room, 4/F</b>	Basic Science	
1030-1100	4/F of Sung Terrace	Coffee Break & Visit Exhibits	
1100-1300	<b>Ching Room, 4/F</b>	<b>Free Paper Session</b> Electrophysiological Study Cardiac Imaging I	
	<b>Ming II Room, 4/F</b>	Case Report Session	
1300-1430	Oyster Bar, 18/F	Lunch	
1430-1600	<b>Ching Room, 4/F</b>	<b>Free Paper Session</b> Structural Heart Disease	
	<b>Ming II Room, 4/F</b>	Cardiac Imaging II Miscellaneous	
1600-1630	4/F of Sung Terrace	Coffee Break & Visit Exhibits	
1630-1730	<b>Ballroom C, 3/F</b>	<b>Best Paper Oral Presentation</b>	
1730-2000	<b>Ballroom C, 3/F</b>	<b>Mainland / Taiwan / Hong Kong Expert Forum</b> Insights into C-type Natriuretic Peptide and Its Potential Therapeutic Use in Heart Failure It's Challenged to Perform Rotational Ablation for Under-Expanded Double Layer Stents PCI Strategy for the Complex LM Disease Circulatory Support in Complex PCI Left Atrial Appendage Closure Experience and Single-center Data Bioabsorbable Vascular Scaffold for Severely Calcified Vessels Assisted Circulation and Vascular Protection	Wei-min Li (PR China) Po-chang Wang (Taiwan) Yi-da Tang (PR China) Kam-tim Chan (Hong Kong) Ya-wei Xu (PR China) I-Fan Liu (Taiwan) Gui-fu Wu (PR China)
2000-2130	<b>Ballroom A&amp;B, 3/F</b>	<b>Welcome Dinner</b>	



## Saturday, 17 June 2017

0800	3/F of Tang Terrace	Registration	
0830-1230	<b>Ballroom C, 3/F</b>	<b>Joined Symposium – Cross-straits Medicine Exchange Association / Hong Kong College of Cardiology Guideline and Practice: Clinical Case Based Conference (GAP-CCBC)</b> <i>(Presentation in English or Putonghua)</i>	
		Coexistence of Acute Pulmonary Embolisms and Acute Myocardial Infarction Accompanied by Incidental Leriche Syndrome: A Case Report and Review of Literature Fuwai Hospital 中國醫學科學院阜外醫院	Xuanqi An (PR China) 安宣齊
		The Goal of FFR after PCI Cheng Hsin General Hospital 振興醫院	Hsu-lung Jen (Taiwan) 任崑龍
		How Big is the Leak Queen Elizabeth Hospital 伊利沙伯醫院	Jason LK Chan (Hong Kong) 陳良貴
		Laser+DCB: The Future for ISR Treatment? Shanghai Tenth People's Hospital 上海市第十人民醫院	Ya-wei Xu (PR China) 徐亞偉
		An Unexpected Way to the End: Recurrent Ventricular Tachycardia After Myocardial Infarction People's Hospital of Guangdong Province 廣東省人民醫院	Ying-cong Liang (PR China) 梁穎聰
		Complex PCI case Taichung Veterans General Hospital 臺中榮民總醫院	Yu-tsung Cheng (Taiwan) 鄭諭聰
		Short Term Benzbromarone Treatment to Prevent Contrast Induced Nephropathy Beijing Chaoyang Hospital 北京朝陽醫院	Ji-fang He (PR China) 何冀芳
		Epicardial Catheter-Based Ventricular Reconstruction in a Patient with Ischemic Heart Failure and Anteroapical Aneurysm Xiamen Cardiovascular Hospital 廈門心臟中心	Jian Wang (PR China) 王建
		BVS in Real World Practice: An Overview of Multi-Center Experiences in Taiwan National Taiwan University Hospital 國立臺灣大學醫學院附設醫院	Yi-chih Wang (Taiwan) 王怡智
		Stent Thrombosis with Bioresorbable Vascular Scaffolds Conde S. Januário General Hospital 仁伯爵綜合醫院	Edmundo Patricio Lopes Lao (Macau) 劉百球
		Sudden Death in a Right Heart Failure Patients with Gastric Carcinoma First Affiliated Hospital of Dalian Medical University 大連醫科大學附屬第一醫院	Xiao-le Yang (PR China) 楊曉蕾
		RFCA on Slow Heartbeat of Atrial Flutter Hebei Yanda Hospital 河北燕達醫院	Chia-wei Chen (PR China) 陳佳緯

## Saturday, 17 June 2017

0930-1200	<b>Ballroom A&amp;B, 3/F</b>	<b>Symposium for Allied Cardiovascular Health Professionals 2017: Management of Complications Arising from Procedures in Cardiac Catheterization</b> <b>Laboratory</b> Management of Complications of Percutaneous Coronary Intervention Management of Complications of Radiofrequency Ablation Management of Complications of Structural Heart Disease Intervention Management of Complications of Cardiovascular Implantable Electronic Device Implantation	Tak-shun Chung (Hong Kong) Steve WK Lai (Hong Kong) Yat-yin Lam (Hong Kong) Ho-chuen Yuen (Hong Kong)
1245-1345	<b>Ballroom, 3/F</b>	<b>Pfizer Lunch Symposium</b> (Lunch will be provided) Personalizing NOACs for AF Patients: Hot Topic and Current Issues	Basil S. Lewis (Israel)
1400-1430	<b>Ballroom, 3/F</b>	<b>25th ASC Opening Ceremony</b> Guest-of-Honor: Prof. Siu-chee Chan, JP Under Secretary for Food and Health, Government of Hong Kong Special Administrative Region	
1430-1530	<b>Ballroom, 3/F</b>	<b>AstraZeneca Symposium</b> Redefining the Role of DAPT in MI Management From Efficacy to Effectiveness: CVD REAL Study	Steven SL Li (Hong Kong) Chung-seung Chiang (Hong Kong)
1530-1630	<b>Ballroom, 3/F</b>	<b>Amgen Symposium</b> What is New in PCSK9 Inhibitors in 2017 & Beyond? Case Presentation Local Clinical Case Presentation	Hung-fat Tse (Hong Kong) Kin-man Miu (Hong Kong)
1630-1900	<b>Ballroom, 3/F</b>	<b>Plenary Lectures</b> Optimising AF Treatment for High Risk People: Real-life Lessons from Hospital Clinics Who are the Most Suitable Patients for the Novel Lipid Therapy - PCSK9 Inhibitors? Update on the Management of Chronic Stable Angina Update on Treatment of Fluid Overload & Hyponatremia in HF Critical Limb Intervention in Hong Kong	Joseph SK Kwan (Hong Kong) Vincent OH Kwok (Hong Kong) William E. Boden (USA) David CW Siu (Hong Kong) Bryan PY Yan (Hong Kong)
1915-2000	<b>Ballroom, 3/F</b>	<b>Hong Kong Heart Foundation Lecture</b> Human-Induced Pluripotent Stem Cell Platform for Cardiovascular Diseases - Are We Lost in Translation?	Hung-fat Tse (Hong Kong)
2000-2130	<b>Ballroom A&amp;B, 3/F</b>	<b>Dinner</b>	

*\*Coffee will be served at 10:30 - 11:00 & 17:00 - 18:30 at 4/F of Sung Terrace.*

## Sunday, 18 June 2017

0800	3/F of Tang Terrace	Registration	
0830-1030	<b>Ballroom C, 3/F</b>	<b>PCI Cases Discussion Prize Presentation</b>	
1030-1100	4/F of Sung Terrace	Coffee Break & Visit Exhibits	
1100-1330	<b>Ballroom C, 3/F</b>	<b>Plenary Lectures</b> Emerging Leader Forum - Challenging CTO case with Resolute Onyx - Local Clinical Data of Resolute Onyx - Simplify the Challenges with Resolute Onyx Our experience in Absorb & Best in Class DES - Xience Management of Sympathetic OverDrive Hypertension Implications of EMPA-REG OUTCOME in Asian Patients Taking Heart Failure Management a Step Further	Yu-ho Chan (Hong Kong) Frankie CC Tam (Hong Kong) Shing-fung Chui (Hong Kong) Kazuyuki Yahagi (Japan) David CW Siu (Hong Kong) David CW Siu (Hong Kong) Cheuk-man Yu (Hong Kong)
1330-1500	Ballroom A&B, 3/F	Lunch	
1500-1630	<b>Ballroom C, 3/F</b>	<b>Symposium on Novel Technologies in Cardiology TAVI</b> TAVI in Asia - Are We Ready for the Prime Time Common Queries on MitraClip Procedure Leadless Pacemaker Left Atrial Appendage Closure - Matching Device with Anatomy Leadless Pacemaker	Michael KY Lee (Hong Kong) Boron CW Cheng (Hong Kong) Simon CC Lam (Hong Kong)  Gary CP Chan (Hong Kong)
1630-1700	4/F of Sung Terrace	Coffee Break & Visit Exhibits	
1700-1830	<b>Ching Room, 4/F</b>	<b>Heart Rhythm Symposium - Difficult CIED Scenarios</b> The Pacemaker Detects AF, Do I Need to be Concerned? The Patient Still Complains of SOB After CRT, What Next? My Patient has an ICD Shock, Appropriate or Inappropriate? How Should I Manage? How to Manage an ICD Patient with VT Storm?	Chu-pak Lau (Hong Kong) JoJo SH Hai (Hong Kong) Gary CP Chan (Hong Kong) Lily Cheung (Hong Kong)
1830-2000	<b>Sung Room, 4/F</b>	<b>Farewell Dinner</b>	

# Paediatric Cardiology Symposium Programme

**Saturday, 17 June 2017**

0830-0835	<b>Ching Room, 4/F</b>	<b>Welcome Address</b>	Adolphus KT Chau (Hong Kong)
0835-1030	<b>Ching Room, 4/F</b>	<b>Paediatric Cardiology Symposium I</b> Transcatheter Intervention of Dysfunctional RVOT Conduits  Right Ventricular Outflow Tract Strategies : Pulmonary Valve Preservation and Reconstruction Echocardiographic Evaluation of Right Ventricular Function Before and After Pulmonary Valve Implantation Cardiac MRI Assessment of Dysfunctional Right Ventricular Outflow Tract in Congenital Heart Disease. From an Interventionist's Perspective Experience of The Melody Valve in Percutaneous Pulmonary Valve Implantation	Sachin Khambadkone (United Kingdom) Xin Li (PR China)  Yiu-fai Cheung (Hong Kong)  Robin HS Chen (Hong Kong)  Sachin Khambadkone (United Kingdom)
1030-1100	4/F of Sung Terrace	Coffee Break & Visit Exhibits	
1100-1230	<b>Ching Room, 4/F</b>	<b>Free Paper Session Paediatric Cardiology I</b>	
1230-1400	Ballroom, 3/F	Lunch	
1400-1430	<b>Ballroom, 3/F</b>	<b>Opening Ceremony</b>	
1430-1600	<b>Ching Room, 4/F</b>	<b>Paediatric Cardiology Symposium II</b> Prevention and Treatment of Severe Complications of Transcatheter Closure of Atrial Septal Defect Cardiac Resynchronisation Therapy: Application in Children Discussion Timing of Cardiac Surgery in Congenital Heart Disease  Fetal Balloon Pulmonary Valvuloplasty: Two Case Reports Management of Severe Coronary Artery Lesion in Kawasaki Disease Transcatheter Occlusion of Aortopulmonary Window: An Available Minimally Invasive Choice Discussion	Hui-shen Wang (PR China)  Jin-jin Wu (PR China)  Rocha Barnabe Antonio (Hong Kong) Zhi-wei Zhang (PR China) Fang Liu (PR China)  Yi-min Hua (PR China)
1600-1750	<b>Ching Room, 4/F</b>	<b>Free Paper Session Paediatric Cardiology II</b>	

*\*Coffee will be served at 10:30 - 11:00 & 17:00 - 18:30 at 4/F of Sung Terrace.*

**ABSTRACTS**

Abstracts for Free Paper Session:

**PERCUTANEOUS CORONARY INTERVENTION + CORONARY ARTERY DISEASE**

**One Year Clinical Outcome of an Endothelial Progenitor Cell Capture Stent Versus Bare Metal Stent in Patient with De Novo Coronary Artery Lesions Treated with Drug-Eluting Balloon**

LT Lam, MH Jim

Grantham Hospital, Hong Kong

**Purpose:** Endothelial progenitor cell capture stent, commercially available as Genous stent, works by promotion of re-endothelialization, and therefore, requires shortened period of mandatory dual anti-platelet therapy (DAPT) without comprising the risk of stent thrombosis. However, whether it causes excessive intimal hyperplasia is not unclear. The purpose of this study is to examine the angiographic and clinical outcomes of Genous stent versus bare metal stent (BMS) in de novo coronary lesions after treatment by drug-eluting balloon (DEB).

**Methods:** From November 2012 to November 2015, a total of 51 patients with de novo coronary artery lesions were randomly assigned in the ratio of 1:1 to Genous Stent + DEB or BMS + DEB. All patients received at least 4 weeks of DAPT afterwards. Restudy angiograms were performed at 6-10 months. One year clinical outcomes data were also collected.

**Results:** There were no significant difference seen in baseline clinical, lesion, device and procedural characteristics in both groups. There were a trend of higher restenosis rate (Genous 12.5% vs BMS 5%,  $p=0.61$ ) and one year target vessel revascularization (TVR) rate (Genous 15.4% vs BMS 8%,  $p=0.69$ ) in Genous stent group than in BMS group, but it were both statistically insignificant. One year MI rates after discharge were low in both groups (Genous 0% vs BMS 4%,  $p=0.49$ ). There was one cardiac related death due to heart failure in the BMS group.

**Conclusions:** Overall the results from the two groups were similar. However, there were only nonsignificant descriptive results shown in this study. No definite recommendations regarding the use of Genous stent compared with BMS could be drawn in this study.

**Contrastive Study on the Prognostic Values From Independent GRACE Score, SYNTAX Score and Combined Scoring of GRACE And SYNTAX for Patients with ACS Undergoing PCI**

N Liu,<sup>1</sup> Q Liu,<sup>1</sup> B Xing<sup>2</sup>

<sup>1</sup>Department of Cardiology and Cardiac Catheterization Lab, Second Xiangya Hospital, Central South University, Changsha; <sup>2</sup>Department of Cardiology, Central South University Xiangya School of Medicine Affiliated Haikou Hospital, Haikou, China

**Objectives:** This study aims to combine coronary artery anatomy-related SYNTAX (Synergy between Percutaneous Coronary Intervention with Taxus and Cardiac Surgery) score system and GRACE (Global Registry of Acute Coronary Events) score system which includes only clinical variables into a new risk score system to build a NewScore that not only contains coronary artery anatomy-related variables but also have clinical variables. Then, exploring the prognostic value of three score systems in patients with ACS (Acute Coronary Syndrome, ACS) undergoing PCI (Percutaneous Coronary Intervention, PCI).

**Methods:** In this study, we collected 670 patients with ACS undergoing PCI admitted from October 2011 to March 2014 Department of Cardiology of affiliated HaiKou Hospital Xiangya School of Medicine Central South University. This research collected patients' coronary angiography data and clinical data including age, heart rate, systolic blood pressure, Killip classification, ST segment changes, myocardial marker and cardiac arrest and so on. The next step is to calculate SYNTAX and GRACE risk score respectively, followed patients for 1 year of time after the onset of the disease.

On the basis of GRACE and SYNTAX score system, building the data model by random forest statistical method and developing a NewScore that combines coronary anatomy with clinical data. And then compare the difference between the three risk score system incidence of adverse events, depict the receiver-operating characteristic curve of the three risk score (Area under the receiver-operating characteristic curve, the ROC) and calculate the Area under the curve (Area under the curve, AUC). Finally, comparing the predictive value of the three risk scoring systems to the patients' incidence of adverse events and mortality during follow-up 1 year after PCI.

**Results:** The higher the SYNTAX and the GRACE risk score, the higher incidence of adverse cardiovascular events. Based on the SYNTAX and the GRACE risk score, a new score system has been developed by random forest statistical methods, which combines clinical data and coronary artery anatomy, low-risk group  $\leq 34$  points; High risk group  $> 34$  points. NewScore, SYNTAX and GRACE risk score of the area under the ROC curve is 0.6807, 0.5564, and 0.5577 respectively, the NewScore and SYNTAX, GRACE risk score area under the curve comparison have a significant difference ( $P < 0.05$ ), while the SYNTAX and GRACE risk score was no significant difference of the area under the ROC curve.

**Conclusion:** The prognosis value of NewScore system is better than SYNTAX and GRACE risk score system in patients with ACS undergoing PCI during 1 year follow-up. The prognosis value of SYNTAX and GRACE risk score system are considerably the same in these patients in 1-year follow-up. The Newscore system redistrict the low-risk ( $\leq 34$  points) and high-risk groups ( $> 34$  points). The higher the score, the higher the proportion of adverse cardiovascular events.

**ABSTRACTS**

Abstracts for Free Paper Session:

**PERCUTANEOUS CORONARY INTERVENTION + CORONARY ARTERY DISEASE**

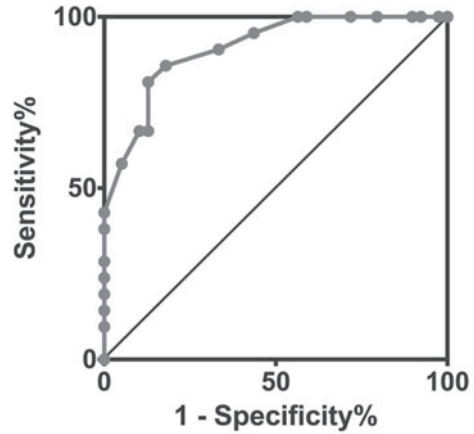
**Comparison of iFR and FFR and Correlation with Clinical Outcome**

MW Chu, MH Wong, MCS Chiang, YH Fong, YW Cheng, CF Tsang, CK Kwok, NH Luk, SF Chui, KC Chan, LK Chan, CY Wong, CL Fu, KY Lee, KC Ho, KT Chan, CS Chiang  
 Department of Medicine, Queen Elizabeth Hospital, Hong Kong

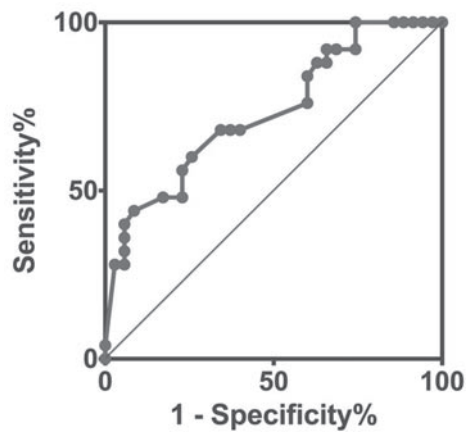
**Purpose:** The study aim to evaluate the accuracy of instantaneous wave-free ratio (iFR) with respect to fractional flow reserve (FFR), in assessing hemodynamic severity of coronary stenosis. iFR was also correlated with clinical outcome.

**Methods:** A retrospective review was performed in patients who had with coronary angiogram between October 2013 and October 2014. Data were extracted from clinical and procedure records. The performance of iFR and intravascular ultrasound (IVUS) was analyzed with receiver operating characteristic (ROC) curves.

**Results:** Sixty patients were identified. Twenty-one patients (35%) had a FFR value of less than or equal to 0.8. Their iFR values were strongly correlated with FFR (R 0.82, 95% CI 0.72-0.89, p<0.0001). The area under curve (AUC) was 0.91 (95% CI 0.84 to 0.98, p<0.0001) (Figure 1). A iFR cutoff value of 0.92 had a sensitivity of 85.7% (95% CI 63.7-97.0%) and a specificity of 82.1% (95% CI 66.5-92.5%) in assessing hemodynamic severity of coronary stenosis. Using the IFR cutoff value 0.92 as a new standard, a ROC curve for IVUS area has an AUC 0.73 (95% CI 0.63-0.88, p=0.0012). A IVUS area of 3.5 mm<sup>2</sup> gave a sensitivity of 68.0% (95% CI 46.5-85.1%) and a specificity of 65.7% (95% CI 47.8-80.9%) in assessing hemodynamic significance of coronary stenosis (Figure 2). There was no significant difference in MACE (Major adverse cardiac events as defined by death, myocardial infarct, target lesion revascularization, CABG, PCI, stent thrombosis) between iFR and IVUS area (p=0.57 and p=0.46 respectively).  
**Conclusions:** In this cohort, iFR was shown to be strongly correlate with FFR and can be used as an adenosine free alternative to FFR in guiding clinical decision.



**Figure 1.** Receiver operating characteristic (ROC) curve of instantaneous wave-free ratio (iFR) with FFR=0.8.



**Figure 2.** Receiver operating characteristic (ROC) curve of intravascular ultrasound (IVUS) area with iFR=0.92.



ABSTRACTS

Abstracts for Free Paper Session:

PERCUTANEOUS CORONARY INTERVENTION + CORONARY ARTERY DISEASE

**An Update Meta-analysis of Percutaneous Coronary Intervention for Patients with ST Elevation Myocardial Infarction and Multi Vessel Coronary Disease**

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**Background:** There is strong evidence that urgent reperfusion of the culprit vessel improves survival. Current guidelines recommend percutaneous coronary intervention (PCI) for the culprit lesion during the index in hemodynamically stable patients with ST elevation myocardial infarction. It is based largely on observational studies. However, the strategy for stenosis in non-culprit vessels is still under controversy. Recently, several randomized controlled trials have provided new evidence suggesting a multi vessel revascularization approach should be appropriate. Current evidence seems conflicting. Thus we perform this meta-analysis of randomized controlled trials comparing multi vessel PCI versus culprit vessel only PCI during primary PCI in patients with ST elevation myocardial infarction and multivessel coronary disease to make a comprehensive understanding.

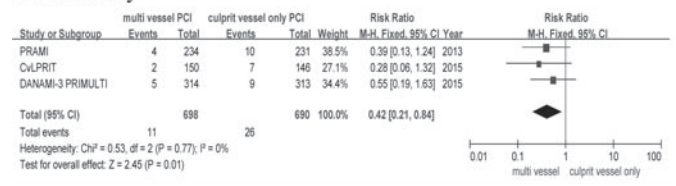
**Methods:** We searched in Medline, EMBASE, Cochrane library databases and major international meetings for randomized controlled trials. For randomized controlled trials comparing multi vessel PCI versus culprit vessel only PCI in ST elevation myocardial infarction patients with multi vessel coronary disease. We restricted our search in the recent five years, from 2011 to 2016, and reported in English language. Two reviewers independently reviewed the titles, abstracts and collected the data from studies that met the inclusion criteria. Conflicts between reviewers were resolved by consensus. We extracted the data, including published year, study design, duration, patient characteristics and clinical outcomes, efficacy and safety events. Internal validity of randomized controlled trials was assessed. We examined the following clinical efficacy and safety outcomes including major adverse cardiac events (MACE), cardiovascular death, myocardial infarction, all cause mortality, stroke, major bleeding, contrast induced nephropathy during follow-up. MACE was defined as the combination of death and non-fatal myocardial infarction. We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines for conducting this meta-analysis. We estimated the percentage of variability across studies attributable to heterogeneity beyond chance using the I<sup>2</sup> statistic. I<sup>2</sup> statistic values <50% was considered as low degree of heterogeneity, and values >50% was considered as high degree of heterogeneity. Fixed effect model with Mantel-Haenszel method was used when the risk of heterogeneity was low, otherwise random effect model was chosen. Risk ratio (RR) and 95% confidence interval (CI) were used as the summary statistic. A two sided p value less than 0.05 was regarded as statistically significant. Revman version 5.3 was used for all statistical analyses.

**Results:** Four randomized controlled trials enrolling 1602 participants fit our selection criteria with the follow up duration ranging from 12 to 38 months. There were 72 and 92 events occurred in multi vessel PCI and culprit vessel only respectively. In our meta-analysis, combined data revealed no significant reduction in MACE (RR: 0.77, 95% CI 0.44-1.24, p=0.28). There was a 15% risk reduction for myocardial infarction with multi vessel PCI, 35 events occurred in the multi vessel PCI and 40 events occurred in the culprit only PCI. However, there was no statistically significant different (RR: 0.85, 95% CI 0.28-2.60, p=0.77) and substantial heterogeneity in the magnitude of the effect across the included trials (I<sup>2</sup>=71%, p=0.02) which was mostly attributable to the result of one randomized controlled trials presented in 2015. Compared to culprit vessel only PCI, there was no reduction in all cause mortality (RR: 0.84, 95% CI 0.55-1.28, p=0.41) with multi vessel PCI either. Cardiovascular mortality and repeat revascularization events were

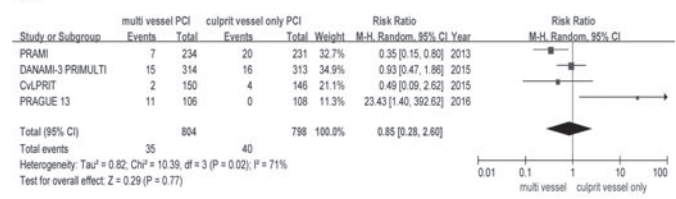
reported in 3 randomized controlled trials including 1388 participants. Notably, there was a dramatic risk reduction for cardiovascular mortality favoring multi vessel PCI with no evidence of heterogeneity (RR: 0.42, 95% CI 0.21-0.84, p=0.01). As repeat revascularization was concerned, 38 events occurred with multi vessel PCI while 110 events occurred with culprit vessel only PCI. Multi vessel PCI reduced the risk of repeat revascularization by 66% compared with culprit vessel only PCI (RR: 0.34, 95% CI 0.24-0.49, p<0.00001). The magnitude of the risk reductions recorded for repeat revascularization in this meta-analysis was consistent with former studies. Safety endpoints including stroke, major bleeding and contrast induced nephropathy were also estimated. Three randomized controlled trials with 1137 participants were included in the analysis of stroke. Six events occurred in each group making the results without difference. Major bleeding was reported in 2 trials including 923 participants, in whom 16 events were recorded with no statistically significance in both strategy (RR: 0.45, 95% CI 0.16-1.27, p=0.13). Contrast induced nephropathy was also reported in 2 trials with 923 participants. Eight events occurred in the multi vessel PCI while 9 events occurred in the culprit vessel only PCI. There was a mildly trend towards facing multi vessel PCI (RR: 0.88, 95% CI 0.33-2.26, p=0.79). There were no significant difference in these endpoints indicating that multi vessel PCI can be performed as safe as culprit vessel only PCI in certain way.

**Conclusion:** In summary, our meta-analysis shows no clear benefit in MACE for multi vessel PCI in ST elevation myocardial infarction patients with multi vessel coronary disease than culprit vessel only PCI. Notably, there seems to have a risk reduction for cardiovascular mortality and repeat revascularization. Meanwhile, multi vessel PCI perform as safe as culprit vessel only PCI in our meta-analysis. However, the best timing of PCI is still debated, thus more randomized controlled trials are ongoing to clarify this issue. In our opinion, multi vessel PCI should not be routinely performed for all the patients, but based on individualize assessment including severity of stenosis, contrast volume, renal function and co-morbidity diseases.

CV mortality



MI



Major bleeding





## ABSTRACTS

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Abstracts for Free Paper Session:

### PERCUTANEOUS CORONARY INTERVENTION + CORONARY ARTERY DISEASE

#### **Red Cell Distribution Width and Mortality in Patients with Acute Coronary Syndrome: A Meta-Analysis on Prognosis**

LL Abraham IV, JDA Ramos, EL Cunanan, MDA Tiongson, FER Punzalan  
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**Background:** Red cell distribution width (RDW), a routine component of the CBC, measures variation in the size of circulating erythrocytes. It has been associated with several clinical outcomes in cardiovascular disease.

**Objectives:** Our primary objective was to determine the association of RDW with mortality in patients admitted for acute coronary syndrome (ACS) by pooling together data from available studies. We also examined the association of RDW with major adverse cardiovascular events (MACEs).

**Methods:** Using MEDLINE, Clinical Key, ScienceDirect, Scopus, and Cochrane Central Register of Controlled Trials databases, a search for eligible studies was conducted until January 9, 2017. Studies that fulfilled the following were included: 1) observational; 2) included patients admitted for ACS; 3) reported data on all-cause or cardiovascular (CV) mortality in association with a low or high RDW; and 4) used logistic regression analysis to control for confounders. The quality of each study was evaluated using the Newcastle-Ottawa Quality Assessment Scale. Our primary outcome of interest was all-cause or CV mortality. We also investigated the impact of RDW on MACEs for the studies that reported these outcomes. Review Manager (RevMan) 5.3 was utilized to perform Mantel-Haenzel analysis of random effects and compute for relative risk.

**Results:** We identified 13 trials involving 10,410 patients, showing that in ACS, a low RDW is associated with a statistically significant lower all-cause or CV mortality [RR 0.35, (95% CI 0.30 to 0.40),  $p < 0.00001$ ,  $I^2 = 91\%$ ].

**Conclusion:** A low RDW during an ACS is associated with lower all-cause or CV mortality and lower risk of subsequent MACEs, providing us with a convenient and inexpensive risk stratification tool in ACS patients.

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#### **Network Meta-Analysis of Cardiovascular Outcomes in Randomised Controlled Trials of New Antidiabetic Drugs**

Y Fei, MF Tsoi, CR Kumana, TT Cheung, BMY Cheung  
The University of Hong Kong, Hong Kong

**Purpose:** Few randomised controlled trials directly compared the effect of new antidiabetic drugs on cardiovascular outcomes in patients with type 2 diabetes (T2D). We performed a network meta-analysis to assess the cardiovascular effects of these drugs.

**Methods:** We searched for randomised controlled trials that reported rates of major adverse cardiovascular events (MACE) and deaths in T2D patients with established cardiovascular risks, involving glucagon-like peptide-1 receptor agonists (GLP-1 RAs), sodium-glucose co-transporter 2 (SGLT-2) inhibitors, and dipeptidyl peptidase-4 (DPP-4) inhibitors. Data were analysed using frequentist approach and Bayesian framework in R.

**Results:** Seven randomised controlled trials with altogether 62268 T2D patients were included for analysis. Compared to placebo, GLP-1 RAs and the SGLT-2 inhibitor reduced MACE (OR 0.89, 95%CI 0.82-0.97 and OR 0.85, 95%CI 0.73-0.99, respectively) and all-cause mortality (OR 0.89, 95%CI 0.80-0.99 and OR 0.67, 95%CI 0.55-0.81, respectively). The SGLT-2 inhibitor was more beneficial than GLP-1 RAs in reducing all-cause mortality (OR 0.76, 95%CI 0.61-0.94). DPP-4 inhibitors increased all-cause mortality when compared to GLP-1 RAs (OR 1.16, 95%CI 1.01-1.33) and the SGLT-2 inhibitor (OR 1.53, 95%CI 1.24-1.89).

**Conclusions:** GLP-1 RAs and the SGLT-2 inhibitor reduced the risk of MACE and all-cause mortality. DPP-4 inhibitors were inferior to these two drug classes in reducing cardiovascular events. The SGLT-2 inhibitor was the best in preventing deaths among the three antidiabetic drugs classes.

**ABSTRACTS**

Abstracts for Free Paper Session:

**HEART FAILURE**

**Urinary Albuminuria-To-Creatinine Ratio as a Predictor of All-Cause Mortality and Hospitalization of Congestive Heart Failure in Chinese Elder Patients with High Cardiovascular Risks**

MM Liu

Fuwai Hospital, China

**Background:** Data are limited with regard to the relations of albuminuria and incidence of cardiovascular disease events (CVD) in Chinese elder patients with high cardiovascular risk.

**Methods and results:** We examined the association of albuminuria-to-creatinine ratio (ACR) and the incidence of CVD events and all-cause mortality in 1474 Chinese patients with high cardiovascular risks. During the median following up of 56 months, 213 patients developed primary cardiovascular outcome (composite outcome of cardiovascular death, myocardial infarction, stroke and hospitalization of congestive heart failure) and 117 patients died. Higher baseline urinary ACR(>30 mg/g) experienced a nearly 2-fold of all-cause mortality (HR 1.69, 95%CI 1.05-2.72, p<0.05) and a 3-fold of heart failure hospitalization (HR 3.21, 95%CI 1.59-6.49, p<0.001) comparing with lower baseline urinary ACR (≤10 mg/g). The primary cardiovascular outcome, cardiovascular death, stroke and myocardial infarction showed no difference in three grades of urinary ACR (>30 mg/g, 10 mg/g-30 mg/g, ≤10 mg/g) in this cohort. In proportional hazard models adjusted for sex and medications, higher grades of urinary ACR was associated with higher risk of all-cause death among patients above 65 (adjusted HR 1.93, 95%CI 1.12-3.30, comparing ACR>30 mg/g vs. ACR ≤10 mg/g), but not below 65 (P for interaction=0.21). While higher levels of ACR was associated with higher hospitalization of congestive heart failure among patients below 65 (adjusted HR 7.67, 95%CI 2.13-27.64, comparing ACR>30 mg/g vs. ACR ≤10 mg/g), but not above 65 (P for interaction=0.01).

**Conclusions:** In this post hoc analysis of Chinese individuals with high cardiovascular risks, higher urinary ACR was associated with higher all-cause mortality and heart failure hospitalization. Patients above 65 tend to experience death while individuals below 65 exposed to the risk of heart failure hospitalization. Our analysis also reassured the low grade of ACR (under the current threshold of microalbuminuria) does not increase cardiovascular events.

**The Clinical, Electrocardiographic, Echocardiographic Profile and In Patient Outcomes of Adult Filipino Patients with Methamphetamine Induced Cardiomyopathy at a Tertiary Government Hospital**

JE Duya, FE Punzalan, PF Reganit, EJ Llanes

University of the Philippines - Philippine General Hospital, Philippines

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. 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. Twenty-two patients, all males and less than 60 years old were enrolled. Forty percent were MAP users for >10 years, 77% were smokers, 82% were alcoholic and 5% had cocaine abuse. 30% had a previous HF hospitalization. Thirty-five percent 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%). Forty percent 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. To our knowledge, this is the first prospective study on this topic that can guide cardiologists/internists in the early recognition and prompt management of this escalating sociopolitical and clinical concern.

**ABSTRACTS**

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Abstracts for Free Paper Session:

**HEART FAILURE**

**Green Tea Extract as a Treatment for Cardiomyopathy Patients with Diastolic Dysfunction: An Observational Study**

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Heart Center, Children's Hospital of Chongqing Medical University, Chongqing, China

**Background:** Hypertrophic cardiomyopathy (HCM) and restrictive cardiomyopathy (RCM) mainly cause diastolic dysfunction with an impaired relaxation and an abnormality in ventricular blood filling during diastole, which may predispose patients to poor prognosis without efficient causative treatment. Recent reports indicate the potential effect of epigallocatechin-3-gallate (EGCG), the most abundant catechin in green tea, to reduce cardiac myofibril hypersensitivity to  $Ca^{2+}$ . In this study, we investigated changes of cardiac function, laboratory tests and clinical characteristic in cardiomyopathy patients with diastolic dysfunction after consumption of green tea extract (GTE).

**Methods:** Fourteen cardiomyopathy patients (6.89 [0.5; 14.1] years) with diastolic dysfunction were submitted to clinical examination, echocardiography, electrography, and laboratory testing before and after daily consumption of GTE capsules containing 300 mg epigallocatechin-3-gallate for at least 12 months.

**Results:** A significant decrease of isovolumetric relaxation time (IVRT), increase of left ventricle end diastolic dimension (LVEDD) and left ventricle end diastolic volume (LVEDV) by echocardiography and decrease of brain natriuretic peptide (BNP) were observed after a 1-year period of GTE consumption. LV ejection fraction, LV wall thickness, atrial dimension by echocardiography remained unchanged.

**Conclusion:** These results suggest that EGCG is effective in improving the impaired relaxation in cardiomyopathy patients with diastolic dysfunction.

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ABSTRACTS

Abstracts for Free Paper Session:

BASIC SCIENCE

**Nicotine Accelerates Atherosclerosis in Apolipoprotein E-Deficient Mice by Activating  $\alpha 7$  Nicotinic Acetylcholine Receptor on Mast Cells**

C Wang, H Chen

The Second Affiliated Hospital Zhejiang University School of Medicine, China

**Objective:** Cigarette smoking is an independent risk factor for atherosclerosis. Nicotine, the addictive component of cigarettes, induces mast cell (MC) release and contributes to atherogenesis. The purpose of this study was to determine whether nicotine accelerates atherosclerosis through MC-mediated mechanisms and whether MC stabilizer prevents this pathological process.

**Approach And Results:** Nicotine administration increased the size of atherosclerotic lesions in apolipoprotein E-deficient (Apoe<sup>-/-</sup>) mice fed a fat-enriched diet. This was accompanied by enhanced intraplaque macrophage content and lipid deposition but reduced collagen and smooth muscle cell contents. MC deficiency in Apoe<sup>-/-</sup> mice (Apoe<sup>-/-</sup>-KitW-sh/W-sh) diminished nicotine-induced atherosclerosis. Nicotine activated bone marrow-derived MCs in vitro, which was inhibited by a MC stabilizer disodium cromoglycate or a nonselective nicotinic acetylcholine receptor blocker mecamylamine. Further investigation revealed that  $\alpha 7$  nicotinic acetylcholine receptor was a target for nicotine activation in MCs. Nicotine did not change atherosclerotic lesion size of Apoe<sup>-/-</sup>-KitW-sh/W-sh mice reconstituted with MCs from Apoe<sup>-/-</sup>- $\alpha 7$ nAChR<sup>-/-</sup> animals.

**Conclusions:** Activation of  $\alpha 7$  nicotinic acetylcholine receptor on MCs is a mechanism by which nicotine enhances atherosclerosis.

**Protective Effect of Tetramethylpyrazine on Coronary Dilator Function: Role of ER stress in BK<sub>Ca</sub> Channel Regulation**

WT Sun, XC Wang, SK Mak, J Fu, Q Yang

Division of Cardiology, Department of Medicine and Therapeutics, Institute of Vascular Medicine, Li Ka Shing Institute of Health Sciences, Institute of Innovative Medicine, Faculty of Medicine, The Chinese University of Hong Kong, Hong Kong

**Purpose:** Despite considerable evidence suggesting the cardioprotective benefits of tetramethylpyrazine (TMP), mechanistic understanding of the vasoprotective effects of TMP remains incomplete. Whether TMP may preserve smooth muscle BK<sub>Ca</sub> channel function in diseased conditions, and whether inhibition of ER stress is involved are yet to be studied. The present study was designed to investigate the effect of TMP on homocysteine-induced BK<sub>Ca</sub> channel dysfunction in coronary arteries with further unrevealing the role of ER stress.

**Methods:** Endothelium-denuded porcine small coronary arteries were studied for the dilatory function of BK<sub>Ca</sub> channels. Expressions of ER stress molecules and BK<sub>Ca</sub> channel were determined by Western blot and RT-PCR, and BK<sub>Ca</sub> channel currents were recorded by patch-clamp in primary cultured coronary arterial smooth muscle cells (PCASMCs).

**Results:** TMP protected the vasodilatory function of BK<sub>Ca</sub> channels against impairment caused by homocysteine and the chemical ER stress inducer. In homocysteine-exposed PCASMCs, TMP downregulated the expression of ER stress markers, i.e., GRP78, ATF6, p-PERK, p-eIF2 $\alpha$ , and p-IRE1, meanwhile preserved BK<sub>Ca</sub>  $\beta 1$  protein level with a consequent enhancement of BK<sub>Ca</sub> current. The restoration of BK<sub>Ca</sub>  $\beta 1$  level by TMP against homocysteine was accompanied by a decreased nuclear localization of FoxO3a and a downregulation of E3 ubiquitin ligase.

**Conclusions:** In coronary arteries, TMP protects against homocysteine-induced smooth muscle BK<sub>Ca</sub> channel dysfunction through inhibiting ER stress-mediated loss of BK<sub>Ca</sub>  $\beta 1$  subunit, which can be attributed, at least in part, to the suppression of FoxO3a-driven E3 ubiquitin ligase-induced degradation of  $\beta 1$  protein.

Supported by RGC/GRF CUHK14118414; Lui Che Woo Institute of Innovative Medicine - CARE theme 8303303, and CUHK Direct Grant 4054273.

**ABSTRACTS**

Abstracts for Free Paper Session:

**BASIC SCIENCE**

**Remote Ischemic Post-conditioning and Per-conditioning Improve Myocardial Dysfunctions in a Rat Model of Severe Hemorrhagic Shock**

XX Liao, ZF Yang

Sun Yat-sen University, Guangzhou, China

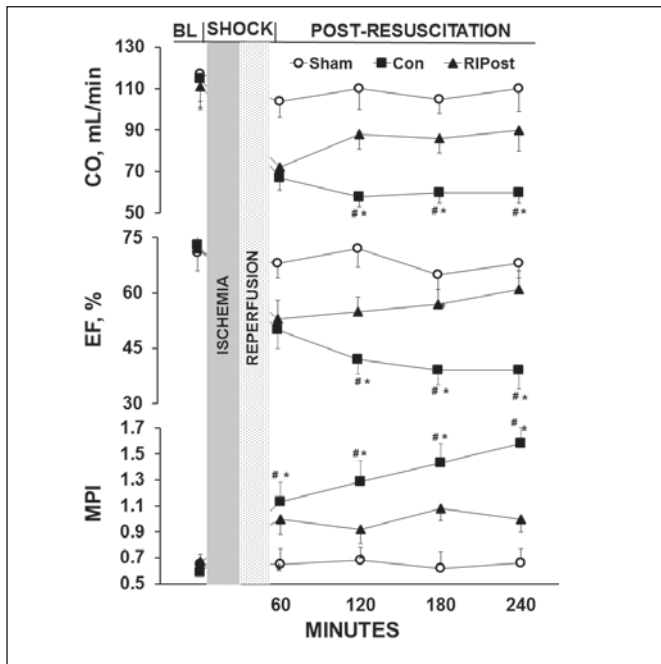
**Introduction:** We have previously demonstrated that remote ischemic pre-conditioning (RIPC) protects myocardial function after resuscitation from hemorrhagic shock. However, the clinical application of RIPC is limited by the unpredictability of haemorrhagic shock. In the present study, we investigated the effects of remote ischemic post-conditioning (RIPost) on myocardial functions in this rat model of severe haemorrhagic shock.

**Methods:** Twenty male rats were randomized into three groups: Sham (n=5), Control (n=10) and RIPost (n=10). Remote ischemic conditioning was induced by four cycles of 5 minutes of limb ischemia followed by reperfusion for

5 minutes during or after resuscitation for RIPost groups after reperfusion. Hemorrhagic shock was induced by removing 45% of the estimated total blood volume during an interval of 1 h. Forty minutes after the completion of bleeding, the animals were reinfused with shed blood during the ensuing 40 min. The animals were monitored for 4 h or observed for an additional 72 h. Myocardial function was measured by echocardiography at baseline, 1 h, 2h, 3h and 4 h post-resuscitation. Troponin T (TnT) and N-terminal pro-Brain Natriuretic Peptide (NTpro-BNP) were measured at BL, 2h and 4h post-resuscitation.

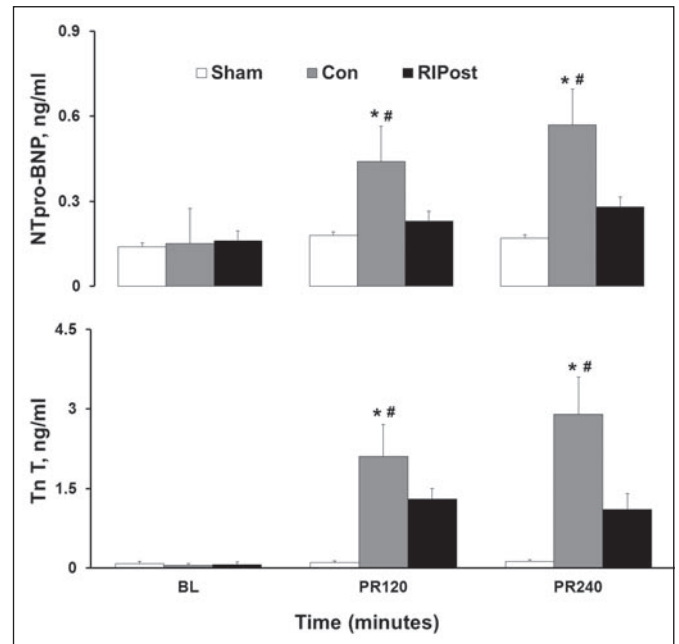
**Results:** At 2 h after resuscitation, ejection fraction, cardiac output and myocardial performance index were significantly better in the RIPostC group than in the Control group. TnT and NTpro-BNP level after resuscitation were notably reduced in RIPost group when compared to Control group.

**Conclusion:** RIPost attenuates myocardial dysfunction after resuscitation in this rat model of severe hemorrhagic shock.



**Figure 1.** Myocardial function.

BL, baseline; CO, cardiac output; EF, ejection fraction; MPI, myocardial performance index; Con group, control group; RIPost group, remote ischemic post-conditioning. \*p<.05 vs. the sham group, #p<0.05 vs. the RIPost group.



**Figure 2.** Levels of Troponin T and N-terminal pro-Brain Natriuretic Peptide. BL, baseline; Tn T, Troponin T; NTpro-BNP, N-terminal pro-Brain Natriuretic Peptide; Con group, control group; RIPost group, remote ischemic post-conditioning. \*p<0.05 vs. the sham group, #p<0.05 vs. the RIPost group.

**ABSTRACTS**

Abstracts for Free Paper Session:

**BASIC SCIENCE**

**Frequencies of *SLCO1B1* Polymorphisms and the Influence on Susceptibility to Statin-Induced Myopathy**

W Chan,<sup>2</sup> PY Cheung,<sup>2</sup> MS Li,<sup>2</sup> SK Sundaram,<sup>2</sup> B Tomlinson,<sup>1</sup> CH Tzang<sup>2</sup>  
<sup>1</sup>Department of Medicine and Therapeutics, The Chinese University of Hong Kong; <sup>2</sup>Prenetics Limited, Hong Kong

**Purpose:** Statins, also known as 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase inhibitors, are one of the most commonly prescribed medications in persons with cardiovascular disease. Statin-induced myopathy is the major serious adverse event with statins. The majority of patients (60%) who stopped taking a statin cite muscle pain as the primary reason for discontinuation. Variants in *SLCO1B1* resulting in decreased function of the liver uptake transporter can predict increased risk for myopathy particularly with simvastatin and to a lesser extent, with atorvastatin and pravastatin. This study examined the allele, genotype and phenotype frequencies of *SLCO1B1* which is relevant to statin toxicity in the Hong Kong population.

**Methods:** Genotyping analysis was performed with iGenes Pharmacogenomics Test, using TaqMan Real-Time Polymerase Chain Reaction technology at Prenetics Limited (Prenetics) ISO15189:2012 accredited laboratory. Common variants of *SLCO1B1*, including \*1A, \*1B, \*5, \*15 and \*17, were detected. *SLCO1B1* phenotypes were categorized into Normal Function, Decreased Function and Poor Function based on Clinical Pharmacogenetics Implementation Consortium (CPIC) guidelines.

**Summary:** Out of 1273 genotyped individuals, 1035 (81.3%) were self-identified as Asians, 80 (6.3%) were Caucasians, 1 was African American (0.1%), and 7 (0.5%) were mixed race. A total of 150 (11.8%) individuals did not report their race/ethnicity. Further analysis was only performed in the Asian group. The prevalence of *SLCO1B1* haplotypes was: *SLCO1B1*\*1B (65.2%), *SLCO1B1*\*1A (23.1%), *SLCO1B1*\*17 (8.8%) and *SLCO1B1*\*15 (2.9%). None of the Asian subjects in the study cohort was identified with *SLCO1B1*\*5. The genotype and phenotype frequencies of *SLCO1B1* are reported in Table 1. A significant proportion of the Asian subjects (22.1%) were found to have *SLCO1B1* polymorphisms that increase their risk for statin-induced myopathy,

with 212 (20.6%) having one variant that would limit the dose of simvastatin that should be used and 15 (1.5%) having two variant alleles in whom it would be safer to use an alternative statin.

**Conclusions:** The present study provides important insights on the frequency of *SLCO1B1* variations associated with reduced drug transporter function in the Hong Kong population. Genotyping for the *SLCO1B1* might aid in tailoring statin therapy for safe and effective use. In fact, the CPIC practice guideline is available to provide interpretive guidance for the management of myopathy risk with simvastatin based on *SLCO1B1* genotype. Our results contribute to the overall knowledge of cardiovascular pharmacogenomics and may help in the implementation of precision medicine in Hong Kong.

**Conflict of Interests:** Dr. Wing Chan, Dr. Belinda Cheung, Dr. Candy Li, Dr. Senthil Sundaram and Dr. Lawrence Tzang are employed by Prenetics Limited (Prenetics) for the development of pharmacogenomic testing products, as well as to provide genotype analysis and interpretation of pharmacogenomic test results for clinical decision making; Professor Brian Tomlinson chairs the Medical Advisory Board at Prenetics to provide advice and feedback on the scope of services.

**Table 1.** Frequencies of *SLCO1B1* polymorphisms in the 1035 Asian subjects recruited in the present study

Genotype	<i>SLCO1B1</i> Genotype/Phenotype Frequencies		Asian, n (%)
	Predicted Phenotypes	Clinical Implication	
*1A/*1A	Normal Function	Normal Myopathy Risk	56 (5.4%)
*1A/*1B			314 (30.3%)
*1B/*1B			438 (42.3%)
*1A/*15	Decreased Function	Intermediate Myopathy Risk	12 (1.2%)
*1A/*17			40 (3.9%)
*1B/*15			37 (3.6%)
*1B/*17			123 (11.9%)
*15/*15	Poor Function	High Myopathy Risk	2 (0.2%)
*15/*17			7 (0.7%)
*17/*17			6 (0.6%)

**Lifelong Burden of Vitamin D Deficiency Increases Clinical Cardiac Events and Death Unraveled by an Exome Chip-Derived Multi-Loci Genetic Risk Score: A Mendelian-Randomized Study**

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**Purpose:** Prior cardiovascular (CV) studies on vitamin D are vastly short-termed. We investigated whether a novel multi-loci genetic risk score for lifelong-deficient vitamin D exposure infer causality to cardiac events and death under Mendelian randomization approach.

**Methods:** We studied serum 25-hydroxyvitamin D levels among 5772 subjects in a prospective clinical cohort. Twelve pre-specified candidate SNPs involved along the vitamin D biosynthetic, activation/receptor pathways from prior GWAS were studied. We constructed a 12-point genetic risk score (GRS) based on 6 SNPs confirmed associated with serum 25-hydroxyvitamin D level (rs2282679, rs4588, rs7041, rs1155563, rs1993116, rs2060793, all P less than 0.05) for CV risk prediction. Study endpoints were acute coronary syndrome (ACS)/myocardial infarction (MI), ischemic stroke, congestive heart failure (CHF), peripheral vascular disease (PVD), CV death, and combined CV endpoints.

**Results:** After a mean follow-up duration of 58.4±27.8 months, incident events of ACS, MI, CHF, ischemic stroke, PVD and CV death were respectively 99 (1.7%), 191 (3.3%), 431 (7.5%), 98 (1.7%), 24 (0.4%) and 47 (0.7%). Total combined CV event was 660 (11.4). Vitamin D GRS was associated with combined CV events (P=0.009). Kaplan Meier analysis showed that lifelong vitamin D exposure as determined by GRS was associated with improved survival from combined CV events (log-rank=12.9, P=0.012).

Adjusted for potential confounders, genetical vitamin D status was independently predictive of reduced combined CV events (HR 0.96, 95%CI 0.93-0.99, P=0.009). Mendelian randomization analysis (Walds estimate; Fiellers Theorem for 95% confidence interval) showed that lifelong vitamin D exposure has a causal protective effect against the risk of combined CV events (OR=0.885, 95%CI 0.806 - 0.970, P=0.009).

**Conclusions:** Lifelong vitamin D exposure as determined a novel multi-loci genetic score predicts combined incident CV events.

**Disclosure:** This study was supported by the Health and Medical Research Fund, Food and Health Bureau, HKSAR (Project no. 10111531)



ABSTRACTS

Abstracts for Free Paper Session:

BASIC SCIENCE

**Therapeutic Effects of Baicalin on Monocrotaline-induced Pulmonary Hypertension in Rats**

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**Background:** Baicalin can attenuate monocrotaline (MCT)-induced pulmonary artery pressure (PH), however, the potential mechanism remains unexplored. Bone morphogenetic protein (BMP) signaling regulated by nuclear factor- $\kappa$ B (NF- $\kappa$ B) has been shown to play an important role in MCT-induced PH. Here, we investigated whether baicalin regulation NF- $\kappa$ B-BMP axis and the subsequent anti-proliferation in pulmonary vascular to have a therapeutic effect on PH.

**Methods:** The PH model was induced by intraperitoneal injection of 60 mg/kg monocrotaline (MCT). Forty animals were randomly assigned to 4 groups: Control, Control+baicalin, PH and PH+baicalin groups (n=10 in each). Baicalin groups were given baicalin 100 mg/kg by intragastric administration from 2 days after MCT injection. Thirty days later, the hemodynamics data were measured through Swan-Ganz catheter; the mRNA and protein expression levels of inflammatory factors and BMP-related signaling molecules in lung tissue were detected by quantitative real-time polymerase chain reaction (qRT-PCR), immunohistochemical and Western blotting.

**Results:** Our data revealed that baicalin attenuated MCT-induced lung and right ventricular hypertrophy damage with a decrease of right ventricular systolic pressure (RVSP), right ventricle/left ventricle plus septum ratio (RV/LV+S), and attenuated pulmonary vascular remodeling. Furthermore, the expression level of NF- $\kappa$ B p65, inhibitor of NF- $\kappa$ B (I- $\kappa$ B $\alpha$ ), BMP-2/4/9,

BMP receptor 2 (BMPR2), inhibitor of differentiation 1 (Id1) and Id3 was restored in baicalin+MCT group than in MCT-PH group ( $P < 0.05$ ).

**Conclusion:** We concluded that the protective effects of baicalin against the lung and heart damage through inhibiting NF- $\kappa$ B-BMP signaling pathway, providing new mechanistic information about PAH.

**Histone Deacetylase 2 (HDAC2) was Involved in Placental P-Glycoprotein Regulation in Vitro and Vivo: A Probable Target for Congenital Heart Disease Prevention**

HY Duan, C Wang

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**Introduction:** Environmental origins of congenital heart disease (CHD) highlights the pivotal role of heart-placenta connection. P-glycoprotein (P-gp), expressed in the syncytiotrophoblast of placenta, is indispensable for fetal protection from deleterious environmental exposures. Histone deacetylase (HDAC) 1/2/3, core epigenetic enzymes for deacetylation modification, were extremely abundant in trophoblast cells. We have recently reported that these three HDACs inhibition induced P-gp expression in placental cells. This study aimed to validate the specific HDAC subtypes regulating placental P-gp expression and function in vitro and vivo, illuminating epigenetic targets for CHD prevention in the context of fetal protection.

**Methods:** Bewo and JAR cells (human placenta choriocarcinoma) were transfected with HDAC1/2/3 specific siRNA. Real time PCR, Western-Blot, immunofluorescence and fluorescent dye efflux assay were employed for evaluation of placental P-gp expression, localization, and efflux activity following transfection, respectively, identifying the HDAC subtypes regulating placental P-gp in vitro. Subsequently, siRNA for the identified HDAC was intraperitoneally injected to pregnant mice every 48 h from E7.5 to E15.5. Digoxin was administered at 50  $\mu$ g/kg by gavages 1 h prior to euthanasia at E16.5. Dams were sacrificed, and samples were harvested. Real time PCR, Western-blot and immunohistochemistry were used to determine

expressions and localization of Hdac1/2/3 and P-gp in placentas, respectively; digoxin concentration in maternal plasma and fetal-unit were analyzed by enzyme-multiplied immunoassay.

**Results:** In vitro, reduction of HDAC2 expression induced placental P-gp mRNA and protein production, immunolocalization of P-gp still being mainly on the cell membranes; HDAC2 suppression elevated P-gp efflux activity of its dye fluorescent substrates-DiOC2(3) and Rh 123. In vivo, HDAC2 siRNA increased expression of placental P-gp, without significant alteration in its tissue distribution; digoxin transplacental rate after HDAC2 siRNA injection was significantly decreased without significant alteration in placental weights, fetal weights and maternal plasma digoxin concentrations.

**Conclusions:** Inhibition of HDAC2 could result in induction of placental P-gp expression and function, which might be a promising target for prevention of CHD on the ground of fetal protection from environmental contributors.



## ABSTRACTS

Abstracts for Free Paper Session:

## BASIC SCIENCE

**Role of cGMP and EDHF Pathways in Hydrogen Sulfide-induced Vasodilation in the Human Internal Mammary Artery**C Yuan,<sup>1</sup> HT Hou,<sup>1</sup> HX Chen,<sup>1</sup> J Wang,<sup>1</sup> Q Yang,<sup>1</sup> GW He<sup>1,2,3\*</sup><sup>1</sup>Department of Cardiovascular Surgery & Center for Basic Medical Research, TEDA International Cardiovascular Hospital, Chinese Academy of Medical Sciences, Tianjin, China; <sup>2</sup>The Affiliated Hospital of Hangzhou Normal University & Zhejiang University, Hangzhou, China; <sup>3</sup>Department of Surgery, Oregon Health and Science University, Portland, Oregon, U.S.A.**Purpose:** Endogenous H<sub>2</sub>S generated by mercaptopyruvate sulfurtransferase (MPST) coupled with cysteine aminotransferase (CAT) in endothelium, which has been proved to be a physical vasodilator and blood pressure regulator, may play an important protective role in the pathogenesis of coronary heart disease. The signal mechanism through which H<sub>2</sub>S regulates vasodilatation in humans is still unknown. The present study aimed to investigate the role of cGMP and EDHF on H<sub>2</sub>S-induced vasodilatation in human internal mammary artery (IMA).**Methods:** To assess the endothelium-dependency of the acetylcholine (ACh) and exogenous H<sub>2</sub>S -induced relaxation and the effect of CAT inhibitor (aminooxyacetic acid, AOAA), a competitive CAT substrate (L-aspartate), and K<sub>Ca</sub> channel blocker or K<sub>ATP</sub> channel blocker, IMA (n=88) segments from 32 patients undergoing coronary artery bypass grafting were studied in a myograph. Enzyme-linked Immunosorbent Assay (ELISA) for PDE5A, and western blot analysis for eNOS and p-eNOS<sup>ser1177</sup> were performed. Methylene blue assay was used to quantify the contents of H<sub>2</sub>S.**Results:** The maximal relaxation induced by ACh was significantly attenuated by AOAA or L-aspartate, Iberiotoxin (BK<sub>Ca</sub> channel blocker) (P<0.05), or IK<sub>Ca</sub> channel blocker plus SK<sub>Ca</sub> channel blocker (TRAM-34+Apamin) (P<0.01), or K<sub>ATP</sub> channel blocker (Glibenclamide) (P<0.05). Removal of endothelium did not significantly change the exogenous H<sub>2</sub>S (NaHS)-mediated maximal relaxation. Further, NaHS increased eNOS phosphorylation at its activating site S1177, and down-regulate PDE5A activity. Incubation with ACh for 4 hours significantly increased the H<sub>2</sub>S concentration.**Conclusions:** Endogenous H<sub>2</sub>S could be produced under the stimulation of ACh and CAT is one of the key enzymes in production of H<sub>2</sub>S in the endothelial cell of IMA. In addition, H<sub>2</sub>S may activate eNOS to produce NO that activates PKG to induce vasodilatation via cGMP pathway. Further, H<sub>2</sub>S as a potential EDHF directly stimulates K<sub>Ca</sub> channels to induce vasodilatation. These findings may provide new therapeutic targets for the treatment of vasospasm of coronary artery bypass grafting vessels and provide a pharmacological basis for the development of new vasodilator drugs.**Phosphorylation of Connexin43 at Serine368 is Necessary for Induction of Cardioprotection by a Connexin43 Carboxyl-Terminal Mimetic Peptide**JB Jiang, JA Palatinus, HM He, J Iyyathuraia, LJ Jordan, FX McGowan Jr, K Schey, G Bultynck, ZW Zhang, RG Gourdie  
Guangdong Cardiovascular Institute, China**Background:** Remodeling of connexin43 (Cx43), the main cardiac gap junction (GJ) protein, is a pathogenic hallmark of myocardial infarction. ACT1, a peptide mimetic of the carboxyl terminus (CT) last 9 amino acids (RPRPDDLEI) of Cx43, reduced GJ remodelling and arrhythmias and improved contractile function following ventricular injury (PMID:24527326). These effects were associated with inhibition of Cx43 interaction with the scaffolding protein ZO-1 and increased PKC-ε-mediated phosphorylation of Cx43 at a serine at position 368 (Cx43 pS368) of its primary sequence. Here, we address whether the molecular mechanism of cardioprotection by ACT1 results from its effects on Cx43 interaction with ZO-1 and/or phosphorylation.**Methods and Results:** ACT1 prompted an increase in PKC-ε-mediated phosphorylation of a Cx43-CT substrate at S368 in an *in vitro* assay - as reported (PMID:24527326). We analysed the molecular targets of this pS368 using tandem mass spectroscopy and surface plasmon resonance (SPR). These approaches revealed that ACT1-induced S368 phosphorylation (Cx43 pS368) occurred via a novel mechanism that involved its binding to an α-helical domain (H2). A pair of positively charged lysine (K344, K345) in the Cx43 CT and a cluster of negatively charged amino acids (residues) in ACT1 were identified as the molecular determinants. This ACT1-Cx43 CT interaction occurred independent of ACT1 binding to the second PDZ domain (PDZ2)of ZO-1. We generated a series of mutant ACT1 peptides (pS368-/PDZ2+) in which its three negatively charged aspartic (D) and glutamic (E) acid amino acids were substituted by alanines (A). A mutant ACT1 peptide (pS368+/PDZ2-) lacking the CT isoleucine necessary for interaction with ZO-1 PDZ2 was also prepared. Using our *in vitro* phosphorylation assay, together with SPR and thermal shift assays to assess protein-protein interactions, we confirmed that ACT1 pS368-/PDZ2+ peptides, capable of binding to ZO-1 PDZ, neither interacted with the Cx43 CT nor increased Cx43 pS368. Conversely, the mutant ACT1 pS368+/PDZ2- peptide failed to bind ZO-1 PDZ2, but competently interacted with the Cx43 CT and induced Cx43 pS368. ACT1 and mutant peptides were tested for cardioprotection in an *ex vivo* mouse heart ischemia-reperfusion model. ACT1 significantly reduced ischemic injury size and improved functional recovery of the left ventricle in association with upregulated Cx43 pS368. By contrast, ACT1 (pS368-/PDZ2+) showed no cardioprotective effects.**Conclusions:** We conclude that phosphorylation of Cx43 at serine368 is necessary for the cardioprotective effects of ACT1. These data indicate a role for the small α-helical domain H2 in the Cx43 carboxyl terminus in the ventricular response to ischemic injury.

## ABSTRACTS

Abstracts for Free Paper Session:

### ELECTROPHYSIOLOGICAL STUDY

#### **Weathering an Adenosine Insensitive Right Ventricular Outflow Tract Ventricular Tachycardia (Ado-Insensitive RVOT VT) Storm in an Adolescent Female: A Case Report**

JE Duya, N Daud, M Morilla, J Mojica, G Gervacio, MJ Agbayani, L Go, O Malanyaon

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**Introduction:** Majority of ventricular tachycardia (VT) are associated with structural 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 y/o female, asthmatic, had palpitations, light-headedness 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 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 will be prevented.

#### **The Evolving Clinical Profile, Pattern of Management and Outcome of Patients with Acute Cardioembolic Stroke Seen in University of the Philippines Philippine General Hospital**

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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 outcomes of Filipino patients with CES. 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. About 126 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 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  $1.9 \pm 0.96$ . Bleeding complications was 6%. CES were associated with longer hospital stay (16 days) and development of nosocomial pneumonia (46%). The profile of Filipino CES patients was similar to the previous studies in terms of the patients' age, neuroimaging findings, rate of hemorrhagic conversion, and low anticoagulation rate. Contrary to western data, Filipino CES patients are younger, with majority of them having RHD.

**ABSTRACTS**

Abstracts for Free Paper Session:

**ELECTROPHYSIOLOGICAL STUDY**

**Ivabradine versus Beta Blockers in Mitral Stenosis in Sinus Rhythm: an Updated Meta-analysis of Randomized Controlled Trials**

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**Background:** Mitral stenosis (MS) symptoms are worsened during tachycardia and exercise. Beta-blockers are used in controlling heart rate (HR) in MS, resulting in symptom improvement, but come with significant side effects. Ivabradine has a selective action on the sinus node devoid of the usual side effects of beta blockers. Small studies have recently investigated the role of ivabradine in MS in sinus rhythm.

**Objectives:** To determine the efficacy of ivabradine compared to beta-blockers, in terms of exercise duration, maximum HR achieved, resting HR, mean gradient, and working capacity among patients with mitral stenosis in sinus rhythm.

**Methods:** We conducted systematic search of studies using MEDLINE, Google Scholar, Science Direct, Scopus, Clinical Key, Cochrane, and clinicaltrials.gov databases in all languages and examined reference lists of studies. We included trials that met the study inclusion criteria. Studies identified were assessed for risk of bias using the Cochrane Collaboration Tool for Assessing Risk of Bias. We used inverse variance analysis of fixed effects to compute for mean difference, carried out using RevMan 5.3.

**Results:** Using data from five identified trials, ivabradine was better compared to beta blockers in total exercise duration [mean difference 32.73 seconds (95%CI 12.19, 53.27; p=0.002; I<sup>2</sup>=0%)], maximum HR achieved after

exercise [mean difference -3.87 beats per minutes (95% CI -5.88,-1.860; p=0.0002; I<sup>2</sup>=23%)], and work capacity [mean difference 0.56 METS (95% CI 0.33,0.80; p<0.00001; I<sup>2</sup>=0%); inferior to beta blockers in resting HR achieved [mean difference 1.83 seconds (95%CI 0.39, 3.28; p=0.01; I<sup>2</sup>=91%); and comparable to beta blockers in terms of mean gradient [mean difference -0.52 mmHg (95% CI -1.20, 0.16; p=0.13; I<sup>2</sup>=6%)].

**Conclusion:** Ivabradine is better or comparable to beta blockers in terms of the outcomes measured, and may be considered as an alternative for patients with MS in sinus rhythm who are intolerant to beta-blockers.

**A Novel Leadless Transcatheter Pacing System Implantation in Chinese**

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**Introduction:** A novel leadless transcatheter pacing system (TPS) was approved as alternative to conventional transvenous pacing system. However the feasibility of large delivery sheath (27 French) implantation in small sized Chinese was unknown. The purpose of this study was to report a series of leadless pacemakers implantation in two centers.

**Method:** This is a prospective cohort study from 17th September 2015. TPS (MICRA, Medtronic, MN, USA) was implanted percutaneously without sedation. All patients who underwent procedure had guideline-based indication. The primary efficacy end point was the percentage of patients with low and stable pacing capture thresholds (<2V at a pulse width of 0.24 msec) at the latest follow up. The safety end point was freedom from procedure or system related complications.

**Result:** TPS were successfully implanted in consecutive 60 patients (Age 81.9±9.8, Male=25) and the mean follow up was 6.2±3.2 months. One patient has bioprosthetic tricuspid valve, three patients underwent hemodialysis, seven patients underwent extraction due to infection before and 1 patient has absence of superior vena cava. The primary indications were sick sinus syndrome (50%) and heart block. The body weight was 57±8.2 kg (The lowest one was 34 kg). Procedure time was 38.4±7.8 min. First attempt successful rate was 50/60. Two patients underwent 7 attempts. One patient underwent 9 attempts and complicated by non-capture after procedure. Snaring was

successfully done and re-implanted uneventfully. Five patients received right ventricular outflow tract implant and 55 received right ventricular apex implant. Safety endpoint was 93.3%. Two patients suffered from groin hematoma and treated conservatively. One cardiac tamponade and tapping was done. TPS was re-implanted after tapping in the same procedure. Neither dislodgment nor infection was found. The rate of the primary efficacy end point was 98.3%.

**Conclusion:** TPS has high successful implantation rate in Chinese. The performance of TPS implantation in Chinese was comparable to the reported series.

**ABSTRACTS**

Abstracts for Free Paper Session:

**ELECTROPHYSIOLOGICAL STUDY**

**Benefit of ICD in Non-Ischaemic Cardiomyopathy Versus Ischaemic Cardiomyopathy - A Single Center Review**

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Department of Medicine, Queen Elizabeth Hospital, Hong Kong

**Background:** In both AHA and ESC Guidelines, insertion of implantable cardioverter-defibrillator (ICD) is Class 1 recommendation for patients with heart failure with reduced left ventricular ejection fraction. The evidence of benefit for patients suffering from ischaemic cause of heart failure is much stronger, with Class Ia evidence support for ICD use according to latest ESC Guideline, while the use of ICD in patients with non-ischaemic cause is supported by Class Ib evidence only. However, the benefit of ICD in non-ischaemic cardiomyopathy is continuously being challenged, whether the apparent benefit still stands, with numerous recent advancement in heart failure medication and device treatment, in particular, the CRT. The recently published DANISH trial result, which concluded that there is no mortality benefit for ICD insertion in non-ischaemic heart failure patients, has reheated the debate on whether ICD insertion in non-ischaemic heart failure patients should still be advocated with modern era of heart failure treatment.

**Objective:**

*Primary outcome:*

- to compare the all cause mortality difference between non-ischaemic and ischaemic heart failure patients being inserted with ICD according to the latest AHA/ESC guideline suggestion (within the same period as DANISH Trial)

*Secondary outcome:*

- to compare local data on mortality in non-ischaemic cardiomyopathy patients after ICD insertion with mortality in DANISH trial

**Method:** A retrospective analysis on non-ischaemic and ischaemic heart failure patients with ICD inserted in Queen Elizabeth Hospital according to the latest AHA/ESC guideline 2016 in the period of 7/2/2008-30/6/2014 (same as DANISH trial) with endpoint followup on or before 30/6/2016 (same as DANISH trial). Method to distinguish between ischaemic and non-ischaemic cause was either by coronary angiogram or cardiac imaging study. Both cases of Primary and Secondary prevention were included in the study. Data was then analyzed with SPSS.

**Results:**

*Primary outcome:*

A total of 55 patients were included in the study. Within the designated period, a total 24 patients passed away (overall mortality rate: 43.6%). In the ischaemic group, 15 out of 36 patients passed away (mortality rate 41.7%), while in the non-ischaemic group, 9 out of 19 patients passed away (mortality rate 47.3%) [p=0.685]. The mean survival period (after data censoring in survival analysis) of the ischaemic group was 68.6 months while that of non-ischaemic group was 55.9 months [p=0.297].

Sub-analysis of Primary and Secondary prevention group:

- In the Primary prevention group:

In the ischaemic group, the mortality rate is 43.75% (7 out of 16 patients), while in the non-ischaemic group, the mortality rate is 50% (5 out of 10 patients) [p=0.756]

- In the Secondary prevention group:

In the ischaemic group, the mortality rate is 40% (8 out of 20 patients), while in non-ischaemic group, the mortality rate is 44% (4 out of 9 patients) [p=0.691]

*Secondary outcome:*

- The mortality rate of the non-ischaemic group in this trial is 47.3% while that in DANISH trial was 21.6%.

**Conclusion:**

- In this review, there is no significant difference in all cause mortality in patients being treated with ICD in either ischaemic or non-ischaemic heart failure patient. The mortality benefit of the use of ICD in ischaemic heart failure patients has been proven in multiple studies. Hence, our result has indirectly shown that the use of ICD in non-ischaemic heart failure patient may also be beneficial on all cause mortality similar to the ischaemic group of patients. However, further survival analysis has shown that the survival curves started to bifurcate with longer time period.

- Sub-analysis has shown no mortality difference even when outcome is stratified into Primary or Secondary prevention group. However, further survival analysis has shown that, in the Primary prevention group, there is a statistically non-significant trend that the non-ischaemic group has a shorter mean survival time and also the survival curve has started to bifurcate with longer time period.

- Secondary outcome has shown that the mortality rate of non-ischaemic group of patients in the study is much higher compared that to the DANISH Trial.

**ABSTRACTS**

Abstracts for Free Paper Session:

**CARDIAC IMAGING I**

**Assessment of Left Ventricular Function in Patients with Chronic Aortic Regurgitation by Three Dimensional Strain Imaging: Comparison with Cardiac Magnetic Resonance Imaging**

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**Objectives:** The aims of this study were to evaluate the change of geometry and function in patients with chronic aortic regurgitation (AR) using three-dimensional speckle tracing imaging (3D-STI) and to discuss its relationship with conventional LV parameters of systolic and diastolic function.

**Methods:** A prospective study was conducted in 41 healthy volunteers and 133 patients with AR and the AR group were divided into three subgroups. Left ventricular volumetric parameters and three-dimensional strain parameters were acquired by 3D-STI. Among AR patients, 24 subjects randomly selected underwent cardiac magnetic resonance imaging (CMR) in 48 hours. To analyze and explore the difference of these index with control and AR groups.

**Results:** With the degree of regurgitation increasing, the measures of EDVI, ESVI, LVMI, LVRI, EDSI, ESSI gradually increase, but the measures of Ld/Td, Ls/Ts gradually decrease. Comparing with control group, the measures of GLS were lower, but RoA, Twist were larger in moderate group. And GLS, GRS, Torsion, RoA, Twist were lower in severe group. Correlation analysis showed that Ld/Td, Ls/Ts, LVRI, GLS, GRS, RoA, Twist has a positive correlation and ESSI, EDSI, LVMI has a negative correlation with LVEF. And GLS has a negative correlation with E/E'. Multiple linear regression analysis identified GLS, GRS, RoA as predictors of LV ejection

fraction in all patients with AR and LAd, EDSI, LVMI, LVRI as predictors of E/E'. Comparing with CMR, the measures of EDV, ESV, SV, LVEF, LVM by 3D-STI were not significant difference.

**Conclusions:** Patients with moderate AR exits subclinical LV longitudinal axis dysfunction in the early stage and an increased apical rotation and an preserved radial, circumferential strain maybe the factors to remain normal ejection fraction of left ventricular. And the volumetric parameters and three dimensional strain parameters can be related to left ventricular diastolic and systolic function.

**Evaluation of Right Ventricular Volumes and Functions in Patients with Heart Failure by Three-Dimensional Echocardiography and Speckle Tracking Imaging**

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**Background:** Right ventricular (RV) dysfunction is increasingly recognized in patients with heart failure and is reported to be associated with poor prognosis. The aim of this study was to investigate the changes of RV volumes and functions in heart failure by three dimensional echocardiography (3DE) and speckle tracking imaging.

**Methods:** One hundred and twenty-five patients with heart failure and 32 healthy subjects were included in this study. One hundred and twenty-five patients included 34 heart failure patients with preserved ejection fraction (HFpEF, LVEF  $\geq 50\%$ ), 28 heart failure patients with mid-range ejection fraction (HFmrEF, LVEF 40-49%) and 63 heart failure patients with reduced ejection fraction (HFrEF, LVEF  $< 40\%$ ). RV end diastolic volume index, end systolic volume index, ejection fraction (EF) and RV longitudinal strain of free wall were determined by 3DE and speckle tracking imaging.

**Results:** RV end diastolic volume index and end systolic volume index were increased, whereas RV longitudinal strain of free wall and RVEF were reduced in patients with heart failure. Furthermore, patients with HFpEF, HFmrEF and HFrEF yielded a gradual decrease in RVEF and RV longitudinal strain, and a gradual increase in RV volume with worsening LVEF. During the conventional two-dimensional and three-dimensional echocardiography, and speckle tracking imaging parameters, only RVEF differentiated patients with HFpEF from normal controls ( $50 \pm 5\%$  vs.  $46 \pm 5\%$ ;  $p < 0.05$ ).

**Conclusions:** The RV volumes and RVEF by 3DE, and RV longitudinal strain significantly differ among the patients with HFpEF, HFmrEF and HFrEF.



**ABSTRACTS**

Abstracts for Free Paper Session:

**CARDIAC IMAGING I**

**3D Echocardiographic Evaluation of the Association Between Pulmonary Hypertension and Right Ventricle Function in Patients with Severe Rheumatic Mitral Stenosis**

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**Background:** Post-capillary Pulmonary hypertension (PH) is a significant contributor to right ventricle (RV) dysfunction and morbidity. The two hemodynamic profiles in left heart disease with PH, passive PH with increased pulmonary venous pressure and reactive PH with increased pulmonary vascular resistance (PVR >3 Wood units, WU), are difficult to distinguish non-invasively. The clinical significance of PVR on right ventricle function remains to be elucidated in patients with rheumatic mitral valve stenosis (RMS).

**Methods:** Between 2014-2016 forty female patients referred to our hospital for the management of pure severe RMS (mitral valve area ≤1.5 cm<sup>2</sup>, stage D) were included in this study. Two groups were formed based on PVR (calculated based on the ratio of TRV/TVI<sub>RVOT</sub>), 18 patient have PVR ≤3 WU (group II), and 21 patients have PVR>3 WU (group III). Twenty age-matched healthy subjects with normal echocardiograms served as controls (group I). RV function was assessed using 3D echocardiography according to the recommendations of the American Society of Echocardiography. 3D longitudinal global strain of the RV freewall (RV GLS-freewall) and interventricular septum (RV GLS-septum) were measured using commercially available hardware and software (Philip IE33, Tomtec 4D-RV-analysis software).

**Results:** The results of RV function indices for three groups are shown in Table 1. All indices of RV function were significantly lower in patients with

reactive PH (Group III) including RV EF, FAC (fractional area change), TAPSE (Tricuspid annular plane systolic excursion, mm) and increase in Tei index (myocardial performance index) compared to group I and II. Patient with passive PH (Group II) have moderate reduced EF and elevation in Tei index as compared to normal controls (Group I). There are no significant difference in FAC and TAPSE between group I and II. RV GLS-freewall and GLS-septum were significant lower in group II compared to group I (p<0.01). Group III patients had further decrease in RV GLSfreewall and GLS-septum compared to group I or II (p1<0.01, p2<0.05, respectively). Multiple linear regression analysis revealed a significantly correlations between GLS (freewall) systolic strain and PVR (r=0.825, p<0.001), as well as between GLS (septum) systolic strain and PVR (r=0.756, p<0.001).

**Conclusions:** Incremental impairments of RV dysfunction were observed in severe rheumatic MS patients from passive to reactive PH. Our study identified a significant correction between global RV longitudinal systolic strain and PVR, suggesting that RVGLS may serve as good index for assessing PH subtypes and RV dysfunction.

**Table 1.** RV function indices measured in three groups

	<b>Group I (Control)</b>	<b>Group II (PVR≤3)</b>	<b>Group III (PVR &gt;3)</b>
RVEF (%)	50.05±3.14	45.74±4.92 <sup>a</sup>	32.23±5.20 <sup>ab</sup>
FAC %	43.18±3.10	41.35±4.60	32.34±5.0 <sup>ab</sup>
TAPSE	21.64±1.98	20.39±2.66	12.61±1.45 <sup>ab</sup>
Tei index	0.38±0.04	0.47±0.08 <sup>a</sup>	0.58±0.13 <sup>ab</sup>
GLS (freewall, %)	-26.50±2.02	-22.86±2.50 <sup>a</sup>	-14.18±2.64 <sup>ab</sup>
GLS (septum, %)	-15.43±2.92	-13.54±2.18 <sup>a</sup>	-8.58±2.63 <sup>ab</sup>
PASP (mmHg)	20.25±4.49	41.22±19.95 <sup>a</sup>	51.90±29.30 <sup>a</sup>

Notes: Value presented as Mean±SD, One-way ANOVA followed by multiple Bonferroni comparison. P<0.05 is considered statistically significant. "a" represent there is significant difference as compared to group I, indicates there is significant difference compared to group II.

**Evaluation of Myocardial Wall Stress in Patients with Subclinical Atherosclerosis by Three-dimensional Speckle Tracking Echocardiography**

J Wang, BY Zhou, MX Xie

Department of Ultrasound, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China

**Objective:** To evaluate the myocardial wall stress (MWS) in patients with subclinical atherosclerosis (SA) using three-dimensional speckle tracking echocardiography (3D-STE), predicting left ventricular remodeling from the perspective of afterload.

**Methods:** Eighty patients with subclinical atherosclerosis were divided into low-risk group (27 cases), middle-risk group (26 cases) and high-risk group (27 cases) according to the Framingham risk score (FRS). Each of them were examined by echo-tracking (ET) techniques and three-dimensional speckle tracking echocardiography (3D-STE) to obtain the parameters like intima-media thickness (cIMT), stiffness parameter (β), left ventricular myocardial wall stress (MWS) and remodeling index (LVRI) for analysis.

**Results:** There were no statistical difference in LVEF and LVRI among those three groups, while myocardial wall stress (MWS) had significantly difference among the three groups (P<0.05). Compared with low-risk group, cIMT, β, E/e were higher in high-risk group (P<0.05). MWS was positively correlated with b and SBP, and negatively correlated with LVEF (P<0.01). Stepwise multiple regression analysis demonstrated that MWS have multiple regression relation with SBP, LVEF and LVRI.

**Conclusions:** Decreased arterial elasticity was associated with increased risk of cardiovascular events in patients with subclinical atherosclerosis which results in increased systolic MWS and which may predispose to LV hypertrophy in late.

ABSTRACTS

Abstracts for Free Paper Session:

CARDIAC IMAGING I

**Quantitative Evaluation of Cardiovascular Function in Patients with Subclinical Atherosclerosis by Ultrasonography**

J Wang, BY Zhou, MX Xie

Department of Ultrasound, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China

**Objective:** To evaluate the cardiovascular function in patients with subclinical atherosclerosis using echo-tracking (ET) techniques and three-dimensional speckle tracking echocardiography (3D-STE).

**Methods:** Eighty patients with subclinical atherosclerosis were divided into low-risk group (27 cases), middle-risk group (26 cases) and high-risk group (27 cases) according to the Framingham risk score (FRS). Each of them were examined by echocardiograph and carotid ultrasound to obtain the parameters like intima-media thickness (cIMT), stiffness parameter ( $\beta$ ) and LV peak systolic global longitudinal strain (GLS), LV peak systolic global circumferential strain (GCS), myocardial wall stress (MWS) for analysis.

**Results:** Pressure-strain elastic modulus (Ep), Left atrial volume index (LAV) and myocardial wall stress (MWS) had significantly difference among the three groups ( $P<0.05$ ). Compared with low-risk group, cIMT,  $\beta$ , PWV $\beta$  were higher and GLS was lower in high-risk group ( $P<0.05$ ). There were no statistical difference in LVEF and GCS among the three groups.  $\beta$  was positively correlated with age and FRS, and negatively correlated with GLS ( $P<0.05$ ). LAV was positively correlated with age and E/e ( $P<0.05$ ). GLS was positively correlated with FRS and  $\beta$  ( $P<0.05$ ). MWS was positively correlated with  $\beta$  and SBP, and negatively correlated with LVEF ( $P<0.01$ ).

**Conclusions:** ET combined with 3D-STE could be applied to early and accurately evaluate the cardiovascular function in patients with subclinical atherosclerosis, and provide scientific bases for establishing intervention policy.

**Echocardiographic Follow Up in Post TAVI Patients. Single Centre Experience**

MH Wong, MCS Chiang, YH Fong, MW Chu, YW Cheng, CF Tsang, CK Kwok, NH Luk, SF Chui, KC Chan, LK Chan, CY Wong, CL Fu, KY Lee, KC Ho, CS Chiang, KT Chan

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**Background:** Surgical aortic valve replacement (SAVR) was used to be the mainstay of treatment of symptomatic severe aortic stenosis. Transcatheter aortic valve implantation (TAVI) has evolved in recent years to become an alternative approach to SAVR for certain groups of patients. TAVI has been performed in Queen Elizabeth Hospital (QEH) Hong Kong since year 2010.

**Methods:** This is a retrospective review of patients who have undergone TAVI procedure in QEH. A total of 86 patients have undergone TAVI from 2010 to 2016. Echocardiographic follow-up was performed in all patients receiving TAVI procedure in QEH. An analysis of echocardiographic parameters including aortic valve area; mean pressure gradient; left ventricular mass and left ventricular ejection fraction (LVEF) of patients before and after TAVI at 6 months; 1 year; 3 years and 5 years is included in this study.

**Results:** There is significant improvement in terms of aortic valve area (baseline  $0.68\pm 0.19$  cm<sup>2</sup>) and mean pressure gradient (baseline  $51\pm 15$  mmHg) after the procedure at 6 months ( $1.91\pm 0.35$  cm<sup>2</sup> and  $9$  mmHg $\pm 3$  mmHg respectively) which can be maintained up to 5 years ( $1.96\pm 0.31$  cm<sup>2</sup> and  $8$  mmHg $\pm 3$  mmHg respectively). There is also reduction in left ventricular mass from  $237\pm 72$  gram at baseline to  $189\pm 51$  gram at 6 months and  $165\pm 30$  gram at 5 years. Improvement in LVEF after TAVI is also observed in patients who had impaired LVEF before the procedure.

**Conclusion:** This single centre review provides 5 years local echocardiographic data for TAVI patients in Hong Kong.



**ABSTRACTS**

Abstracts for Free Paper Session:

**CASE REPORT SESSION**

**Subacute Myopericarditis Manifesting as Bidirectional Ventricular Tachycardia in a Young Filipino Female**

LL Abrahan IV, JH Regalado, EL Cunanan, CF Agustin, JEDL Duya, MJF Agbayani, GG Gervacio, MHS Maria, PN So  
University of the Philippines - Philippine General Hospital, Philippines

**Introduction:** Bidirectional ventricular tachycardia (BVT) is classically associated with digitalis toxicity or familial catecholaminergic polymorphic ventricular tachycardia (CPVT). We describe a unique case wherein BVT was documented in subacute viral myopericarditis, emphasizing the role of cardiac MRI in the diagnosis.

**Clinical Presentation:** A 27-year-old female with no co-morbidities presented with a two-month history of left-sided heart failure symptoms after recovering from a flu-like illness. Upon admission, she was hypotensive and in cardiorespiratory distress. On examination, she had clear breath sounds, an inferolaterally displaced apex beat, mitral and tricuspid regurgitation murmurs, and minimal bipedal edema.

**Work-up/Imaging:** The initial ECG showed frequent multifocal PVCs. On echocardiography, there was biventricular dilatation with depressed systolic function, secondary MR and TR, and a moderate-sized pericardial effusion with no signs of tamponade. Serum digoxin assay levels were low. Cardiac troponins were mildly elevated. Other blood exams, such as CBC, ESR, creatinine, and electrolytes were unremarkable. Cardiac MRI demonstrated thickened, inflamed pericardium and late gadolinium enhancement in the subepicardial layer of the lateral LV wall, consistent with recent myopericarditis.

**Management/Outcome:** Her hemodynamics were stabilized with dobutamine and norepinephrine drips, and intravenous amiodarone converted the rhythm to atrial fibrillation and eventually sinus without ventricular ectopy. She was weaned off the inotropes. After 24 hours, however, BVT was documented. Even with lidocaine infusion and oral sotalolol, she had recurrent episodes of BVT and PVCs. The patient was intubated due to pulmonary congestion, and became hypotensive again. Despite numerous defibrillations, she continued to have incessant VT, ultimately leading to her demise.

**Conclusion:** The case echoes the importance of considering viral myocarditis as a differential for BVT. This report also highlights the use of cardiac MRI in the diagnosis of myopericarditis, and offers options for the management of incessant VT.

**A Successful Pregnancy in a 25 Year Old Female with Uncorrected Patent Ductus Arteriosus (PDA) and Severe Valvular Pulmonic Stenosis (PS)**

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**Introduction:** Congenital heart disease is an important cause of maternal morbidity/mortality during pregnancy since the circulatory physiology is altered with attendant deleterious effect on the mother/fetus. There is limited local data on the maternal/fetal outcomes of combined congenital heart diseases.

**The Case:** A 25 year old, diagnosed with PDA presented pregnant at 29 6/7 weeks with uterine contractions. She had a prior first trimester abortion. On admission, she had stable vital signs with no pulmonary congestion or cyanosis. She had a RV heave and a machinery like murmur consistent with PDA. Corpus was enlarged and cervix was opened (2 cm) with intact bag of water. The ECG showed sinus rhythm, right axis deviation, left posterior fascicular block, biventricular hypertrophy with strain and premature atrial complexes. Chest X-ray showed levocardia, biventricular enlargement, dilated main pulmonary artery, with no signs of pulmonary congestion. Echocardiogram revealed left ventricular concentric remodelling, preserved overall systolic function, dilated right atrium and right ventricle, moderate sized Patent Ductus Ateriosus, severe pulmonic valvular stenosis (PS), moderate pulmonary hypertension. Biophysical profile and congenital anomaly scan were normal. Patient was admitted at the ICU and started on tocolysis, antibiotic therapy and dexamethasone. On 32nd week AOG, the

patient had sustained uterine contractions and delivered a live baby girl (APGAR 9,9). Post partum, she remained hemodynamically stable with no heart failure medications.

**Discussion:** Pregnancy is tolerated in asymptomatic women with small PDA. However, little is known about the maternal/fetal outcomes of patients with moderate PDA combined with severe PS. This case highlights the possibility of carrying a pregnancy without clinical deterioration despite two uncorrected hemodynamically significant lesions. The valvular PS maybe providing some degree of protection against clinical congestion in a with moderate PDA. To our knowledge, this is the first reported Filipino case of a successful pregnancy in a patient with PDA and severe PS.

**ABSTRACTS**

Abstracts for Free Paper Session:

**CASE REPORT SESSION**

**"From Dinner To Death": Fish Envenomation Presenting as Acute Fulminant Necrotizing Fasciitis And Refractory Shock in an Adult Filipino. A Case Report**

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The Philippines is home to an array of marine animals therefore marine envenomations are common. In literature, 20-50 Filipinos succumbed to box jellyfish envenomation. However, we lack local data on the incidence of local fish envenomation, its natural course and its appropriate management. A 35 year old healthy male presented at the ER with refractory shock. Thirty-three hours prior to admission, while preparing a fish (Local Name: Burog), he accidentally punctured his left thumb with a fish spine. Twelve hours after, erythema, progressive swelling and violaceous discoloration of the thumb progressing to involve all the digits, forearm and arm were noted. Multiple tense bullae appeared with progressive numbness and motor weakness. Thirty-seven hours post injury, the patient came at the ER in shock. He had flat neck veins, bronchovesicular breath sounds and distinct heart sounds. The left upper extremity is markedly swollen, erythematous, with multiple bullae formation. After vigorous fluid challenge with minimal blood pressure response, maximal vasopressor support was started. Acute Necrotizing Fasciitis from Fish Envenomation and multifactorial shock was considered. He was given tetanus prophylaxis and broad-spectrum antibiotics. Since no antidote was locally available, the patient underwent emergency debridement/fasciotomy of the affected limb. Extensive necrosis of the fascia and foul smelling grayish discharge were seen intra-operatively. Post-operatively, the patient succumbed due to multiple organ dysfunction

syndrome. Blood/bullae fluid samples obtained revealed a heat labile protein toxin belonging to the species of stonefish. Stonefish venom consists of capillary permeability factor, a potent vasodilatory agent, which has direct myotoxic and neurotoxic activity responsible for the refractory shock. A high index of suspicion is warranted since stonefish anti-venom is not locally available. Management consists of removal of spines, aggressive fluid resuscitation, hot water immersion techniques, institution of appropriate empiric antibiotics and early surgical debridement.

**Tuberculous Vasculopathy of Mesenteric Arteries: A Very Peculiar Vascular Cause of Intractable Massive Upper Gastrointestinal Bleeding**

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Upper gastrointestinal bleeding (UGIB) from tuberculous vasculopathy is extremely atypical. Among reported cases, UGIB from gastrointestinal tuberculosis (GITB) was due to ulcers, aortoenteric fistulas, hemobilia, drug induced and rarely, vasculopathy. Tuberculous aorto-enteric fistula accounts for <1% of UGIB causes and tuberculous vasculopathy is thought to be rarer. A 22-year-old Filipino was admitted for epigastric pain after a 3 month history of recurrent abdominal pain, intermittent melena, weight loss, prolonged cough and fever. On admission, he was normotensive, tachycardic and in respiratory distress. He was cachectic, pale, icteric, with multiple cervical lymphadenopathies. There was no abdominal bruit noted. Baseline laboratory tests revealed anemia, lymphopenia, elevated AST and ALT, elevated PT INR and extensive pulmonary infiltrates (miliary TB pattern). The patient was initially stabilized with aggressive hydration, blood transfusion and was started on IV proton pump inhibitors. Stat EGD revealed non specific gastropathy. Abdominal CT scan revealed splenic abscess and multiple retroperitoneal lymphadenopathies. Empiric anti-tuberculosis medications were started. On the 5th hospital day, the patient had recurrent massive UGIB and succumbed to hemorrhagic shock. Autopsy revealed multiple creamy yellow nodules in the lungs, serosa of the stomach, small/large intestines, liver, spleen and bilateral kidneys. The intestines were adherent to the caked mesentery. The stomach showed thinning of the walls, flattening of the rugae

with no ulcers, perforations or fistulas. Acid fast bacilli were demonstrated on smears taken from multiple organs. Within the intestinal walls and mesenteric vessels, granulomas adjacent to medium-sized blood vessels, perivascular inflammation with muscle wall distortion and granuloma emboli were seen indicating a vasculopathic process. The massive UGIB was most likely due to mucosal ischemia secondary to tuberculous vasculopathy.

This report highlights the importance of including tuberculous vasculopathy as part of the list of differential diagnoses for UGIB in patients with tuberculosis so as timely and focused management can be instituted.

**ABSTRACTS**

Abstracts for Free Paper Session:

**CASE REPORT SESSION**

**Systolic Anterior Motion of Mitral Valve Subchordal Apparatus in Hypertrophic Cardiomyopathy: A Rare Echocardiographic Pattern causing LVOT Obstruction**

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**Background:** Systolic anterior motion (SAM) of the mitral valve or chordate is one characteristic seen in hypertrophic cardiomyopathy (HCM) with flow obstruction. More often than not, the obstruction is caused by valvular rather than chordal SAM (1 in 62 patients with HCM based on a 1984 observational study). We describe the role of echocardiography in identifying the actual anatomical location of the mitral valve apparatus involved in SAM, in assessing consequent left ventricular outflow tract (LVOT) obstruction and its impact on management in an otherwise asymptomatic patient.

**The Case:** We report a case of a 29 year old male admitted for an elective noncardiac surgery, presenting with a cardiac murmur and left axis deviation with biventricular hypertrophy on electrocardiogram. On 2D transthoracic echocardiography (TTE), an asymmetrically hypertrophied left ventricle with systolic motion of anterior mitral valve was incidentally seen. Continuous wave Doppler assessment across the LVOT showed significant gradient of obstruction (mean gradient = 51 mmHg). Transesophageal echocardiography (TEE) demonstrated a redundant anterior mitral valve with the subchordal apparatus mainly causing SAM. In contrast to the LVOT gradient obtained on TTE, only a mild degree of LVOT obstruction (mean gradient = 10 mmHg) was documented. Because of this finding, patient was cleared for surgery. Management was deemed conservative with emphasis on close surveillance

for signs and symptoms attributable to development of significant LVOT obstruction in patients with HCM.

**Conclusion:** To our knowledge, this is the first reported case in our country of an echocardiographic pattern of systolic anterior motion primarily of the subchordal mitral valve apparatus causing some degree of LVOT obstruction in hypertrophic cardiomyopathy. Echocardiographic features such as asymmetric left ventricular hypertrophy and presence of some LVOT obstruction caused primarily by subchordal apparatus, could impact decisions in management in an asymptomatic patient.

**Case Reports of Giant Myxoma in Right Atrium (RA)**

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**Clinical Presentation:** A 50-year-old male patient presented to our hospital and complained of exertional palpitation and chest tightness for more than ten days. He had no history of smoking and drinking.

**Physical Examination:** His body temperature was 36°C, heart rate was 80 beats/min, respiratory rate was 20 breaths/min, and blood pressure was 120/78 mmHg. Lung sound was clear and tumor plop was heard between the third and fourth intercostal space at the right sternal edge. Electrocardiogram (ECG) and chest X-ray showed normal.

**Echocardiography findings:** TTE demonstrated a giant mass (with a diameter of approximately 89.2×45 mm); and 3D fullvolume view showed the mass filled the entire right atrium (RA) in systole and prolapsed into the right ventricle in diastole. The mass was irregularly shaped and had a rough edge and connected with multiple masses of different sizes. There was no obstruction in the tricuspid valve (TV) orifice and inferior vena cava. The velocity of E wave in the TV was 0.9 m/s and moderate tricuspid regurgitation was detected. The mass was attached to the patent foramen of the interauricular septum with a diameter of approximately 13 mm.

**Surgery Findings and Pathogenesis:** At surgery, a giant mass (with a diameter of approximately 80×30 mm) was found attached to the patent foramen of the interauricular septum exclusively in the slightly dilated RA. The surgeon performed complete tumor resection and direct repair of the atrial septum. Pathological examination revealed classic structure of cardiac

myxoma displaying endothelial rings and cords, myxoid, fibrous and hemorrhagic stroma.

**Postoperative evaluation:** Postoperative evaluation was done by echocardiography one week postoperatively. No mass was seen in the RA and mild to moderate tricuspid regurgitation was still present. The patient was asymptomatic at 1 and 6 months after surgery.

**Summary and Discussion Points:**

1. Cardiac myxoma represents approximately 50% of all benign cardiac tumors in adults, with left atrial myxomas constituting 75% of all myxomas.
2. Myxoma in RA is a rare occurred localization, with the diameter over 80 mm and asymptomatic is ever rarer.
3. TTE is the first choice for diagnosis due to its advantage of being non-invasive and real time and can reveal useful information about myxoma such as size, location and hemodynamics.
4. Diagnosis of cardiac myxoma should be firstly differentiated from thrombus of cardiac chambers.
5. Surgical treatment is necessary and has to be performed once the lesion is identified.

**ABSTRACTS**

Abstracts for Free Paper Session:

**CASE REPORT SESSION**

**Renal Vein Thrombosis in a Patient with Nephrotic Syndrome From IgM Nephropathy and Systemic Lupus Erythematosus: A Case Report**

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Renal vein thrombosis (RVT) is the formation of blood clot within a vein that can obstruct and migrate to cause organ swelling and pain, renal failure, catastrophic pulmonary embolism and death. The disease is rare in healthy population and its overall prevalence is unknown, probably because it is under diagnosed. It is common in nephrotic patients with a prevalence of 22% to 52%. The absolute risk of venous thrombosis is about 1% per year among patients with nephrotic syndrome. There is no published literature on the occurrence of renal vein thrombosis and simultaneous nephrotic syndrome secondary to IgM nephropathy and systemic lupus erythematosus. Recent studies suggest that a hypercoagulable state in nephrotic syndrome is the cause of renal vein thrombosis. It is, however, unclear why the renal vein is susceptible to thrombosis. The most common cause of death in SLE is active disease (26.5%), infection (25%) and thrombosis (both at 26.5%), with the latter dominating in the second 5-year period of follow-up. This is a case of a 23-year old female, who presented with left flank pain preceded by infection and multi-organ symptoms. Timely work-up revealed an acute renal vein thrombosis with extension to the inferior vena cava, nephrotic syndrome and systemic lupus erythematosus (SLE). Immediate initiation of low molecular weight heparin overlapped with Warfarin successfully cleared the thrombosis. Kidney biopsy - electron microscopy revealed IgM nephropathy, a rare cause

of renal vein thrombosis. Despite the resistance of an IgM nephropathy to steroids, the patient responded well to Hydrocortisone and was later shifted to oral Prednisone. The nephrotic syndrome and the activity of SLE were successfully treated with Enalapril and Atorvastatin; and Hydrochloroquine and Prednisone, respectively. The presence of renal vein thrombosis warrants vigilant search for underlying complicated diseases, which greatly affects treatment strategies.

**"Too Young to have a Broken Heart": Spontaneous Coronary Artery Dissection causing ST Elevation Myocardial Infarction in a Young Adult**

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**Synopsis:** ST-elevation myocardial infarction (STEMI) rarely occurs among patients 18 to 34 years old. Spontaneous coronary artery dissection (SCAD) is a rare cause of STEMI and is frequently described among patients in peripartum period. SCAD has a high mortality rate if not recognized and treated immediately. We present a case of SCAD presenting as STEMI in a 19-year-old nonpregnant patient.

**Case:** A 19-year-old female with chronic kidney disease, complained of sudden onset substernal chest pain. Physical examination showed a BP of 140/90 mmHg, HR of 112 bpm, with note of rales, pedal edema, and cold clammy extremities. Electrocardiogram showed ST-elevation in leads V3 to V6. Cardiac troponin was elevated and echocardiography revealed left ventricular segmental hypokinesia and depressed systolic function. Patient was diagnosed with acute anterolateral wall STEMI. Coronary angiogram revealed total occlusion of the mid-segment of the left anterior descending artery (LAD), while the rest of the coronary arteries were strikingly normal. After initial balloon angioplasty and stenting of the mid LAD, coronary artery dissection was noted at the distal LAD. A stent was successfully deployed, achieving TIMI flow grade III with no residual stenosis. She remained stable and was discharged improved.

**Discussion:** STEMI rarely happens in the young adults. Moreover, literature highlights the rarity of STEMI caused by SCAD. SCAD usually occurs among young pregnant patients without risk factors for atherosclerosis. We highlighted the significance of suspecting SCAD among young patients who present with STEMI and prompt treatment with revascularization in clinical situations such as this case.

**Conclusion:** SCAD remains to be a rare cause of STEMI. However, SCAD should be considered among young individuals with STEMI. Treatment is primarily medical unless there is persistent chest pain and/or ischemic ECG changes, hemodynamic instability, or unstable arrhythmia, where revascularization is necessary.

## ABSTRACTS

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Abstracts for Free Paper Session:

### CASE REPORT SESSION

#### **Successful Endovascular Intervention in Catheter-Related Central Venous Stenosis: A Report on Two Filipino Patients**

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**Synopsis:** Central venous access devices are essential in patients with end-stage renal disease undergoing hemodialysis. However, their presence substantially increases the risk of central vein stenosis. Therapeutic options are limited and are largely based on expert opinion. We report our experience on successful endovascular intervention of central vein stenosis in two Filipino patients.

**Case Presentation:** We present two cases of catheter related central vein stenosis. Both were previously diagnosed with end-stage renal disease with a history of multiple intrajugular catheter insertion. Both patients sought consult in our institution due to progressive facial, neck, and arm swelling. On physical examination, both revealed marked facial and neck swelling with tortuous neck and anterior chest veins. The first patient was found to have a stenosis on the right brachiocephalic vein, while the other had a severe right subclavian vein stenosis. Both were managed with balloon angioplasty and stenting, with note of immediate relief of symptoms and good outcome on follow-up.

**Conclusion:** Endovascular approaches to correction of central vein stenosis remain limited, suboptimal, and possibly even detrimental in certain cases. This case series highlights several important points. 1) Early referral of patients for chronic kidney disease care must be done with discussion of hemodialysis access and follow-up; 2) Central vein catheters must be avoided,

if possible, by placement of an arteriovenous access prior to the onset of dialysis; 3) Early recognition of the symptoms of CVS must be made to avoid disabling morbidities and hemodialysis access failures; and 4) Endovascular therapy is a safe and effective option in the management of CVS.

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#### **Ostial Left Main Coronary Artery Stenting of a Patient with Takayasu Arteritis: A Case Report and a Review of Related Literature**

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**Synopsis:** Takayasu arteritis (TA) is a large-vessel vasculitis usually presenting with discrepant pulses and blood pressures. Affected patients at times may present with coronary ostial narrowing causing acute coronary syndrome (ACS). TA should be suspected in someone with paucity of risk factors for coronary artery disease presenting with ACS such as the patient in this case.

**Case:** A 41-year-old male was referred to cardiology clinic for angina. He has no identified co-morbidities but had three previous episodes of ACS. Further history revealed that he had claudication and hip pain. Work-up from other institutions included treadmill exercise test and CT coronary angiogram revealing left main coronary artery lesion. On initial examination, there was note of discrepant blood pressures in all extremities. We suspected a vasculitic disease hence he was worked up for TA and referred to Rheumatology. TA was diagnosed based on CT aortogram revealing calcifications and stenosis. Coronary angiogram was performed which revealed left main coronary artery ostial stenosis. Other vessels were smooth and free of disease. Patient was offered bypass surgery but opted to undergo angioplasty with stenting. He underwent angioplasty achieving TIMI Flow III with no post-procedural complications. Patient was discharged improved and asymptomatic.

**Discussion and Conclusion:** Takayasu arteritis is a rare disease with high prevalence among female Asian patients aged 10-40 years old. TA sometimes present with ACS due to coronary artery ostial narrowing. There is no consensus whether bypass or angioplasty is the better approach because of possible restenosis for both procedures due to underlying vasculitis. We highlighted the significance of suspecting TA among patients with ACS with paucity of risk factors for CAD. Treatment with CABG or angioplasty is an option but close follow up and periodic monitoring should be done to control TA and prevent coronary artery restenosis.



**ABSTRACTS**

Abstracts for Free Paper Session:

**CASE REPORT SESSION**

**Successful Transcatheter Closure of a Giant Aneurysm in a Congenital Coronary Artery Fistula from the Left Coronary Artery to the Left Ventricle**

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**Objective:** Congenital coronary artery fistula (CCAF) combined with a giant aneurysm is a rare congenital malformation. We reported a case of CCAF from the left coronary artery to the left ventricle with a large aneurysm in an 8-year-old girl that we percutaneously closed with an Amplatzer Vascular Plug II at the entry point and an Amplatzer Duct Occluder II at the exit point of aneurysm.

**Method:** Selective coronary angiography showed the fistula originated from a branch of intraventricular septum and drained into left ventricle with an aneurysm of 32\*35 mm in diameter. The diameter was 3.5 mm for the exit point of aneurysm, and 7.2 mm for the entry point of aneurysm. An A-A loop was created with the help of a 2.5 Fr microcatheter, a 0.014 inch floppy guidewire and a 0.010 inch hydrophilic guidewire. A 6 Fr sheath was used and occlusion devices were deployed with a 04-04 mm ADO II at the exit point and a 12 mm AVP II at the entry point of aneurysm.

**Result:** After releasing AVP II, selective coronary angiography showed that distal LAD was opacified. However, there was no apparent ST-T changes on echocardiography during the 15 minutes test in the procedure. EKG showed junctional escape rhythm and aberrant ventricular conduction without ST-T changes 24hr post procedure. ECG was normal without residual shunt or wall motion abnormality. Follow-up EKG at 1 month and 3 months showed normal sinus rhythm. Follow-up ECG at 3 months showed shrinkage size of CAA and thrombus formation within the aneurysm.

**Conclusion:** Transcatheter closure of CCAF with a giant aneurysm is feasible and could be an alternative therapy. To close both the entry and exit point of aneurysm in order to exclude the aneurysm could be an effective way to prevent potential complications. Long-term follow-up should be considered after transcatheter closure of CCAF.

**The Transcatheter Aortic Valve Implantation for Severe Chronic Aortic Regurgitation by Using a New 34 mm Evolut R Device: The First Case Report in Hong Kong**

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**Background:** Surgical aortic valve replacement (SAVR) is a gold standard treatment for patients with severe symptomatic chronic aortic regurgitation (AR). When left ventricular (LV) function impairment is present and operative mortality increases exponentially. There have been reports of off-label use of transcatheter aortic valve implantation (TAVI) for the management of inoperable pure severe AR. The CoreValve Evolut R 34 mm transcatheter heart valve (THV) is the largest sized TAVI system available in the market, and is recently approved for use in patients of severe aortic stenosis with annulus size ranging from 26-30 mm, which accounts for approximately 25-30% of the eligible global TAVI patient population. In pure severe AR, it is usually associated with enlarged aortic root and annulus, the new valve may be the treatment option for those patients with high or extreme surgical risk.

**Method and Result:** We report the first case report of TAVI procedure by CoreValve Evolut R 34 mm THV in a 75-year-old man with severe pure AR, who presented with recurrent admission due to congestive heart failure. His past medical history included hypertension, diabetes mellitus, dyslipidemia, stage 4 chronic kidney disease (GFR 28 ml/min), recurrent ischaemic stroke thirteen and three years ago, and obstructive sleep apnoea. Echocardiography showed trileaflet aortic valve with severe AR; There was severe LV dilatation, and severely impaired LV systolic function with ejection fraction 20-25%.

Coronary angiogram showed severe triple vessels disease. The Society of Thoracic Surgeons Predicted Risk of Mortality score for SAVR and bypass operation was 9.9%. The Heart Team considered there was prohibitive surgical risk, and the patient and his relatives accepted the use of TAVI as off-label use. Formal approval was obtained for compassionate usage of TAVI in severe AR. The procedure was performed via right femoral route under general anaesthesia in hybrid operation theatre. Based on the diameter and perimeter of aortic annulus from CT aortogram as 28.3 mm and 89.7 mm respectively, CoreValve Evolut R 34mm THV was chosen according to the manufacturer's recommendation. It also gave about 20% oversize in order to prevent device dislodgement because the native valves were lack of calcification for device anchoring. In view of very poor LV function, surgical bypass was set up via left femoral artery and vein for back up support in case of severe complication occurred. The prosthesis was deployed successfully under cardiac pacing at 120bpm to minimize its movement. Prolonged on table observation via transesophageal echocardiogram and fluroscopic examination showed stable valve position and mild residual AR before completing the procedure. Daily echocardiography before discharge showed static valve position and the patient was discharged home uneventfully one week after procedure.

**Conclusion:** TAVI for severe AR by using CoreValve Evolut R 34 mm THV is safe and feasible. Careful preoperative planning and supportive multi-disciplinary team approach is important and necessary for successful result from this kind of complex and high-risk operation.



**ABSTRACTS**

Abstracts for Free Paper Session:

**STRUCTURAL HEART DISEASE**

**Percutaneous Paravalvular Leak Closure: Initial Experience in Hong Kong**

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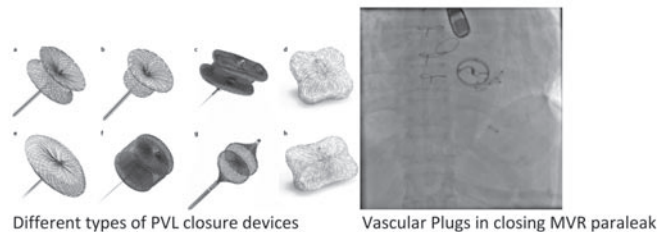
**Background:** Paravalvular leak (PVL) occurs in 5-17% of patients following surgical valve replacement. Symptoms include congestive heart failure or hemolytic anemia. Percutaneous paravalvular leak closure is an alternative to repeat surgery and is extremely useful in patients who are inoperable or at high surgical risk.

**Methods:** Retrospective study. The paravalvular leak registry of Queen Elizabeth Hospital, Hong Kong collected data since January 2013 till March 2017. Data was reviewed and analyzed.

**Results:** Fourteen procedures were attempted in 11 patients in our centre since January 2013. Patient age was 65±19 years. Thirty-six percent were female. The main indications for closure were heart failure only (36%) and both hemolysis and heart failure (55%). One of the patients had 2 previous open-heart surgeries and the other had 3. All prostheses were mechanical. Device were successfully implanted in 82% (9 out of 11) of patients, through femoral arterial (29%), femoral venous (43%) and apical (29%) approach. 86% were done under general anesthesia with TEE guidance. The target valves were 7 mitral (64%), 2 aortic (18%), 1 TAVI (9%) and 1 aortic graft (9%). Two patients (18%) received repeated procedure while 1 of them received 3 procedures. Vascular plug II was used in 9 out of 11 (82%) while vascular plug III and a rectangular occluder device was used in the remaining 2 procedures respectively. A mean of 2.3 devices were placed in each

procedure. Pre-procedural leak was severe (55%) and moderate (45%) or mild (29%) and was multiple in 1 patient. Post-procedural PVL improved to none in 55%, mild in 36% and moderate in 9%. There was no in-hospital mortality. Complications include device embolization (14%), wound complications requiring surgical hemostasis (7%) or debridement for infection (7%) and persistent or new hemolysis (45%). Mean NYHA functional class improved from 2.64±0.67 pre-procedure to 1.8±0.79 (p=0.0224) 30 days post-procedure.

**Conclusion:** Percutaneous PVL closure is an effective procedure to improve symptoms and PVL severity. It represents an alternative option for patients with high surgical risk or those with past multiple open-heart surgeries.



Different types of PVL closure devices

Vascular Plugs in closing MVR paraleak

**Left Atrial Appendage Occlusion (LAAO) for Stroke Prevention in Chinese Patients with Atrial Fibrillation: Single Centre Six-Year Experience with AMPLATZER Cardiac Plug/Amulet and Watchman**

GSH Cheung,<sup>1</sup> KCY So,<sup>1</sup> AKY Chan,<sup>1</sup> SSW Au,<sup>2</sup> SKC Chan,<sup>2</sup> APW Lee,<sup>1</sup> BPY Yan<sup>1</sup>

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<sup>2</sup>Department of Anaesthesiology, Prince of Wales Hospital, Hong Kong

**Background and Purpose:** Majority of published data concerning LAAO mainly came from Caucasian, while the corresponding data from Asian, especially Chinese population is limited. The aim of this study is to review all our Chinese patients who underwent percutaneous LAAO by using two most commonly used devices, ACP/Amulet and Watchman.

**Methods:** This retrospective study included all consecutive patients with non-valvular AF who underwent LAAO at one of the tertiary hospital in Hong Kong between June 2009 to January 2016.

**Results:** 104 LAAO procedures were recorded in the study period. The mean age was 71.5 years old, and majority of them was male. The mean CHA<sub>2</sub>DS<sub>2</sub>-VASc and HAS-BLED score were 4.0±1.6 and 2.8±1 respectively. There was no significant difference in baseline between patients receiving Watchman or ACP/Amulet. The mean procedural and fluoroscopic time of the Watchman and ACP/Amulet devices were 64.9±28.4 vs 90.8±39.3 minutes (P=0.0003), and 14.1±7.6 vs 18.5±10.1 minutes (P=0.01) respectively. LAAO devices were successfully implanted in 100 (96.2%) out of 104 patients at the index procedures. Within thirty day of procedure, there were eight (7.7%) major periprocedural adverse events occurred, and no any case of stroke or TIA, systemic embolism, and procedure related or cardiovascular death. The

mean follow-up was about 2.5 years (29.2 +/-2.6 months, range from 5 to 44 months). Eight deaths (7.7%) was found at follow-up, and none was related to the LAAO procedure. Five ischaemic stroke (4.8%) and one traumatic subarachnoid hemorrhage happened. The annual ischaemic stroke rate was 2.0% (5/253.1 patients-years), which was significantly lower than the expected rates of stroke based on CHA<sub>2</sub>DS<sub>2</sub>-VASc score (5.6%).

**Conclusion:** The main finding of this single centre all-comers study was that LAAO with either Watchman or ACP/Amulet in Chinese patients were not only safe and feasible with favourable acute procedural successful rate and complication rate comparable to the Western counterparts, but also effective in reducing the ischaemic stroke and bleeding events in longterm.

**ABSTRACTS**

Abstracts for Free Paper Session:

**STRUCTURAL HEART DISEASE**

**Left Atrial Appendage Occlusion before Completion of DAPT versus Combined Antithrombotic Therapy in Chinese Patients undergone PCI with Nonvalvular Atrial Fibrillation: A Single Centre Retrospective Case-Control Analysis**

KCY SO,<sup>1</sup> GSH Cheung,<sup>1</sup> AKY Chan,<sup>1</sup> SSW Au,<sup>2</sup> SKC Chan,<sup>2</sup> APW Lee,<sup>1</sup> BPY Yan<sup>1</sup>

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**Background:** Around 10% of patients undergone percutaneous coronary intervention (PCI) has nonvalvular atrial fibrillation (NVAF). Currently, combined antithrombotic therapy (CAT) is the more commonly adopted approach to prevent stent thrombosis and stroke, in which patients receive a course of dual antiplatelet therapy (DAPT) plus oral anticoagulant (OAC) ranged from 0-12 months followed by a P2Y<sub>12</sub> inhibitor plus OAC to complete guideline-recommended DAPT duration. Yet, CAT is associated with 3 to 4-fold increase risk of bleeding. Left atrial appendage occlusion (LAAO) might be an alternative in these patients.

**Objective:** The aim of this analysis is to evaluate the thromboembolic and bleeding risks of LAAO in post-PCI Chinese patients with NVAF before completion of standard DAPT therapy compared to DAPT alone or CAT respectively.

**Methods:** We retrospectively reviewed the LAAO registry (from June 2009 to February 2016) of our center to identify subjects with previous PCI using drug eluting stents (DES) and LAAO performed before completion of DAPT. Patients with NVAF and PCI using DES done in our center within the same study period were reviewed. Post-PCI antithrombotic regimens (DAPT alone

versus CAT) were identified for grouping. 4 non-cardiovascular and non-bleeding related mortality cases within 1 year were excluded. The primary end-point was the number of patients developed stroke or transient ischemic attack (TIA) and/or major bleeding events (defined by intracranial hemorrhage (ICH) or a drop of haemoglobin  $\geq 3$ g or clinical need to stop  $\geq 1$  antithrombotic) within one year post-PCI. Secondary end-point was number of patients with major adverse cardiovascular and cerebrovascular events (MACCE) defined by death, myocardial infarction (MI), stroke/TIA, stent thrombosis or repeated revascularization.

**Results:** We compared LAAO (n=14), CAT (n=30) and DAPT (n=60) patients. The mean CHA<sub>2</sub>DS<sub>2</sub>-VASC scores were 4.7 $\pm$ SD1.7, 4.6 $\pm$ SD1.6 and 4.5 $\pm$ SD1.3 respectively (p=0.84). The mean HAS-BLED score was significantly higher in the LAAO group (3.2 $\pm$ SD0.9 versus 2.6 $\pm$ SD1.0 versus 2.3 $\pm$ SD0.9, p=0.01). The mean PCI to LAAO time was 3.4 $\pm$ SD3.3 months. The mean duration of DAPT plus OAC in the CAT group was 6.3 $\pm$ SD1.0 months. Within one year post-PCI, 10% of patients (n=6) on DAPT developed stroke/TIA with one mortality resulted compared to 0 stroke/TIA in the LAAO and CAT groups (p=0.10). 7.1%, 16.7% and 5.0% patient(s) in LAAO, CAT and DAPT group had major bleeding events within one year (n=1, 5 and 3, p=0.18) respectively. All bleeding events in the LAAO and CAT groups happened during their DAPT plus OAC therapy. No patient had MACCE in the LAAO and CAT groups compared to n=7 patients (11.7%) in the DAPT group, including NSTEMI requiring PCI (n=1) in addition to the stroke patients (n=6; p=0.06).

**Conclusion:** Despite the higher baseline HAS-BLED score, LAAO appeared to reduce the bleeding risk with comparable efficacy in stroke prevention compared to CAT after PCI in Chinese patients with NVAF. Further randomized data with larger sample size is needed to confirm this hypothesis.

**Anti-Thrombotic Medication Left Atrial Appendage Occlusion with Watchman Device: Warfarin or Novel Oral Anti-Coagulations?**

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**Background:** Following percutaneous left atrial appendage occlusion (LAAO) by implanting Watchman device, the patients are recommended to receive warfarin and aspirin for a minimum for 45 days to allow endothelialization of the device's fabric covering. If echocardiographic criteria (i.e. no thrombus and leaks less than 5 mm) for successful LAA closure are fulfilled at 45-day TEE, warfarin is discontinued. Clopidogrel and aspirin are continued until 6 months post implant, followed by aspirin alone indefinitely thereafter. Novel oral anticoagulation (NOAC) could offer more benefit than taking warfarin, which has a narrow therapeutic window, requires frequent laboratory monitoring, and is affected by diet, drugs and illnesses.

**Purpose and Methods:** To study the feasibility of using NOAC for the anticoagulation regime after Watchman implantation. To review all LAAO procedures by Watchman device in one tertiary hospital retrospectively, and to compare the 45-day TEE finding and clinical events in different post implantation anticoagulation regime.

**Results:** From October 2009 to September 2016, there were 64 Watchman LAAO procedure performed. The mean CHA<sub>2</sub>DS<sub>2</sub>-VASC and HAS-BLED score were 4.3 (+/- 1.4) and 3.1 (+/-1) respectively. The mean age was 72.6 (+/-7.9) years old, and 68.2% was male. 60.3%, 22.2% and 17.5% of patients received warfarin, plavix and NOAC (apixaban 4.8%, dabigatran 6.3% and rivaorxaban 6.3%) respectively after the procedures. Comparing the 45-days TEE findings in patients received warfarin and NOAC, there was no significant difference in the incidence of leaks (11 vs 6, p=0.26), and thrombus formation over the the device (1 vs 0, p=0.115). There was one case of residual leak more than 5 mm at 45-day TEE, which required continuation of warfarin; the discontinuation rate of warfarin and NOAC at 45 days were 97.3% and 100% respectively (p=0.77). There was no any clinical events of stroke and bleeding in 30 days and 3 months. One case of 30-day mortality was due to peritonitis, which not related to procedure.

**Conclusion:** For patients not absolutely contraindicated for oral anticoagulation, apart from warfarin as standard anticoagulation regime after Watchman implantation, NOAC could also provide similar outcome without additional complication.

## ABSTRACTS

Abstracts for Free Paper Session:

## STRUCTURAL HEART DISEASE

**Effect of Severe Renal Failure on Left Atrial Appendage Occlusion Outcome: A Retrospective Single-Centre Analysis**KCY So,<sup>1</sup> GSH Cheung,<sup>1</sup> AKY Chan,<sup>1</sup> SSW Au,<sup>2</sup> SKC Chan,<sup>2</sup> APW Lee,<sup>1</sup> BPY Yan<sup>1</sup><sup>1</sup>Division of Cardiology, Department of Medicine and Therapeutics;<sup>2</sup>Department of Anaesthesia and Intensive Care, Prince of Wales Hospital, Hong Kong

**Background:** Patients with atrial fibrillation (AF) have a higher incidence of renal impairment. The coexistence of both conditions not only increases the risk of thromboembolism but also the risk of bleeding paradoxically. In severe renal failure (KDOQI Stage 4 or 5, eGFR <30 mL/min), the net clinical benefit of anticoagulants especially in dialysis-dependent patients remains uncertain. Left atrial appendage occlusion (LAAO) may be an alternative mean for stroke prophylaxis in patients with severe renal failure. However, data of LAAO in this group of patients is limited.

**Objective:** The objective of this study is to evaluate the procedural outcomes, risk of ischemic and hemorrhagic stroke, moderate to severe bleeding and mortality in severe renal failure and AF patients undergone LAAO.

**Methods:** We retrospectively reviewed the LAAO registry (from June 2009 to February 2016) of our center to identify subjects with severe renal failure defined by eGFR <30 mL/min (estimated by the latest CKD-EPI equation). Patients in the registry with eGFR ≥30 mL/min were recruited for comparison. The baseline age, CHA2DS2-VASc and HAS-BLED scores were compared. The procedural time, length of stay (LOS), incidence of overall and individual peri-procedural complications, rate of procedural success (defined by successful occlusion of LAA without any procedural related complications at 60 days), rate of stroke or transient ischemic attack (TIA), rate of bleeding and mortality were evaluated and compared.

**Results:** Only 9 out of 161 patients (5.6%) in the cohort had severe renal failure and 3 (1.9%) were dialysis-dependent. They had significantly higher mean CHA2DS2-VASc and HASBLED scores (5.38±SD1.8 versus 3.99±SD1.5, p=0.014; 4.13±SD1.1 versus 2.82±SD1.0, p=0.001) compared to those without severe renal failure. There is no statistical significant difference in the procedural time, LOS, incidence of individual peri-procedural complications, rate of technical success, rate of stroke or TIA and rate of bleeding at 1 year follow-up. However, patients with severe renal failure had significantly lower rate of procedural success rate (55.6% versus 87.5%, p=0.025), due to femoral hematoma (n=1), cardiac tamponade (n=1), thirty-day mortality related to peritonitis (n=1) and device related thrombus (n=1) detected in follow-up transesophageal echo. 2 out of 6 severe renal failure patients with 1 year follow-up died of non-cardiovascular causes (33.3% versus 1.9%, p=0.014).

**Conclusion:** Severe renal failure might not affect the efficacy of LAAO in preventing stroke or TIA and bleeding. However, they had significantly lower procedural success rate at 60 days and higher 1-year non-cardiovascular mortality rate. Analysis with large sample size and longer follow-up is needed to confirm this hypothesis.

**Percutaneous Transcatheter Closures of Multi-Orifices Perimembranous Ventricular Septal Defects with a Large Inlet Using Two Amplatzer-Type Occluders: Patients Selection and Mid-Term Follow-Up Results**

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**Background:** Percutaneous transcatheter closure of multi-orifices perimembranous ventricular septal defects (Pm-VSDs) with a large inlet is relatively challenging and troublesome. Furthermore, in some rare cases, when the two main orifices are far apart and the upper exit is simultaneously close to the aortic valve, does surgical repair is the only choice? We reported a series of such patients undergoing successful transcatheter closure using two Amplatzer-type occluders in children, focus on patients selection and mid-term follow-up results.

**Methods:** All available clinical details, cardiac catheterization data, echocardiography parameters and follow-up data of those children were reviewed.

**Results:** Between January 2007 and December 2015, seventeen children undergone successful transcatheter closure using two Amplatzer-type occluders. One case had transient III degree atrioventricular block (AVB) during the intervention and converted to complete left bundle branch block (CLBBB) after procedure, incomplete right bundle branch block (IRBBB) occurred in four patients, the ECG recovered to normal after dosing dexamethasone prior to their discharge. Additionally, three patients had mild

tricuspid valve regurgitation in one week after the procedure but recovered several months later. At the mean follow-up time of 65 months (26-120 months), all of patients were asymptomatic and no valve regurgitation and arrhythmias were detected.

**Conclusion:** For multi-orifices Pm-VSDs with a large inlet, if the septal aneurysm is large and dense enough to anchor two devices, transcatheter closure at the outlet with two devices is an effective and safe alternative to surgical repair with favorable mid-term follow-up results.

**ABSTRACTS**

Abstracts for Free Paper Session:

**STRUCTURAL HEART DISEASE**

**The Mid-Term and Long-Term Follow Up Outcomes of Post-Procedure Complete Left Bundle Branch Block after Transcatheter Closure of Perimembranous Ventricular Septal Defect**

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**Backgrounds:** In the past decades, transcatheter closure of perimembranous ventricular septal defect (VSD) has been widely proved to be a safe and effective alternative to surgery. With the development of transcatheter techniques and the modifications of closure devices, the rate of serious post-procedure arrhythmias including complete or high-degree atrioventricular block, has been remarkably decreased. Recently, post-procedure complete left bundle branch block (CLBBB) has caused extensive concern as several case reports demonstrated that it could lead to left ventricular enlargement and a significant decrease in left ventricular systolic function. However, data regarding the incidence and prognostic implications of post-procedure CLBBB is rare currently, particularly in children.

**Objectives:** The present study intended to determine the mid-term and long-term follow up outcomes of post-procedure CLBBB after transcatheter closure of perimembranous VSD in children, aiming to provide some references for the clinical management of post-procedure CLBBB.

**Methods:** Between January 2005 and June 2014, a total of 1928 children undergone successful transcatheter closure of perimembranous VSD using modified symmetric double-disk occluder in our center. All children with post-procedure CLBBB were enrolled. All available clinical outcomes and follow-up data were reviewed and analyzed.

**Results:** Totally, post-procedure CLBBB after transcatheter closure of perimembranous VSD occurred in 23 cases, with an incidence of 1.19% (23/1928). All of those 23 children were followed up with a range of 2-10 years. Among them, 21 cases developed CLBBB within 1 week after the procedure, but most of them (15/21) reverted to the normal sinus rhythm after administration of intravenous steroids before discharge. For the remaining 6 patients with CLBBB at discharge, recovery to normal conduction occurred in 2 patients at three months and six months follow-up visit, 3 cases reverted to other types of heart block progressively (2 with complete RBBB and left anterior hemiblock, and 1 with left anterior hemiblock) and the other one patient remained unchanged afterwards. One patient who has recovered to normal conduction developed CLBBB again 14 months after the procedure. Late-onset CLBBB was also noticed in 2 patients at eight and twenty months post-procedure, respectively. Among the 4 patients suffering from persistent CLBBB, one of them developed symptoms of heart failure and the echocardiography showed increased left ventricular end-diastolic diameter and decreased left ventricular systolic function eight months after the initial presence of CLBBB, whereas the other 3 cases were asymptomatic and the echocardiography showed no abnormal signs.

**Conclusions:** The general incidence of post-procedure CLBBB after transcatheter closure of perimembranous VSD was relatively low and most of them were transient. However, reversible and late-onset CLBBB could occur and persistent CLBBB could lead to decreased left ventricular systolic function. More careful monitoring after transcatheter closure of perimembranous VSD should be applied for patients with post-procedure CLBBB.

**Transcatheter Structural Heart Intervention: One-Year Experience in A Tertiary Hospital in Hong Kong in 2016**

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**Background:** The percutaneous transcatheter intervention for structural heart disease includes a wide spectrum of cardiac problems and procedures with different techniques and complexity. The establishment of structural heart team could provide multi-disciplinary care to the patients in this rapidly developing field.

**Purpose:** To review and share our experience and results of transcatheter structural heart intervention in one tertiary hospital in Hong Kong. To compare those performances between 2015 and 2016.

**Methods:** A retrospectively review of all patients underwent transcatheter structural heart intervention between January to December 2016 at one of the tertiary hospital in Hong Kong was performed. Patients' demographics, clinical characteristics, operative procedures, postoperative complications and outcome were recorded and analyzed. Types of complication were classified as major and minor, with reference to the definition from VARC-2 consensus document.

**Results:** In 2016, there were 136 procedures of percutaneous transcatheter structural heart intervention performed. The average age was 68.3 years old (range 24-90), and 62% are male. Among them, there were 57 cases (41.9%) of left atrial appendage occlusion, 25 cases (18.4%) of transcatheter aortic valve implantation, 18 cases (13.2%) of percutaneous transcatheter mitral commissurotomy, 11 cases (8.1%) of atrial septal defect closure, 6 cases

(4.4%) of paravalvular leakage closure, 6 cases (4.4%) of patent foreman ovale closure, 3 cases (2.2%) of patent ductus arteriosus closure; and the remaining 10 cases (7.4%) included percutaneous mitral valve repair by MitraClip, ventricular septal defect closure, balloon aortic and pulmonary valvuloplasty, pulmonary arterio-venous malformation occlusion, and coronary arterial fistula occlusion. The procedural successful rate was 97.1%; Major and minor complication rates were 4.4% and 11.8% respectively. The 30-day mortality was 1.5% (n=2). Compared to previous results in 2015, while there are more procedures performed in 2016 with similar in cases distribution, the overall procedural successful rate and complication rate were similar.

**Conclusion:** Routine service of structural heart intervention provided by one dedicate team could maintain the high procedural successful rate and low major complication and mortality rate.

## ABSTRACTS

Abstracts for Free Paper Session:

## CARDIAC IMAGING II

**Relationship between the Abnormal Diastolic Vortex Structure and Impaired Left Ventricle filling in Patients with Hyperthyroidism**

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**Aim:** Intraventricular hydrodynamics plays an important role in evaluating cardiac function. Relationship between diastolic vortex structures and left ventricular (LV) filling is still rarely reported. This study aimed to evaluate the evolution of intraventricular fluid dynamics during diastole in hyperthyroidism (HT), and to explore the alteration of hydromechanics characteristics with sensitive indices.

**Methods:** Forty-three patients diagnosed with HT were divided into two groups according to whether myocardial damage existed: simple hyperthyroid group (HT1, n=21) and thyrotoxic cardiomyopathy (HT2, n=22). Twenty-seven age- and gender-matched healthy volunteers were enrolled as the control group. Offline vector flow mapping (VFM model) was used to analysis the LV diastolic blood flow patterns and fluid dynamics. Hemodynamic parameters like area (A), circulation (C) and intraventricular pressure gradient ( $\Delta P$ ) in different diastolic phase (early, mid, and late) were calculated and analyzed.

**Results:** HT2, with a lower E/A ratio and left ventricular ejection fraction (LVEF), had larger left ventricular end-diastolic diameter (LVEDD) and left atrium diameter (LAD) compared with the control group and HT1 ( $P<0.05$ ). Vortex displayed a typical biphasic temporal course during diastole in these three groups. In early diastole, vortices of the controls were smaller and weaker than those of HT1, larger and stronger than those of HT2 ( $P<0.05$  for

both). Vortices of these three groups increased in mid-diastole at the same pace and differences remained ( $P<0.05$  for both). Then vortices in HT2 developed so fast that exceeded the control group, but still below HT1 during the end of diastole. The intraventricular pressure gradient during early and mid-diastole ( $\Delta P_E$ ,  $\Delta P_M$ ) were higher in HT1 and lower in HT2 compared with those of the control group ( $P<0.05$ ). However, the intraventricular pressure gradient ( $\Delta P_L$ ) of HT2 increased and was higher than that of the control group in late diastole ( $P<0.05$ ). Good correlation could be found between  $C_E$  and E/A ( $P<0.05$ ),  $C_M$  and  $\Delta P_M$  ( $P<0.01$ ),  $C_L$  and FT3 ( $P<0.05$ ). **Conclusions:** VFM can reflect the abnormal left ventricular filling by showing the changes of left ventricular diastolic vortex.

**Echocardiographic Diagnosis of Pulmonary Artery Sling**

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The objective of this study was to analyze echocardiographic characteristics of Pulmonary Artery Sling (LPAS) and to explore the diagnostic value of transthoracic echocardiography. The echocardiographic characteristics of 7 patients with LPAS from 2012 to 2016 were analyzed retrospectively, and compared with computed tomography angiography (CTA) and angiographic reconstructions. Seven cases included 2 fetuses and 5 children (aged 6 months to 13 months). The 5 children with LPAS were all associated with different types of congenital cardiac defects, such as atrial septal defect, ventricular septal defects, left superior vena cava, patent ductus arteriosus, and so on. And the two fetuses with LPAS didn't find any congenital cardiac defects temporarily. Seven cases included 1 partial left pulmonary artery sling and 6 whole left pulmonary artery sling. Echocardiography showed an anomalous origin of the whole left pulmonary artery from the right pulmonary artery in 6 cases, and an anomalous origin of the lower left pulmonary artery from the right pulmonary artery in 1 case. The morphological and hemodynamic changes were also evaluated. In the 7 patients, 1 case was misdiagnosed, and the others were correctly diagnosed. The diagnosis of LPAS was confirmed by CTA and intraoperative findings in the 5 children. Echocardiography is effective in diagnosing LPAS, when the main pulmonary artery extends to the right pulmonary artery directly with the main pulmonary artery bifurcation disappeared and left pulmonary artery aroused from the right pulmonary artery.



**ABSTRACTS**

Abstracts for Free Paper Session:

**MISCELLANEOUS**

**The Long-term Effects in the Cardiovascular Disease of Offspring in Mice after Maternal Exposure to Air Pollution in Utero**

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**Aim:** Ambient particulate matter 2.5 (PM2.5) is a global health concern, as exposure to PM2.5 has consistently been found to be associated with increased cardiovascular morbidity and mortality. However the potential effects and mechanisms of PM2.5 exposure in utero on offspring’s cardiovascular adverse events are still largely unknown. The aim of this study is to investigate the long-term effect on generations after maternal exposure to air pollution in utero.

**Methods and Results:** Pregnant c57 mice were exposed to PM2.5 during the whole gestation (about 300 ug/m<sup>3</sup> PM2.5 for 2 hours/day). A significant low birth weight of offspring was found after PM2.5 exposure, and heart tissue of these new born mice showed an enlargement of sarcoplasmic reticulum, a thickening of Z line and remarkable sarcomere dissolution by using transmission electron microscope. In adulthood, exposure to PM2.5 in utero induced cardiac hypertrophy. To further define the mechanism underlying the cardiac hypertrophy, we found that P300/CBP caused hyperacetylation of histone3 lysine9 near the promoter region of hypertrophic factor GATA4, and induced its overexpression, and that may result in an increase of fetal genes, such as  $\alpha/\beta$  MHC. In utero exposure also strongly affected glucose - lipid metabolism in adult mice.

**Conclusion:** Taken together, our data indicated that maternal exposure to PM2.5 during gestation may caused a series of cardiovascular adverse events, histone acetylation may play an important role in these pathological process.

**Prognosis Value of Serum Bilirubin on Clinical Outcomes in Patients with Infective Endocarditis**

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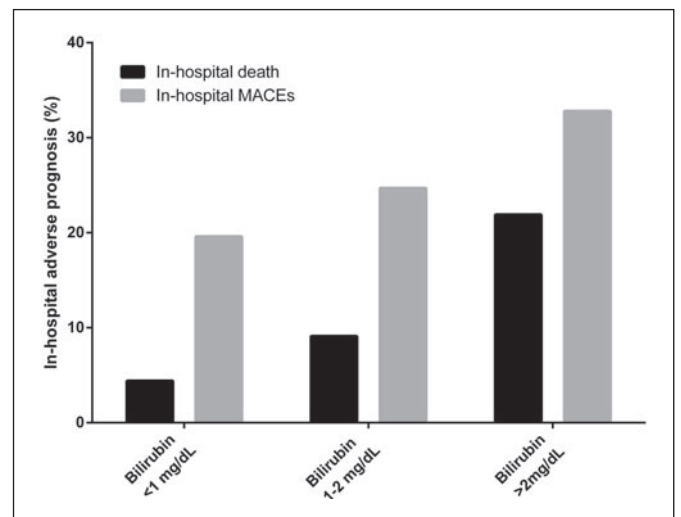
**Background:** Elevated serum total bilirubin level has been proved to be associated with adverse outcomes in patients with sepsis. However, the prognosis value of bilirubin levels in infective endocarditis (IE) was unknown.

**Purpose:** Aimed to evaluate the prognosis value of total bilirubin on clinical outcomes in patients with IE.

**Methods:** We prospectively enrolled 959 consecutive patients with IE between January 2009 and July 2015. Multivariate logistic regression analysis was performed to confirm whether total bilirubin level was an independent risk factor of adverse outcomes.

**Results:** 959 patients (69.8% men; age, 45±15 years) were divided into three groups according to admission serum bilirubin: <1 mg/dL (n=608), 1-2 mg/dL (n=287) and >2 mg/dL (n=64). There was a tendency among groups to increase incidence of in-hospital death and MACE along with elevated bilirubin levels (4.4% vs. 9.1% vs. 21.9%, p<0.001; 19.6% vs. 24.7% vs. 32.8%, p=0.021). Compared to those with normal bilirubin levels, the odds of in-hospital mortality were 2.42 (95% CI 1.20-4.86, p=0.013) and 6.32 (95% CI 2.57-15.56, p<0.001) higher in those with a bilirubin level 1-2mg/dL and more than 2 mg/dL, respectively. The one-year mortality in patients with a bilirubin level 1-2 mg/dL and more than 2 mg/dL were higher than those with normal bilirubin levels (HR=2.30, 95%CI, 1.36,5.11, P=0.041; HR=4.44, 95%CI, 1.37,14.41, P=0.013). Kaplan-Meier curves indicated that patients with bilirubin>1 mg/dL were associated with higher cumulative rate of one-year mortality (Log-rank=13.41, p=0.001).

**Conclusion:** Circulating total bilirubin level measurement in patients with IE might be helpful to identify those who were at risk of in-hospital and one-year adverse outcomes.



**Figure 1.** The incidence of in hospital death and MACEs among different levels of Bilirubin.



**ABSTRACTS**

Abstracts for Free Paper Session:

**MISCELLANEOUS**

**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 extremely rare disease (0.5% of autopsy series) leading to heart failure, thrombosis and death. Eosinophilic myocarditis occurs in 60%. The diagnosis is delayed due to its myriad presentations masquerading as any form of myocarditis. We report 4 Filipinos with HES focusing on their cardiovascular presentation, work up, management and clinical outcomes.

**Summary of Cases:** All patients were between 19-42 years old with good functional capacity. A history of atopy was strong in 50%. Common causes of explained hypereosinophilia 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 heart failure. Half presented with findings of heart failure and 25% had skin findings suggestive of hypereosinophila. Half of patients had ECG findings simulating schema which later resolved upon resolution of hypereosinophilia. Echocardiographic findings showed concentric left ventricular remodeling 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 I was elevated in 50%. Coronary angiogram revealed normal coronaries (100%) upon investigation. Mean absolute eosinophil count (AEC) was 12,752 cells/uL. Endomyocardial biopsy done in 1 patient was consistent with EM. There was histologic evidence of other organ involvement in 75%. Majority (75%) received high dose prednisone and anti-histamines. Dramatic improvement in HF symptoms was

documented in 50% after treatment. The ALI patient showed resumption of arterial flow with collateral formation. Majority (75%) showed dramatic improvement in hypereosinophilia on 6 month-follow up (mean AEC: 318 cells/uL). One patient died of fatal arrhythmia.

**Discussion:** To our knowledge, this is the only Filipino cohort, the largest of all international case series reporting the diverse HES cardiovascular manifestations. By knowing the varied presentation of this disease among Filipinos, physicians can be better equipped in recognizing this elusive diagnosis promptly.

**Similar Resuscitation Outcomes Between 30 mm and 50 mm Compression Depth During Mechanical Chest Compression with Weil Mini Chest Compressor in a Porcine Model of Cardiac Arrest after Acute Myocardial Infarction**

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**Introduction:** Current guidelines require a 50 mm compression depth for manual design of each device, whether this depth yields the most optimal hemodynamic efficacy remains to be tested. In this study, we investigated the effects of compression depth on hemodynamic efficacy during mechanical CPR with the Weil Mini Chest Compressor in a porcine model of cardiac arrest after acute myocardial infarction.

**Hypothesis:** There is no significant difference in hemodynamic efficacy between compression depth of 30 mm and 50 mm during mechanical CPR with the Weil Mini Chest Compressor.

**Methods:** Fourteen male domestic pigs weighing 39±2 kg were utilized. After animal preparations, complete occlusion of the left anterior descending coronary artery (LAD) was confirmed by angiography. Ventricular fibrillation (VF) was electrically induced after 15 minutes of occlusion and untreated for 7 minutes. The animals were then randomized to receive compression depth of 30 mm or 50 mm. Coincident with the start of precordial compression, the animals were mechanically ventilated at a rate of 10 breaths per minute. Defibrillation was attempted by a single 150 J shock after 6 minutes of CPR. If resuscitation was not successful, CPR was resumed for 2 minutes prior to the next defibrillation until either successful resuscitation or for a total of 15 minutes.

**Results:** All animals were successfully resuscitated. There were no differences in coronary perfusion pressure (CPP), end-tidal carbon dioxide (ETCO<sub>2</sub>) and carotid blood flow (CBF) between the two groups (Table). A significantly less rib fracture was observed in the 30 mm group [0 (0-0) vs 1.2 (0-2), p<0.05].

**Conclusion:** Similar hemodynamic efficacy was observed between 30 and 50 mm compression depth during mechanical CPR with the Weil Mini Chest Compressor.

**Table.** Comparison of hemodynamic efficacy between different compression depths during mechanical cardiopulmonary resuscitation

	PC1	PC3	PC5
CPP, mmHg			
30 mm	21.5±4.5	41.4±5.6	34.6±6.9
50 mm	23.1±4.9	42.7±4.1	33.3±5.7
ETCO <sub>2</sub> , mmHg			
30 mm	22.9±4.5	23.8±3.9	5.1±6.3
50 mm	25.1±5.5	24.6±4.9	26.5±4.8
CBF, mL/min			
30 mm	44±7	35±8	37±10
50 mm	49±10	40±9	33±8

Values are presented as mean ± SD. BL, baseline; PC, precordial compression; CPP, coronary perfusion pressure; ETCO<sub>2</sub>, end-tidal carbon dioxide; CBF, carotid blood flow.

**ABSTRACTS**

Abstracts for Free Paper Session:

**MISCELLANEOUS**

**"Persistent Diffuse Deep T Wave Inversion" an ECG Manifestation of Myasthenia Gravis in Crisis: A Case Series at the Philippine General Hospital**

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University of the Philippines - Philippine General Hospital, Philippines

Despite absence of acetylcholine receptors in cardiomyocytes, tachyarrhythmias, myocarditis, and death have been documented in myasthenia gravis. We report 2 cases of MG presenting with deep diffuse persistent T wave inversions (DDPTWI) as a marker for possible MG related cardiac disease. A 68 y/o female, diagnosed MG, post thymectomy for malignant thymoma, was admitted for progressive weakness, chest pain and cough. ECG showed regular sinus rhythm, normal axis, low voltage complexes, prolonged QT interval, diffuse T wave inversion on all leads. Troponin I level was elevated however, monitoring of troponin was negative. Echocardiography revealed concentric LVH with good contractility. ECG monitoring showed deepening diffuse symmetric T wave inversion. Due to the low CAD risk, this was interpreted as non-ischemic and was attributed to MG's autoimmunity. Pyridostigmine, prednisone and plasmapheresis were given. She remained stable through out hospitalization and ECG a month after showed normalization of DDPTWI. A 29 y/o female was admitted for MG crisis. ECG revealed sinus tachycardia, upright T waves. On Day 8, patient developed sepsis induced hypotension and ECG showed 3 mm T wave inversion on lateral leads. Serial ECG showed deepening of T wave inversion on V2-V6. The cardiac enzymes, echocardiogram and electrolytes were normal. With medical management, patient was discharged improved. The dynamic ECG changes were attributed to possible immunologic myocarditis,

which can present with DDPTWI. This series highlights that clinicians should be aware that MG presents with this feature, albeit seemingly alarming, follows a benign course and resolves with the resolution of MG crisis.

**Effect of High-Fat Diet Plus Streptozotocin-Induced Diabetes and Varied Roles of Apelin on Rat Systemic and Pulmonary Arteries**

HM Peng, HJ Ba, HS Wang

Department of Pediatric Cardiology, First Affiliated Hospital, Sun Yat-Sen University, China

**Objective:** To investigate whether diabetes has an effect on pulmonary artery tone regulation and the role of apelin in that process.

**Method:** Diabetes was induced in Sprague-Dawley rats by high-fat diet (HFD) and streptozotocin (40 mg/kg, i.p.). Animals with a fast blood glucose  $\geq 11.1$  mmol/L were considered diabetic and continued on HFD for 6 months. Isometric tension response to acetylcholine (ACh), nitroprusside (SNP) and norepinephrine (NE) of isolated pulmonary artery (PA) rings were compared in diabetic rats and age-matched controls. Alteration of apelin incubation to vasoactivity was observed. Identical myograph tests were performed on the thoracic aorta (TA) as reference. Plasma lipid profile, insulin, HOMA-IR and apelin levels were also measured.

**Result:** Diabetic rats had dyslipidemia (increased triglyceride, LDL-c and decreased HDL-c, apoE and HDL-c/LDL-c ratio), evidence of insulin resistance (increased HOMA-IR) and an increased plasma apelin level. Fast insulin and total cholesterol levels were comparable between groups. Relaxant response to ACh was reduced in both TA and PA from the diabetic group, while response to SNP or NE was not significantly different. Apelin incubation improved vasorelaxant response to ACh in TA but not in PA.

**Conclusion:** Diabetes impairs endothelium-dependent vasodilation in both pulmonary and systemic arteries. The beneficial effect of apelin on endothelium function varies with vessel origin.

**ABSTRACTS**

Abstracts for Free Paper Session:

**PAEDIATRIC CARDIOLOGY I**

**The Clinical Effect of Interventional Treatment in Children's Aortic Coarctation**

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**Objective:** To evaluate interventional treatment's (including percutaneous balloon angioplasty and Stent Implantation) short-term clinical effect on children's aortic coarctation.

**Methods:** Sixteen children age from 9 months to 17 years, underwent percutaneous balloon angioplasty, including five cases of surgical correction then restenosis. The remaining seven children underwent stent implantation, age 8-16 years. Follow-up time from 0.1-8 years, Balloon or stent size is usually based on the normal form of cross-sectional and diaphragm's aortic diameter to choose, no more than the normal aortic diameter, with the exception of choose the balloon size 3 times the diameter of the stenosis.

**Results:** Children get significant immediate treatment effect, including differential pressure of the narrow place were significantly lower, aortic stenosis diameter were significantly broadening immediately and the onset of blood pressure difference significantly decreased postoperatively. The death cases did not appear, the hospitalization days is from 3 to 26 days in percutaneous balloon angioplasty, stenting is from 8-20 days. Respectively, seven cases of those have restenosis. One Case of Stent Implantation was the stent blocked subclavian artery blood and the child need emergency surgical treatment. One postoperative case appeared aortic limited intercalation, one case was coagulant function abnormality.

**Conclusion:** Percutaneous balloon angioplasty and stent Implantation have recent efficacy and high safety in treating children's limited aorta coarctation. Percutaneous balloon angioplasty is a safe and acceptable option for restenosis after surgical correction. The growth of blood vessels and increased blood flow appropriately after interventional therapy, the residual pressure may gradually reduce or also appear narrow again, its medium-term and long-term curative effect of interventional treatment remains to be seen.

**Clinical Characteristics, Cardiac Function and Gene Analysis of Children Cardiomyopathy in South-Western China: A 10 Year Retrospective Single-Center Study**

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Heart Center, Children's Hospital of Chongqing Medical University, Chongqing, China

**Background:** Cardiomyopathy is a heterogeneous group of heart muscle diseases in children, including dilated cardiomyopathy (DCM), hypertrophic cardiomyopathy (HCM), restrictive cardiomyopathy (RCM), arrhythmogenic right ventricular cardiomyopathy (ARVC) and left ventricular noncompaction cardiomyopathy (LVNC), which may predispose patients to sudden cardiac death. This study compared clinical characteristics, cardiac function and follow-up in children cardiomyopathy, and analyzed genetic studies of partial patients.

**Methods:** We retrospectively reviewed data from 310 patients with cardiomyopathy between January 2007 and December 2016, and conducted genetic tests for part of the follow-up patients.

**Results:** Of the 310 patients consisted of 166 boys and 144 girls with an age range of 0.1 to 16.7 years, the average age was 4.6±4.4 years, 2.9% of cases had malgenic family history. The main clinical manifestations were cyanosis, fatigue, anhelation, palpitation after activity, syncope, tachycardia, cardiomegaly, hepatomegaly, peripheral edema. Majority of the patients had III or IV NYHA class (54.5%), 57.9% of DCM, 32.5% of HCM, 77.4% of RCM, 50% of ARVC, 64.8% of LVNC, respectively. Among all patients, the incidence of cardiac dysfunction was 84.5%, on admission, 200 patients with DCM, LVNC mainly performed systolic dysfunction, 110 patients with HCM, RCM mostly encountered diastolic dysfunction. During the 10 years,

the total death rate of cardiomyopathies was 26.45%, meanwhile, the rate of RCM was the highest of 35.48%. DNA sequencing analysis revealed that the mutations mainly were located in encoded sarcomere gene MYH7 (5 cases), TNNI3 (2 cases), MYBPC3 (1 case), TPM1 (1 case), and other genes (RAF1, GAA, PKP2, ILK, DSP) also existed possible pathogenic mutations.

**Conclusions:** Different clinical characteristics and cardiac dysfunction were found in cardiomyopathies. The same gene mutations appeared the different clinical phenotypes, and different gene mutations appeared the same clinical phenotypes, which prompted there existed a complex genetic modification in heart development.

**ABSTRACTS**

Abstracts for Free Paper Session:

**PAEDIATRIC CARDIOLOGY I**

**Targeted Next-Generation Sequencing (NGS) of 22 Candidate Genes in Congenital Heart Disease Patients with Heterotaxy**

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<sup>1</sup>Children's Hospital of Fudan University; <sup>2</sup>Shanghai Key Laboratory of Prevention and Intervention of Birth Defects, Shanghai, China

**Objective:** The development of next-generation sequencing (NGS) technologies has a great impact on the human variation detection given their high-throughput. The purpose of this study was the design of a panel of heterotaxy associated genes as a rapid and efficient tool to perform genetic screening in a series of patients.

**Methods:** We developed a custom AmpliSeq panel for NGS sequencing of the coding sequences of 22 candidate genes which are highly associated with heterotaxy. A genetic analysis on heterotaxy syndrome patients with congenital heart disease was performed using Ion torrent PGM. The DNA variants of interests were confirmed by PCR and followed by direct Sanger Sequencing. For the statistical and bioinformatics analysis, Polyphen 2, SIFT, and Mutationtaster analytical software were used. We also sequenced the variants on the parents of proband if we got the parent's DNA by Sanger sequencing, so that it can help us know whether the mutation is *de novo* or not.

**Results:** Twenty-one potential disease-causing variants were identified in seven genes from 22 patients: DNAH5, ARMC4, MEGF8, SHROOM3, NPHP4, ACVR2B, ZIC3. Fifteen of them were identified SNP with low minor allele frequencies (MAF) and eight of them were first found in this study. Significant increases in the number of "probably damaging" variants were identified in heterotaxy patients but not in database. Also, there existed a significant increase in the total number of "rare" and "low" frequency variants (MAF<0.05) in the patients.

**Conclusions:** Our validated NGS panel resulted in a fast, effective and easy method to characterize the genetic background in the patients and to identify new variants that could be associated to heterotaxy. Our results expand the previously known set of variants carried by these patients and further support the feasibility of using NGS targeted sequencing in diseases with complex genetic basis, such as heterotaxy or congenital heart disease. Moreover, this technique may help in the understanding of the genetic and molecular basis of the disease, and it provides a new tool in clinical practice to simultaneously analyze many genes as well as to identify several molecular events contributing to the phenotype.

**Neonatal Arrhythmias: A Case Series Study**

XJ Huang, L Zhang, P Huang, Z Zhang

Guangzhou Women and Children's Medical Center, China

**Objective:** This study aimed to evaluate the morbidity, clinical features, etiology, and outcomes of neonates with arrhythmias.

**Methods:** Newborns born in our center or elsewhere received heart auscultations and those with arrhythmias were confirmed by standard electrocardiography and/or dynamic electrocardiography. A retrospective review was performed on newborns that were diagnosed with neonatal arrhythmias during hospitalization in neonatal intensive care unit of our center from January 2011 to December 2016. The results of electrocardiography, echocardiography and biochemical analysis were evaluated. A 3-month follow up were reviewed.

**Results:** Among 105,698 neonates born in our center, 40 with arrhythmias were identified with the incidence of 0.038%, which significantly lower than the previous similar research. In total 59 cases, 38 (64%) were male and 21 (36%) were female. Mean age was 15.4 hours. The most common arrhythmias were supraventricular premature beats and supraventricular tachycardia at 23.7% and 28.8%, respectively. The main causes consisted of blood-gas and/or electrolyte abnormality (16 cases) and infection (12 cases). And the high risk factors were abnormal pregnancy (20 cases) and premature birth (12 cases). Eighteen patients were received anti-arrhythmic treatment such as adenosine, propafenone, digoxin or isoprenaline, and 12 cases recovered after treatment. During a 3-month follow-up, 47 (80%) infants recovered. Three cases continued suffering with atrioventricular block and 4 with supraventricular premature beats. Five neonates were died in the newborn

period with two babies had serious infection, one with severe asphyxia, one had chromosome abnormality combined with infection, and one had chromosome abnormality combined with infection and pulmonary artery atresia.

**Conclusion:** Effective diagnosis and treatment in the perinatal period can reduce the incidence of neonatal arrhythmias. Most neonatal arrhythmias are functional and temporary with a favorable prognosis. Dead cases with neonatal arrhythmias often died of its primary diseases.

**ABSTRACTS**

Abstracts for Free Paper Session:

**PAEDIATRIC CARDIOLOGY I**

**Transcatheter Closure of Coronary Artery Fistulae by Using Amplatzer Vascular Plug II In Children: A Clinical Observation and Follow-Up Study in 8 Cases, Single Center Experience**

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**Background:** To assess the short- and mid-term efficacy of transcatheter closure (TCC) of congenital coronary artery fistulae (CAF) by using Amplatzer vascular plug (AVP) in children.

**Methods:** Retrospective analysis was performed on 8 patients treated with transcatheter closure of CAFs using AVP.

**Results:** Among the 8 cases who underwent successful TCC and whose age was from 1.7 to 132 months. A no-residual-shunt rate was 62.5% (5/8) right after deploying devices. The period of postoperative follow-up was 3-36 months. Postoperative C/T ratio and diameter of right ventricle were less than the baseline levels (P<0.05). EF% was in normal range postoperatively. Of 8 cases, 5 took aspirin for 6 months after TCC, 1 for 3 months, 1 for 3 days, and 1 did not take any. In 1 case migration of the device was noticed with a moderate residual shunt, which reduced gradually after discontinuance of aspirin therapy. In all cases no thrombotic or embolic event was found, and no vascular complication was found.

**Conclusion:** TCC by AVP in children can reduced shunting and relieve symptoms. Residual shunt may be common complications. Postoperative anticoagulating or antiplatelet therapy may prolong the duration of residual shunt or even worsen it.

**Subcutaneous ICD Experience in a Tertiary Paediatric and Congenital Heart Centre in Hong Kong**

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<sup>1</sup>Department of Paediatric Cardiology, Queen Mary Hospital; <sup>2</sup>Division of Cardiology, Department of Medicine, Queen Mary Hospital, The University of Hong Kong; <sup>3</sup>Department of Cardiothoracic Surgery, Queen Mary Hospital, Hong Kong

**Aim:** We report our experience in the use of subcutaneous implantable cardioverter-defibrillator (S-ICD) in the single tertiary Paediatric and Congenital Heart Centre in Hong Kong.

**Methodology:** Retrospective analysis of all cases of S-ICD from January 2014 to March 2017 was conducted.

**Results:** Four cases of S-ICD were implanted. Mean body weight at ICD implantation was 57.5 kg, with a mean follow-up time of 14.9 months. All were indicated for ICD therapy for secondary prevention. Only one patient has a background of congenital heart disease. Half of our cohort necessitated change of device due to lead complication in previous ICD system. One patient received inappropriate shock due to T wave oversensing, which resolved after re-programming of the S-ICD system under treadmill test. To date, no appropriate ICD shocks were delivered in all our patients.

**Conclusion:** S-ICD can be safely used in our paediatric and congenital heart patients.

	Case 1	Case 2	Case 3	Case 4
Age of implantation (year)	11.0	17.3	19.3	29.8
Weight (kg)	48	54	55	73
Cardiac diagnosis	VT (RVOT) s/p radiofrequency ablation	Idiopathic VT/VF	Long QT syndrome (Type 2)	Tetralogy of Fallot s/p repair
Indication of ICD implant	VT arrest, documented TdP	VF arrest	History of collapse	VT syncope, inducible VT during EPS
Prior ICD system failure	No, first implanted ICD	No, first implanted ICD	Yes, atrial lead fracture, fluctuating ventricular lead impedance	Yes, failure of ICD lead
Follow-up time	27 months	25 months	7 months	0.5 month
Inappropriate shock	Yes, T wave oversensing. Resolved after storing templates in Treadmill test	X	X	X
Other complications	X	Minor wound problem	Minor wound problem	X
Appropriate shock	X	X	X	X

VT: ventricular tachycardia; VF: ventricular fibrillation; TdP: Torsades de pointe; EPS: electrophysiology study



ABSTRACTS

Abstracts for Free Paper Session:

PAEDIATRIC CARDIOLOGY I

**Meta-analysis of Fontan Procedure Extracardiac Conduit vs. Intracardiac Lateral Tunnel**

J Zheng, ZZ Li, XF Li, HL Yi

Beijing Children's Hospital Affiliated To Capital Medical University, China

**Objective:** This meta-analysis was designed to determine the effect of an intracardiac lateral tunnel (ILT) versus an extracardiac conduit (ECC) on patients undergoing a Fontan procedure.

**Method:** A search of the literature in PubMed, Embase, Cochran, China Academic Literature, and Wanfang databases yielded 23 studies comprising approximately 1000 patients for analysis.

**Result and Discussion:** There were statistically significant differences between ILT and ECC in the frequency of early sinus node dysfunction, early total arrhythmias, late supraventricular tachycardia, late sinus node dysfunction, late total arrhythmias, and need for pacemaker. By contrast, no statistically significant differences between the two methods were found in takedown, protein-losing enteropathy, thromboembolic events, early supraventricular tachycardia, early mortality, and total mortality.

**Conclusion:** We conclude that an ECC confers some advantages over an ILT, although the underlying mechanism remains unclear.

**Screening and Follow-Up of Congenital Heart Disease in Children Aged 0-3 Years in Rural Areas of Chongqing**

L Zhang, MY An, B Zhu, WD Shen, SJ Tan, XJ Ji, J Tian, XY Liu

Department of Cardiology, Children's Hospital of Chongqing Medical University, Chongqing, China

**Objective:** To explore effective screening procedures for early detection of congenital heart disease (CHD) and to establish "screening-diagnosis-evaluation" systems in rural areas of China.

**Method:** Integral sampling method was used in which 10005 children aged 0-3 years of rural areas of Chongqing were enrolled. After trained by Pediatric cardiologist in Children's Hospital of Chongqing Medical University, general pediatricians and echo cardiologists screened these children through seven indicators, including family history of CHD, dyspnea, cyanosis, special face, heart murmurs, other congenital malformations, SpO<sub>2</sub> <95%. Children with positive indicators were diagnosed by echocardiography. Patients with CHD were evaluated and followed-up by pediatric cardiologists.

**Results:** 175 children were found positive of 7 indicators. One hundred sixty-six cases underwent echocardiography and 60 CHD were diagnosed. The prevalence was 6‰. Forty-six of them were simple type CHD (46/60, 76.65%), mainly ventricular septal defect (22/60, 36.66%) and atrial septal defect (18/60, 30%). Heart murmur alone was the most important indicator of CHD. Heart murmurs combined with special face and other congenital malformations were most effective combination in CHD screening in children aged 0-3 years in rural areas. Sixty CHD patients were followed for 6 to 18 months. Data of follow up showed 13 cases received interventional or surgical therapy, 10 cases improved without treatment, 1 died of non cardiac reasons, 36 cases underwent further following-up.

**Conclusions:** Screening-diagnosis-assessment systems for CHD can be established in rural areas of China by using screening indicator combinations effectively.

**Clinical Characteristics and outcomes of Tetralogy of Fallot with Absent Pulmonary Valve**

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**Objective:** The purpose of this study was to evaluate the clinical characteristics of Tetralogy of Fallot with Absent Pulmonary Valve (TOF/APV) from 12 cases.

**Methods:** There are 12 patients with TOF/APV in Guangdong General Hospital from June 2006 to June 2016. Clinical manifestations, echocardiography, heart CT, electrocardiography and chest radiography were recorded to evaluate the hemodynamic changes, diameter of pulmonary artery (PA) and descending aorta, development of pulmonary valves, other cardiac defects and morphological study of respiratory tract.

**Results:** These 12 patients included 7 males and 5 females, aged from 11 day-old to 31 year-old. The principle diagnosis was TOF/APV, accompanying by ASD or PFO, congenital coronary artery abnormalities, tricuspid valves diseases, or CAVC. Six patients had tracheal abnormalities and three need mechanical ventilation. A massive dilation of PA and branches were presented in all cases. Ten patients received repair surgeries. Pulmonary valve replacements were performed in 2 adults while others received pulmonary valvuloplasty except one had direct anastomosis of PA to right ventricular outflow tract (RVOT) because of the single coronary artery across the RVOT. Patients who had tracheal abnormalities were corrected. After surgery, two had persistent lung infections. Finally all the patients discharged without severe complications. At follow-up, complications included pulmonary regurgitation, pulmonary artery stenosis. The prosthetic valves behaved well

while others showed various degree of pulmonary regurgitation or diastolic pulmonary reverse blood flow.

**Conclusions:** TOF/APV is uncommon and distinct from TOF in prognosis or outcomes. Those patients usually presented as respiratory symptoms due to compression of trachea or bronchi by the dilating pulmonary arteries. Some patients with mild symptoms hospitalized in adulthood. For the management of pulmonary valves, adult patients could place prosthetic valves with satisfaction in follow-up. Patients receiving pulmonary valvuloplasty had significantly pulmonary regurgitation or diastolic pulmonary reverse blood flow. Furthermore, late consequences need long-term follow-up.



ABSTRACTS

Abstracts for Free Paper Session:

PAEDIATRIC CARDIOLOGY II

**Epidemiological Study of Children with Kawasaki Disease from 2010 to 2014 in Guangzhou: A Single-Center Study**

L Wei, L Zhang, P Huang, ZP Wang, MH Yu  
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**Objective:** To evaluate the incidence and epidemiologic characterizes of KD (Kawasaki Disease) in Guangzhou.

**Methods:** We reviewed the medical records and reports of all patients admitted to our hospital with KD diagnosed during the five year period from January 2010 to December 2014.

**Results:** During the five-year study period, a total of 1433 cases of Kawasaki disease were reported from hospital, comprising 943 boys and 430 girls. The ratio of male to female was 1.92:1. The disease occurred in four seasons, but the peak was from April to September. Age onset ranged from 1 month to 15 years, and the peak age 88.6% were younger than 5 years, and 74.1% were younger than 3 years. 27.6% were less than 1 year. There were 130 patients with coronary artery aneurysms. The incidence of coronary artery aneurysms detected by echocardiography was 9.1%. There was no death during acute phase. Thirty-seven cases developed recurrent KD. The recurrence rate was 0.25%.

**Conclusions:** The average annual number of KD has been continuously increasing in Guangzhou. It is very important to reduce the sequelae and the mortality of KD.

**Clinical Analysis for 53 Children of Cardiac Tumors**

HJ Wei, XY Wu, C Wu, XJ Ji, YH Bai, C Feng  
Children's Hospital of Chongqing Medical University, China

**Objective:** To analyze the clinical data of children with cardiac tumors (CTs), in order to provide the guiding evidence for the diagnosis and treatments.

**Methods:** The data of 53 children with CTs was retrospectively collected in our hospital from January 1981 to December 2016. Presentation, diagnosis, treatment and outcome were analyzed.

**Results:** 1) 45 (84.9%) patients had benign tumors, including rhabdomyoma 23 cases (43.4%), myxoma 15 cases (28.3%), fibroma 3 cases (5.7%), and other benign tumors 4 cases (7.5%). There were 8 cases (15.1%) with Malignant tumors, including MCTs 7 cases (13.2%) and PCTs 1 case (5.7%). 2) There were multiple clinical manifestations in patients with CTs, of whom no symptom (32.1%) were most often seen, followed by shortness of breath, convulsions and heart failure. The most common sign was heart murmur (37.7%). 3) Among the 52 patients (98.1%) performed UCG, there were 36 cases (69.2%) diagnosed specific CTs, 7 cases (13.5%) with MCTs and 9 cases (17.3%) with space-occupying lesions. Thirteen patients (24.5%) were performed MRI, of whom all cases had certain tumor nature and 9 cases (69.2%) were diagnosed specific CTs. 4) There were 16 cases (30.2%) in surgical treatment group, of which 1 case (6.3%) died during long-term followed-up. There were 17 cases (32.1%) in non-surgical treatment group and 9 cases (69.2%) died in 13 patients of follow-up. 20 cases (37.7%) in observation group were diagnosed rhabdomyoma and 15 patients of follow-up survived.

**Conclusion:** The majority of pediatric CTs are benign and rhabdomyoma is the most common. UCG is the primary modality for initial evaluation of CTs. MRI can identify the nature of tumors and define the common types of CTs as a supplementary method. Therapy strategies of pediatric CTs should be individualised and surgical resection is an effective treatment. Long-term prognosis of Children with malignant CTs is poor.

**The Differential Compensatory Mechanism of Myocardial Energy Metabolism in Fetal and Adult Heart Failure**

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**Objective:** Heart failure is a complex clinical syndrome. Previous studies suggest that the failing heart in adult reactivates fetal genes and reverts to a fetal pattern of energy substrate metabolism. In the fetal heart failure, however, the adult phenotype expression of contractile protein ( $\alpha$ -MHC, cTnI and aTnT) increased, while the expression of fetal phenotype ( $\beta$ -MHC, ssTnI, fTnT) decreased. It seems to be a very different pathophysiological procedure in contrast with adult heart failure. However, there are only few studies focused on the complex mechanisms of fetal heart failure and pay no attention to the molecular regulation under this specific procedure. We tested metabolic genes expression profiles in the fetal and adult failing heart to get an understanding on how the switches of energy metabolism phenotype are during embryonic stage.

**Methods:** Thirty pregnant rats were divided into isoproterenol-treated and control groups. Intra-amniotic injections of isoproterenol were supplied on E14.5 and E15.5 for fetuses. Thirty adult rats were divided into isoproterenol-treated and control groups. 7-day continuous intraperitoneal injections were performed for adults. H&E staining, and electron microscope were performed. Apoptotic rate assessed by TUNEL analysis and the expression of ANP, BNP were measured. RT-PCR and Western-Blot were used to analyze the expression of key genes in mitochondrial oxidative metabolism (mit-CK, UCP2, UCP3), glucose uptake and oxidative metabolism (GLUT1, GLUT4, PDK2, PDK4), fatty acid metabolism (mCPT-1, MCAD, ACC1), and key factors in metabolic pathway (BAF60c, mTOR, PGC-1 $\alpha$ , PGC-1 $\beta$ , PPAR $\alpha$ ). Immunohistochemistry

was used to detect proteins expression characteristics and tissue localization.

**Results:** Isoproterenol treated fetuses exhibited significant changes in histological evaluation with increased apoptotic rate. In fetal heart failure, the number of mitochondria increased, and the morphology tended to mature. ANP and BNP increased in isoproterenol treated group compared to control group. The expression of mitochondrial creatine kinase (mit-CK), medium-chain acyl-CoA dehydrogenase (MCAD), acetyl-CoA carboxylase 1 (ACC1) and carnitine palmitoyl transferase-1 (CPT-1) increased, uncoupling protein 3 (UCP3) and pyruvate dehydrogenase kinase 4 (PDK4) decreased. Furthermore, the expression of brg1/brm-associated factor 60c (BAF60c) decreased, peroxisome proliferator-activated receptor- $\gamma$  coactivator alpha (PGC-1 $\alpha$ ), mechanistic target of rapamycin (mTOR) increased. The results suggested that in fetal heart failure, glucose and fatty acid oxidation increased, mitochondrial oxidative metabolism enhanced. The transition of energy metabolism phenotype of fetal heart dysfunction were opposite to adult procedure. However, the expression of glucose transporter 4 (GLUT4) decreased, which was consistent with what observed during adult heart failure.

**Conclusion:** Metabolic genes exist as constitutive and inducible forms in the heart. Moreover, we found that the pathophysiological procedure of fetus was quite different from adult procedure in energy metabolism. Myocardial oxidative metabolism in Fetus was low, but the potentiality and activation capability of oxidative metabolism was very strong. In the stress state, myocardium oxidative metabolism increased, metabolic coupling between glycolysis and glucose oxidation enhanced, more energy metabolism substrate involved into the mitochondrial oxidative metabolism pathway. Myocardial energy metabolism in fetal and adult heart failure is different in compensatory mechanism. However, GLUT4 declined both in fetal and adult heart failure, indicating that "insulin resistance" could be a common mechanism of energy metabolism in different periods of heart failure.

**ABSTRACTS**

Abstracts for Free Paper Session:

**PAEDIATRIC CARDIOLOGY II**

**Factors for Extubation Failure Following Infants Cardiac Surgery**

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The First Affiliated Hospital of Sun Yat-sen University, China

**Objective:** To analyse the risk factors for postoperative extubation failure in infant patients with congenital heart disease.

**Methods:** To collect the clinical and laboratory data of the infant with congenital heart disease surgery under extracorporeal circulation in January 2015 to May 2016 in the first affiliated hospital of sun yat-sen university.

**Results:** Sixty cases of congenital h among them 12 cases were of extubation failure group, accounting for 20%, with the male to female ratio of 1.4:1.0, the average age was 0.56 years. Patients under 3 months were 3 cases, accounting for 25%, 3 months to 6 months 5 cases (41.6%). In 8 cases ,the weight was less than or equal to 5 kg, accounted for 66.7%, 4 cases between 5-10 kg, accounting for 33.3%. 48 cases were of successful group, the average age was 1.15 years old, the ratio of male to female was 1.2:1.0. The difference of extracorporeal circulation time and duration of ventilation was statistically significant between two group, and there was no obvious statistical significance about airway spasm and lung infection between two groups. Multivariable Logistic regression analysis found that the extracorporeal circulation time was independent risk factors for the extubation failure of infants with congenital heart disease surgery [the OR = 0.967, 95% CI (0.956 ~ 0.997), p = 0.024].

**Conclusions:** The risk factors for extubation failure included low weight, long breathing machine and long extracorporeal circulation. Multiple factors regression analysis suggest extracorporeal circulation time was the independent risk factors for extubation failure following Infants Cardiac Surgery.

**Prevalence of 22q11.2 Deletion and Genetic Characterization in Chinese Patients with Congenital Heart Disease**

HT Hou,<sup>1</sup> HX Chen,<sup>1</sup> C Yuan,<sup>1</sup> J Wang,<sup>1</sup> Q Yang,<sup>1</sup> GW He<sup>1,2,3\*</sup>

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**Purpose:** The 22q11.2 deletion syndrome, resulted from the rearrangements in the 22q11.2 chromosomal region, is the most common microdeletion syndrome. Most patients share a common 3Mb or 1.5Mb hemizygous deletion of 22q11.2 in the low-copy repeats (LCRs). The remaining patients include smaller deletions that are nested within the 3Mb typically deleted region (TDR) and a few rare deletions that have no overlap with the TDR. The present work aimed to identify the prevalence and the detailed genetic characterization of 22q11.2 deletion or duplication in the children with any sporadic congenital heart disease (CHD), and to explore the genotype-phenotype relationship between deletion/duplication type and clinical data.

**Methods:** A total of 354 CHD patients were screened by multiplex ligation-dependent probe amplification (MLPA) and capillary electrophoresis methods. Universal Probe Library (UPL) technology was applied to validate the MLPA probes.

**Results:** We found 45 patients in 354 CHD (4.6%) carried different levels of deletions or duplications. The phenotypes of the 45 patients included tetralogy of Fallot (TOF, 7), isolated ventricular septal defect (VSD, 9), isolated atrial

septal defect (ASD, 8), isolated patent ductus arteriosus (PDA, 7), mixed type of heart defects (7, two or more defects of VSD, ASD and PDA), partial atrioventricular septal defect (1), VSD with right ventricular outflow tract stenosis (RVOS, 2), VSD with pulmonary stenosis (1), ASD with RVOS and/or pulmonary stenosis (3). Two patients with VSD carried the 3Mb TDR from CLTCL1 to HIC2 (LCR A-D) and 1.5Mb deletions from CLTCL1 to MED15 (LCR A-B) in the LCRs respectively; all the others carried atypical deletions or duplications nested within the LCRs. Based on the gene analysis, CDC45 (13), TBX1 (8), USP18 (7), RTDR1 (6), ZNF74 (5), and SNAP29 (5) exhibited a higher incidence among the 45 individuals; in addition, 7 patients presented a duplication in TOP3B gene.

**Conclusions:** MLPA combining UPL is a useful and affordable molecular analysis method in 22q11.2 deletion and duplication identification. This study revealed 3Mb TDR, smaller deletions, rare deletions, and segmental duplications of chromosome 22q11.2 in Chinese CHD patients. The genotype-phenotype relationship analysis indicated that those gene abnormalities may cause various types of CHD. Our data also suggest that genetic detection should be performed routinely in CHD patients and the unique deletions or duplications may provide useful insight into individual analysis.

**ABSTRACTS**

Abstracts for Free Paper Session:

**PAEDIATRIC CARDIOLOGY II**

**Two Cases of Fetal Balloon Pulmonary Valvuloplasty for Right Heart Outflow Obstruction Lesion**

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Department of Pediatric Cardiology, Department of Maternal-Fetal Cardiology, Guangdong Cardiovascular Institute, Guangdong General Hospital (Guangdong Academy of Medical Sciences), China

**Background:** For those fetuses with membranous pulmonary atresia or critical pulmonary stenosis with intact ventricular septum, the procedure of fetal pulmonary valvuloplasty may be a feasible choice to avoid uni-ventricle outcome. We present two cases of fetal cardiac intervention for right heart outflow obstruction lesion with intact ventricular septum. In both cases, the right ventricle (RV) is hypoplastic with severe tricuspid regurgitation (TR), oval foramen is enlarged, and reverse flow is detected from arterial duct to pulmonary arteries, whereas the pulmonary artery and confluent branches are of moderate size. Performed under general anesthesia and guidance of ultrasound at a gestational age of 28 weeks, the procedure requires a 15 cm-long 18G trocar needle for the establishment of the trajectory, then a 4.00 mm\*9 mm balloon was guided to the site of pulmonary valve with the help of a 0.014-inch guidewire for dilation of pulmonary valve.

**Case 1:** Fetal echocardiographic diagnoses are pulmonary atresia with intact ventricular septum, TV (tricuspid valve)/MV (mitral valve) annulus ratio is 0.56, the longitudinal ratio for both ventricles is 0.42, TV inflow duration accounts for 26% of cardiac cycle, PV (pulmonary valve)/AV (aortic valve) annulus ratio is 0.85, with no signs of RVDCC (right ventricle dependent coronary circulation). The Apgar score at birth is 10, and the pulse oximetry is among 80-90%. Echocardiographic diagnoses are critical pulmonary stenosis, patent ductus arteriosus (PDA), atrium septum defect (ASD), right

ventricle hypoplasia, moderate tricuspid stenosis with regurgitation. After counseling with cardiac surgeons, we performed modified B-T shunt, pulmonary valve commissurotomy, ligation of PDA, enlargement of ASD.

**Case 2:** The fetus was diagnosed with pulmonary stenosis with intact ventricular septum, TV/MV annulus ratio is 0.7, RV/LV longitudinal ratio is 0.63, TV inflow duration accounts for 35% of cardiac cycle, PV/AV annulus ratio is 0.91, without signs of RVDCC. Reexamination two weeks later shows improvement of growth of right heart structures. Much more proportional four-chamber view, extended TV inflow duration and reduced TR indicate remission of severity of RV hypoplasia and increased forward flow of pulmonary valve, and the maximum opening of pulmonary valve is 4.1 mm instead of 1.3 mm pre-operation.

**Conclusion:** Fetuses with membranous pulmonary atresia or critical pulmonary stenosis with intact ventricular septum can be candidates for fetal pulmonary valvuloplasty to prevent uni-ventricle result, but those in whom tricuspid valve is of appropriate size may attain expected benefit. Still, long term results of the procedure remain uncertain and indications are controversial.

**Ventricular Mechanics in Adolescents and Adults Late After Repair of Subarterial and Perimembranous Ventricular Septal Defects**

SY Kwok, SSS Yeung, WY Li, YF Cheung

Queen Mary Hospital, Hong Kong

**Background:** There have been concerns of ventricular dysfunction late after surgical repair of nonsubarterial ventricular septal defects (VSD).

**Objectives:** We assessed and compared right (RV) and left ventricular (LV) mechanics in adolescents and adults after surgical closure of subarterial and perimembranous defects.

**Methods:** A total of 75 subjects were studied: twenty-nine patients after subarterial VSD repair (group I), 17 patients after perimembranous VSD repair (group II) and 29 age-matched controls (group III). RV and LV mechanics were assessed using tissue Doppler and speckle tracking echocardiography, while RV outflow systolic function was quantified by systolic excursion and fractional shortening (FS).

**Results:** Compared with group III, groups I and II had significantly reduced tricuspid annular systolic and diastolic velocities, isovolumic myocardial acceleration, RV global longitudinal systolic and diastolic deformation parameters, and RV outflow systolic excursion (all  $p < 0.05$ ). Group I, but not II, had reduced RV outflow FS ( $p = 0.008$ ) and the lowest global LV longitudinal systolic strain ( $p = 0.008$ ) and systolic strain rate ( $p = 0.014$ ). In group I, postoperative aortic regurgitation was associated with lower LV longitudinal systolic strain ( $p = 0.009$ ) and early diastolic strain rate ( $p = 0.002$ ), while right bundle branch block was associated with lower RV systolic strain rate ( $p = 0.048$ ). As a group, RV outflow excursion ( $p < 0.001$ ) and FS ( $p = 0.001$ ) were correlated with LV global systolic strain.

**Conclusion:** Adolescents and adults late after repair of subarterial and perimembranous VSDs show impairment of RV systolic and diastolic myocardial deformation. The RV outflow function and LV systolic deformation appear to be worse after repair of subarterial defects.

**ABSTRACTS**

Abstracts for Free Paper Session:

**PAEDIATRIC CARDIOLOGY II**

**Paracetamol vs Ibuprofen for Treatment of Pda in Preterms: A Meta-Analysis of 5 Randomized Controlled Trials**

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Department of Pediatrics, The 1st Affiliated Hospital of Guangxi Medical University, China

**Objective:** To evaluate safety and efficacy of Paracetamol vs Ibuprofen in the treatment of PDA in preterms.

**Methods:** A systematic literature search of PubMed, Cochrane Library, Embase and Medline was conducted. Randomized Controlled trials of preterm PDA patients receiving Ibuprofen therapy vs Paracetamol therapy till January 2017 were searched. Two reviewers independently screened the literature according to the inclusion and exclusion criteria, extracted the data and evaluated the quality, and used Revman 5.3 software for statistical analysis.

**Results:** Five studies with a total of 656 patients met the criteria. A total of 656 premature infants with patent ductus arteriosus were included in which 331 were in paracetamol group and 325 were in ibuprofen group. Meta-analysis results showed: There was no significant difference in total PDA closure rate between paracetamol and ibuprofen (OR: 1.27, 95%CI: 0.82-1.97, P=0.28). There was no significant difference in the rate of PDA closure after the first course of treatment (OR: 1.29, 95%CI: 0.89-1.87, P=0.18). Paracetamol was associated with a statistically significant decrease in Gastrointestinal Bleeding (OR: 0.25, 95%CI: 0.10-0.65, P=0.005) and Oliguria (OR: 0.43, 95%CI: 0.17-1.10, P=0.08). All the other parameters such as Sepsis, Necrotising Enterocolitis (NEC), Intraventricular hemorrhage (IVH), Retinopathy of prematurity (ROP), Death, Pulmonary Hemorrhage, Bronchopulmonary Dysplasia (BPD) were found to be statistically similar.

**Conclusions:** The principal findings and other outcomes of our meta-analysis did not reveal any differences between the two drugs and seems to follow the trend of paracetamol being similar in efficacy in comparison to ibuprofen for closure of PDA. Paracetamol was more safer regarding gastrointestinal bleeding and oliguria than ibuprofen.

**The Impact of Air Pollution on Atherogenesis in Children in Hong Kong**

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**Background:** Air pollution (AP) is an imminent global health hazard of the 21st century, in mainland China in particular. AP has been associated with prevalence of cardiovascular diseases, stroke and respiratory disorders.

**Aim:** To establish a clinical model of AP-related atherogenesis as a potential surrogate marker for atherosclerosis (coronary artery disease and stroke) prevention.

**Subjects and Methods:** Nine hundred and seventy-six school students (aged 8-14 years, boys 45.7%) with various AP (PM<sub>10</sub>, NO<sub>2</sub>, CO, O<sub>3</sub> and SO<sub>2</sub>) exposure in urban and rural areas in Hong Kong were studied. PM<sub>10</sub> concentrations were computed from atmospheric-chemical model of the Environmental Protection Department. Their school and home PM<sub>10</sub> exposures were categorized in tertile of yearly AP. Carotid intima-media thickness (IMT) as atherosclerosis surrogate predictive of cardiovascular and stroke outcomes, were measured by high resolution B-mode ultrasound, using an automatic edge-detection software package (CV=0.995). Multiple linear, semi-log and log regression with interaction of the whole group were performed for statistical analysis.

**Results:** PM<sub>10</sub> concentrations at school were slightly lower (26.0 vs 27.7 µg/m<sup>3</sup> P=3.41E-19) compared with exposure at home. Demographic parameters (age, gender), body mass index (BMI), systolic and diastolic blood pressures (SBP, DBP) were similar between lowest and top school AP exposure groups. Carotid IMT was significantly thinner (0.439 mm vs 0.453 mm, P=1.75E-18) in students with lowest PM<sub>10</sub> school exposure tertile compared with top tertile.

	Lowest AP Tertile (N=317)	Top AP Tertile (N=316)	P-Values (Bonferroni adjustment)
PM <sub>10</sub> (µg/m <sup>3</sup> )	22.94	29.87	9.22E-170
Age (yrs)	13.0	13.0	0.8274
Male (%)	37.2	39.9	0.5464
SBP (mmHg)	109.34	107.21	0.0085 (0.06)
DBP (mmHg)	63.00	61.73	0.0227 (0.14)
BMI	19.34	19.35	0.9616
Carotid IMT (mm)	0.439	0.453	1.75E-18

On multiple regression, age, gender and school AP exposure (PM<sub>10</sub>, NO<sub>2</sub>, CO, O<sub>3</sub> and SO<sub>2</sub>) but not home AP exposure, were significantly related to carotid IMT, independent of health variables (F-value: 36.9 on 12 and 963 Degree of Freedom, p-value: <2.2E-16). These variables account for 30.6% of variation in carotid IMT (Adjusted R-squared: 0.3061).

**Conclusion:** AP has an impact on early atherogenic process in young children, proposing a model for preventive intervention for atherosclerosis.

**ABSTRACTS**

Abstracts for Free Paper Session:

**PAEDIATRIC CARDIOLOGY II**

**Evaluation the Middle-Term of Percutaneous Interventional Therapy for Muscular Ventricular Septal Defect in Children**

YZ Wu

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**Objectives:** To evaluate the methods and efficacy of percutaneous closure of muscular ventricular septal defect (MVSD).

**Methods:** Between October 2011 and July 2016, device closure of MVSD was attempted in 51 patients (32 male, 19 female) ranging in age from 1 year to 16 years (5.1±3.52 years). The median size of the MVSD was 4.8 mm (range 3 to 15 mm) by TTE, multiple defects in ten patients. We performed the procedure under TTE guidance and left ventriculography. The efficacy, complications were assessed at 24 hours, 1 month, 3 months, 6 months and 12 months respectively after procedures through the review of the electrocardiogram and echocardiography.

**Results:** Eight cases no significant difference in hemodynamics through standard catheter examination. Cardiac arrest in 1 case, we immediately terminate procedure, selective operation after successful rescue. The device was implanted successfully in 41 of 42 (97.6%) procedures, operative time 90.68±36.42 min, exposure time 18.67±10.89 min. The median follow-up ranging from 1 to 48 months (mean 13.8 months). Mild residual shunts were found in 4 cases, mild tricuspid regurgitation in 2 cases, trivial aortic regurgitation in 1 case, no need to intervene again.

**Conclusions:** Percutaneous closure of muscular ventricular septal defect children is safe and effective with high successful rate and low incidence of complication. The coronary guidewire can be used to establish the circuit, exchange and retain the guidewire increase the success rate of in some challenging cases.

**The Surgical Outcome and Follow-Up Study of Pediatric Congenital Coronary Artery Fistula**

YF Wang, P Huang, L Zhang, ZP Wang, XF Xie, XX Chen

Guangzhou Women and Children's Medical Center, Guangzhou, China

**Purpose:** To analyze the surgical outcome and follow up of congenital coronary artery fistula (CAF) in children.

**Methods:** The clinical data were analyzed retrospectively in 22 patients who were diagnosed as congenital CAF and received surgical treatment between July 2008 and January 2017 in Guangzhou Women and Children's Medical Center. There were 14 boys and 8 girls. The median age was 17 months ranging from 14 days to 12 years old. Two patients underwent fistula ligation without cardiopulmonary bypass (CPB). The remaining 20 cases received fistula correction with beating heart CPB. Direct suture was used in 18 patients and autologous pericardial patch in other 2 patients. Other associated intra-cardiac anomalies in 7 children were corrected during the operation.

**Results:** Two patients had shortness of breath. Three had growth retardation with recurrent respiratory infection or tachypnea. The remaining 17 patients were asymptomatic. Twenty had heart murmurs. Fistulas originated from right coronary artery accounted for 11 patients, with 10 from left coronary artery, 1 from both right and left coronary arteries. Fistulas drained into coronary sinus in 1 patient, right atrium in 6 patients, right ventricular in 13 patients and left ventricular in 2 patients. Single fistula occurred in 20 patients and multiple fistulas in 2 patients. The coronary arteries were obviously dilated in all patients with diameter from 4 to 12 millimeters. There were 8 cases with aneurysmal dilation of coronary arteries. The aneurysmal coronary arteries remained original shape without any intervention during the operation. The mean hospital delay was 12.3±3.2 days. Two patients appeared decreased

heart function within 3 days after the operation, and recovered in return visit one month later. Another 2 patients showed a 1-2 millimeters residual shunt through the fistula without further intervention after the surgical closure. During the perioperative period and the follow-up period (3 months to 8 years), all 22 patients were asymptotically alive without anticoagulation management. Transthoracic echocardiography showed normal cardiac function. Compared with preoperative status, the diameter of dilated coronary arteries was reduced over 6 months follow up after the operation. There were no formation of thrombus in the coronary arteries. Electrocardiography showed no ST-T changes or arrhythmia or myocardial ischemia.

**Conclusions:** Clinical symptoms can be appeared in children with congenital CAF due to large shunt. Surgical correction is an effective method for the management of single CAF or CAF with coexisted intra-cardiac anomalies. The short and medium term outcome was well. The size of the aneurysmal coronary arteries can be shrunken after the closure of CAF. Complications such as myocardial ischemia and thrombosis were not happened, which needs long-term follow up.



**ABSTRACTS**

Abstracts for Poster Presentations:

**Differentiated H9C2 Myoblasts Induced by All-trans-retinoic Acid(RA) is an Available Model in Vitro for Researching Energy Metabolism Switch of Adult Heart Failure**

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Department of Pediatric Cardiology, West China Second University Hospital, Sichuan University, China

**Objective:** H9C2 myoblasts are a cell model used as an alternative for cardiomyocytes. However, the extent to which H9C2 cells can accurately mimic energy metabolism switch to the hypertrophic responses in cardiac myocytes has not yet been fully established. H9C2 cells are not completely differentiated cardiomyocytes, and have the characteristics of embryonic cell lines. This is particularly important in cardiotoxic studies because dose-effect relationship will vary with the degree of cell differentiation. In the present study, we aimed to characterize the metabolic profiles of H9C2 cells at various differentiation states, and to compare with primary neonatal cardiomyocytes, animal models in previous studies to establish a more suitable model of cardiomyocytes in vitro.

**Methods:** H9C2 cells and primary rat neonatal cardiomyocytes were cultured in vitro and treated with isoproterenol (ISO) to promote hypertrophic responses. Adding all-trans-retinoic acid (RA) in H9C2 cell culture medium to induce cell differentiation towards a mature cardiac phenotype. WST-1 method and Annexin-V-FLUOS staining were used to detect cell proliferation rate and apoptosis rate respectively. JC-1 test was used to detect mitochondrial membrane potential. The expression of ANP, BNP,  $\alpha$ -MHC and  $\beta$ -MHC were measured by RT-PCR. The expression of metabolic regulatory genes in mitochondrial oxidative metabolism (mit-CK, UCP2, UCP3), glucose uptake and oxidative metabolism (GLUT1, GLUT4, PDK2, PDK4), fatty acid metabolism (mCPT-1, MCAD, ACC1), and key factors in metabolic pathway (BAF60c, mTOR, PGC-1 $\alpha$ , PGC-1 $\beta$ , PPAR $\alpha$ ) were analyzed by RT-PCR and Western-Blot.

**Results:** RA-induced H9C2 cell differentiation increased the expression of genes encoding for myocardial oxidation metabolism and associated machinery. In the undifferentiated H9C2 cells, ISO enhanced the expression of oxidative metabolic genes was up-regulated, which was similar to that of fetal heart failure. In differentiated H9C2 cells, ISO intervention decreased the expression of oxidative metabolism genes, which was similar to that of adult heart failure. Moreover, the conversion of the metabolic phenotype induced by ISO was time-dependent. It was found that ISO could induce the mitochondrial membrane potential and cell proliferation rate from normal to high at 24h, and then from high to low at 48h, showing a cell self-protection effect at the early stage, similar to compensatory response. And the cell mitochondrial membrane potential and cell proliferation rate were significantly decreased in the later stage, similar to the decompensated response to cell injury. Primary neonatal cardiomyocytes are in a special transition stage from fetus to adulthood, and the expression of energy metabolism genes is constantly changing. Therefore, the metabolic characteristics of primary neonatal cardiomyocytes do not completely represent mature cardiomyocytes.

**Conclusion:** We determined that H9C2 myoblasts remodel their metabolism upon differentiation. Differentiated cells adopted a more oxidative metabolism with better coupling between the glycolytic and oxidative pathways, with undifferentiated cells more reliant on glycolysis, confirming that H9C2 cell differentiation induced by RA towards a more mature cardiac phenotype. BAF60c, PGC-1 $\alpha$  and mTOR also appeared to be involved on H9C2 differentiation. Our findings emphasize the metabolic differences between differentiated and undifferentiated H9C2 cells and raise caution on how to adequately select the H9C2 differentiation state that will act as the better model for the experimental studies.

**Differentiation of Mesenchymal Stem Cells into Cardiomyocytes is Regulated by Mirna-1-2 Via WNT Signaling Pathway**

X Shen , B Pan , HM Zhou , LJ L, TW Lv, J Zhu, XP H, J Tian  
Department of Cardiology, Heart Centre, The Children's Hospital of Chongqing Medical University, Chongqing, China

**Purpose:** Bone marrow derived stem cells (BMSCs) have the potential to differentiate into cardiomyocytes, but the rate of differentiation is low and the mechanism of differentiation is unclear completely. Here, we aimed to investigate the role of miR1-2 in differentiation of mouse BMSCs into cardiomyocyte-like cells and reveal the involved signaling pathways in the procedure.

**Methods:** Mouse BMSCs were treated with miR1-2 and 5-azacytine (5-aza). The expression of cardiac cell markers: Nkx2.5, cTnI and GATA4 in BMSCs were examined by qPCR. The apoptosis rate was detected by flow cytometry and the activity of the Wnt/ $\beta$ -catenin signaling pathway was evaluated by measuring the upstream protein of this signaling pathway.

**Results:** After overexpression of miR1-2 in mouse BMSCs, the apoptosis rate was significantly lower than the 5-aza group, while the expressions of cardiac-specific genes: such as Nkx2.5, cTnI and GATA4 were significantly increased compared to the control group and the 5-aza group. Meanwhile, overexpression of miR1-2 in mouse BMSCs enhanced the expression of wnt11, JNK,  $\beta$ -catenin and TCF in the Wnt/ $\beta$ -catenin signaling pathway. Use of LGK-974, an inhibitor of Wnt/ $\beta$ -catenin signaling pathway, significantly reduced the expression of cardiac-specific genes and partially blocked the role of the miR1-2.

**Conclusion:** Overexpression of miR1-2 in mouse BMSCs can induce them toward cardiomyocyte differentiation via the activation of the Wnt/ $\beta$ -catenin signaling pathway. Comparing with 5-aza, miR1-2 induced differentiation of BMSCs into cardiomyocytes is stronger and safer.



## ABSTRACTS

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### Abstracts for Poster Presentations:

#### **Pulmonary Hypertension in Two Children Associated with Abernethy Malformation and Literature Review**

XF Xie, P Huang, L Zhang, KS Chen, ZP Wang, YF Wang

Department of Pediatric Cardiology, Guangzhou Women and Children's Medical Center, Guangzhou Medical University, China

**Objective:** To enhance the recognition of pulmonary hypertension associated with Abernethy malformation in children.

**Methods:** In this study, 2 pediatric patients were hospitalized in the Guangzhou Women and Children's Medical Center, Guangzhou Medical University. The clinical, Laboratory findings and imaging informations were analyzed and literatures were reviewed.

**Results:** (1) Fatigue, tachypnea and cyanosis after physical activity were the initial manifestations corresponding with pulmonary hypertension associated with Abernethy malformation. Symptoms of hypersplenism are often present, including repeated petechiae, ecchymosis and decreased platelet count. (2) Echocardiogram revealed significantly dilated right room chamber and right ventricular chamber, right ventricular hypertrophy and severe pulmonary hypertension. Abdominal computed tomography showed Abernethy malformation. There were generally no other clinical findings except case 1 with hepatomegaly, hyperammonemia and case 2 with increased Bilirubin and Urinary bile. (3) Diagnosis of Abernethy malformation were primarily made by abdominal ultrasound and abdominal computed tomography separately, and finally confirmed through the portal vein indirect angiography. (4) Pulmonary hypertension showed improvement after treatment of bosentan, transcatheter embolization separately.

**Conclusions:** (1) Abernethy malformation could lead to pulmonary hypertension. (2) Owing to the rarity and lack of awareness of Abernethy malformation, pediatrician and ultrasonic technician may overlook or misdiagnose. (3) The study reminds clinicians of the vital importance of early diagnosis and treatment. If pulmonary hypertension of unknown origin is found, pediatrician should consider abdominal ultrasound to exclude Abernethy malformation. When necessary, abdominal computed tomography, CT angiography and indirect portal vein angiography are helpful to confirm the diagnosis, guide treatment and improve clinical symptoms, prognosis.

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#### **Interleukin-27/WSX-1 Signaling Regulates Inflammatory Cytokine Production in Kawasaki Disease**

Y Wu, RX Liu, QJ Yi, FF Si

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Kawasaki disease (KD), an acute febrile vasculitis, is the leading cause of acquired heart disease among children in developed countries. IL-27 is a multifaceted heterodimeric cytokine with pronounced pro- and anti-inflammatory functions. This study aimed at examining the association of IL-27 with inflammatory cytokine expression in KD patients, mouse model of coronary arteritis and determining the potential mechanisms.

**Methods:** C57BL/6 mice were injected with *Lactobacillus casei* cell wall extract (LCWE) to induce coronary arteritis. The relative levels of IL-27, TCCR/WSX-1, IL-6 and TNF- $\alpha$  expression and inflammatory infiltrates in the coronary arteries were determined by ELISA, immunohistochemical and histology. The effect of WSX-1 activation on IL-27-induced IL-6 and TNF- $\alpha$  expression in human coronary artery endothelium cells (HCAECs) was examined by quantitative RT-PCR.

**Results:** Levels of IL-27, IL-6 and TNF- $\alpha$  were significantly elevated in the LCWE-injected mice. IL-27 enhanced IL-6 and TNF- $\alpha$  expression in HCAECs at 24 hours after stimulation. WSX-1 silencing in HCAECs attenuated IL-27-enhanced IL-6 and TNF- $\alpha$  expression.

**Conclusion:** IL-27 may enhance inflammation by WSX-1 signaling during the development of KD.

**ABSTRACTS**

Abstracts for Poster Presentations:

**Diagnosis of the Therapeutic Strategies to Congenital Coronary Artery Fistula in Children**

L Hu, SS Wang

Guangzhou Women and Children's Medical Center, China

**Objective:** By analyzing the therapeutic regimen of congenital coronary artery (CCAF) fistula in children, we aim to find the optimized adjustment of clinical therapy.

**Methods:** Collect children from July 2013 to February 2016 which treated in hospital and diagnosed with congenital coronary artery fistula 40 cases in total. Summarize and analysis their classification of CCAF, the method of treatment and follow-up data.

**Results:** Forty cases collected, including male 16 (40%), female 24 (60%), their age range from 1 day to 17.4 years old, the average age is (4.5±4.4) years, and weight from 3 kg to 45 kg, average weight is (16.2±10.7) kg. The fistula comes from left anterior descending coronary artery (LAD) in 13 cases, and one from left circumflex coronary artery (LCX), another from double coronary artery, the rest from right coronary artery (RCA). There are 34 CCAF (85%) remitted into right heart system, including 1 case of pulmonary artery (25%), 14 cases in right atrium (RA)(35%), 19 cases in right ventricle (RV) (47.5%); other 5 cases (12.5%) joined left heart system, one in left atrium (LA)(2.5%), 4 cases in left ventricle (LV)(10%); the rest one (2.5%) diffuse into bilateral atrial ventricular chamber. Sixteen children underwent trans catheter interventional closure successfully, while 19 ones through surgical treatment, including the two failed intervention and the retreat one. All the children who taken interventional closure took aspirins for six months, and there was no thrombotic event. But we discovered two thrombus in the children who taken surgical treatment. All the children have normal ECG

after treatment, and the TTE indicate the release of left ventricle with smaller heart chamber size.

**Conclusion:** Trans catheter interventional closure and surgical treatment are safe and effective methods to treat congenital coronary artery fistula. Interventional treatment has short hospital time, and good curative effect to majority of coronary artery fistula. But for bulky and extreme circuitous fistula, and the parent coronary fistula with distal drain type, the surgical treatment is recommended.

**Misdiagnosed Anomalous Left Coronary Artery from the Pulmonary Artery as Endocardial Fibroelastosis in Infancy: A Case Series**

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**Introduction:** Anomalous left coronary artery from the pulmonary artery (ALCAPA) is a rare but severe congenital cardiac malformation. The prognosis mainly depends on the early and accurate diagnosis and treatment. However, without a typical and specific clinical manifestation in early stage, ALCAPA has a higher rate of false initial diagnosis.

**Diagnostic and therapeutic procedure:** Four infants with impaired left heart (LV) function, LV enlargement, mitral valve regurgitation (MR) and LV endocardium thickness were initially diagnosed as endocardial fibroelastosis (EFE). Due to the treatment effectiveness with prednisone acetate and digoxin, abnormal Q waves with T inversion and dilated right coronary artery (RCA), the diagnosis of ALCAPA was suspected. Lastly, cardiac angiography confirmed the diagnosis. All of them were transferred to the cardiac surgery department and received a successful surgical repair. The follow-up results showed that abnormal Q waves with T waves inversion on ECG gradually regressed and disappeared, LVEF and LV dilation returned to a normal range after surgery, with alleviation of MR. Besides, endocardial thickness secondary to ischemia also returned to normal.

**Conclusion:** ACLAPA should be suspected when confronted with patients with left heart enlargement, impaired left ventricular function, and signs of myocardial ischemia, particularly in infancy. EFE is an important differential diagnosis and may also arise as a result of ALCAPA. Abnormal Q waves with T waves inversion, particularly in avL, dilated RCA and increased ratio of RCA/AO are important differential key points for the identification of ALCAPA and EFE. Awareness of this condition is essential for prompt recognition and referral to a tertiary cardiac center to enable early surgical intervention and improved prognosis for these children.

**ABSTRACTS**

Abstracts for Poster Presentations:

**A Successful Transcatheter Device Closure of Atrial Septal Defect in a Child with Cor Triatriatum Sinister**

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Cor triatriatum sinister is a rare congenital cardiac anomaly in which the subdivision of left atrium resulting in circulatory obstruction to the left ventricle. Clinical presentation and its severity depends on intraatrial obstruction of the circulation and complexity of congenital heart disease. It can be diagnosed at any age. An excision of membrane is the choice of treatment. However transcatheter intervention has also been done in selected cases. We present a case of 10-year-old boy with a complain of cough for half month, who was diagnosed cor triatriatum sinister with atrialseptal defect and underwent transcatheter device closure of septal defect using occluder. On follow-up in 12 months, the patient was asymptomatic and no complication was found. ECG obtained sinus rhythm and echocardiography showed same result, no circulatory obstruction in between accessory chambers. Absence of other cardiac anomalies with no obvious obstruction of circulation between accessory chambers, transcatheter device closure of atrial septal defect can be considered in patient with cor triatriatum sinister and need regular follow up.

**Evaluation of Ventricular Function in Fetus with Ebstein's Anomaly by Velocity Vector Imaging**

L Hong, WY Huang, HY Cao, MX Xie  
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**Objective:** To analyze the ventricular function in fetus with Ebstein's anomaly by velocity vector imaging, and to explore the correlation between the cardiac function and the blood flow across the pulmonary valve.

**Methods:** We choose 26 EA fetus and 39 normal fetus with matching gestation weeks; then divide EA fetus into 2 groups according to the pulmonary valve flow direction, direct or reverse. We obtain the left and right ventricular myocardial long axis integral peak velocity, strain and strain rate by VVI, then compare in the group and between groups.

**Results:** (1) Between groups: The right ventricular global longitudinal strain (GLS) and diastolic velocity in EA group is  $-13.16 \pm 5.31\%$  and  $-1.86 \pm 0.55$  cm/s, meanwhile in the normal group is  $-18.89 \pm 0.80\%$  and  $-2.25 \pm 0.73$  cm/s. The data in EA group are lower than the normal group, with significant difference ( $p < 0.01$ ). (2) Within group: The left ventricular GLS in EA fetus with pulmonary valve reverse flow is  $-22.60 \pm 5.13\%$ , and in EA fetus with direct flow is  $-18.58 \pm 4.25\%$ . The data in fetus with reverse flow are higher than the fetus with direct flow, with significant difference ( $p < 0.05$ ).

**Conclusion:** The Ebstein's anomaly affect the fetal cardiac function significantly, with difference influence in varying degrees deformity. VVI can sensitively reflect the myocardial mechanics changes in EA fetus, especially the GLS and diastolic velocity with great sensitivity and specificity for myocardial function evaluation.

**Prenatal Diagnosis of a Congenital Lung Deformity: Horseshoe Lung**

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**Background:** Horseshoe lung (HL) is a rare congenital pulmonary deformity in which the caudal and basal segments of the left and right lungs are joined together behind the pericardium at the height of cardiac apex. The feature of horseshoe lung was first described by Spencer in 1962. Horseshoe lung is often associated with other malformations such as scimitar syndrome, unilateral lung hypoplasia, congenital cystic adenomatoid malformation (CCAM) and esophagobronchial fistula. We report a case of a fetus with HL without other intracardiac and extracardiac malformation, suspected parentally on ultrasound image and confirmed with fetal MRI.

**Case report:** A 32-year-old woman, with no family history of congenital defects, were recommended to our department at 24 weeks and 5 days gestation, because of an abnormal aortic morphology. A fetal echocardiographic evaluation in our department showed the aortic arch and thoracic aortic enlarged with abnormal direction. There was no evidence of intracardiac and great vessel anatomic abnormalities, bone dysplasia, or other extracardiac deformities. Fetal MRI was therefore performed to assess the cause of aortic translocation, and showed the basement of the lungs fused in front of the spine and thoracic aorta. The fused lungs across the mediastinum confirmed the diagnosis of fetal horseshoe lung. Meanwhile the fetal MRI also demonstrated that without pulmonary hypoplasia, esophageal atresia or great vessel deformities.

**Discussion:** The definite diagnosis of horseshoe lung rely on imaging technology. CT is the best postnatal imaging modality for assessment of HL anatomy, evaluation of the lung anomalies development. The pulmonary artery and vein can be clearly identified by contrast-enhanced CT. Prenatal MRI and sonography can confirm the diagnosis of HL, clearly demonstrate the communication between the lungs. When the fetal echocardiology demonstrate the displacement of the heart and the abnormal position of the great vessels, we should take further fetal MRI to confirm the presence of horseshoe lung. The prenatal diagnosis should make definite diagnosis about HL, also should make sure whether there is intracardiac deformities.

**ABSTRACTS**

## Abstracts for Poster Presentations:

**The Temporal Expression Patterns of the Transcription Factors and Target Genes in Cardiomyocyte Hypertrophy**

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To investigate the temporal expression patterns of the related transcription factors and target genes in cardiomyocyte hypertrophy, and provide valuable clues for further researches on cardiomyocyte hypertrophy. Isoproterenol (ISO) was used to induce ventricular myocytes hypertrophy in neonatal mice. The survival rate of cardiomyocyte was detected by CCK-8, and the average diameters and surface areas of cells were measured by computer photograph analysis system. The mRNA and protein expression levels of related genes were respectively measured by RT-PCR and Western blot. The model of cardiomyocyte hypertrophy stimulated by ISO was constructed successfully. The expression levels of GATA4, MEF2C, GATA5, BNP and ANP increased 24 hours after ISO treatment, the expression levels of P300, alpha-MHC and TBX5 increased 12 hours after ISO treatment, and of SRF and beta-MHC mRNA increased 6 hours after ISO treatment ( $P<0.05$ ). The expression levels of GATA4, alpha-MHC, beta-MHC, SRF and P300 mRNA increased firstly, and then decreased in cardiomyocytes induced by ISO. The expression levels of GATA4, SRF, alpha-MHC, beta-MHC and P300 mRNA were still higher than normal ( $P<0.05$ ), but of MEF2C decreased to normal ( $P>0.05$ ) 72 hours after ISO treatment. The expression levels continuously elevated of GATA5, TBX5, ANP and BNP mRNA than that of controls ( $P<0.05$ ), while no fluctuation was found in NKX2.5 mRNA expression ( $P>0.05$ ). The expression of GATA4 protein increased, while of HEY2 protein decreased 48 hours after ISO treatment ( $P<0.05$ ). In hypertrophic cardiomyocytes, the expression

pattern of MEF2C is similar to, but the patterns of GATA5, GATA4, TBX5 and SRF are different with that in the development of heart, implying these genes are important during the process from compensatory stage to decompensation stage. The expression patterns of GATA4, MEF2C and SRF are similar to that of acetylase P300, implying the temporal expressions could be regulated by P300 in cardiomyocyte hypertrophy.

**Application Value of Echocardiography in Congenital Unilateral Absence of Pulmonary Artery in Children: A Report of 35 Cases**

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**Objective:** Unilateral absence of pulmonary artery (UAPA) was a rare congenital pulmonary vascular dysplasia. It's easy to misdiagnosis for its untypical symptom. We would discuss the application value of echocardiography in diagnosing and follow-up of congenital UAPA in children.

**Methods:** The echocardiography features of 35 patients with UAPA confirmed by surgical operations or CTA from May 2009 to July 2016 were analysed retrospectively reviewed the echocardiographic characteristics of this disease.

**Results:** Thirty-five cases were diagnosed as UAPA, Among the 35 UAPA patients 21 cases were right-sided, 14 cases were left-sided UAPA; 16 cases were isolated (14 right-sided, 2 left-sided), 19 cases were combined with additional congenital cardiac malformations. A total of 27 UAPA patients 27/35 were first and correctly diagnosed by echocardiography. Meanwhile, 7 patients were missed and 1 case was misdiagnosed. The UAPA was characterized as complete absence of normal pulmonary artery bifurcation, and main pulmonary artery extending into only one artery branch (left or right). The affected side was perfused by persisting embryonic arteries from the aorta or its branches, or other abnormal collaterals. Eight patients underwent unilateral pulmonary artery reconstruction surgery. The mean velocity of the proximal anastomotic stoma was  $(1.22\pm 0.17)$  m/s, and the distal was  $(2.17\pm 0.56)$  m/s.

**Conclusions:** Echocardiography is the preferred method of preoperative diagnosis of UAPA, but also the postoperative evaluation of pulmonary artery anastomotic stoma and pulmonary artery pressure which is simple, noninvasive and effective.

**Decreased Activity of RCAN1.4 is a Potentially Risk Factor for Congenital Heart Defects in Han Chinese Population**

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Congenital heart disease (CHD) is the largest cause of infant death from birth defects while the aetiology of CHD is largely unknown. The regulator of calcineurin 1 (RCAN1) gene encodes a regulatory protein of calcineurin/NFAT signaling pathway playing important roles for heart development. To investigate the function of RCAN1 in prevention of CHD, we performed an association study of single nucleotide polymorphisms (SNPs) in RCAN1 with CHD in Han Chinese population. The results revealed that one SNP (rs2243890: A/G) located in the promoter region for RCAN1.4 transcript was significantly associated with CHD. Further Q-RT-PCR analysis showed that the minor -1712G allele of rs2243890 in RCAN1 reduced transcription of RCAN1.4 in human heart tissues and luciferase reporter assay demonstrated that the minor G allele decreased RCAN1.4 promoter activity in three cell lines. Our electrophoretic mobility shift assay (EMSA) also disclosed that the minor -1712G allele of rs2243890 displayed a higher binding affinity with some nuclear proteins. Furthermore, the rare point mutation RCAN1.4E25K identified in a VSD patient attenuated the suppression of RCAN1.4 on NFAT-mediated transcription. Our results indicate that reduced RCAN1.4 transcription and/or decreased RCAN1.4 activity potentially increase CHD risk in Han Chinese population, providing new insight for studying CHD etiology.

**ABSTRACTS**

Abstracts for Poster Presentations:

**A Study of the Spatial Relationship Between Cardiac Chambers in the Fetal Human Heart Using a Macrovascular Corrosion Casting Technique**

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**Objective:** To explore the application of a macrovascular corrosion casting technique via ABS perfusion clarifying the spatial relationship between cardiac chambers in the fetal human heart.

**Methods:** Cardiovascular casting via ABS perfusion was performed for 28 fetal hearts, including 18 obtained from induced labor after permission due to congenital heart disease prenatally diagnosed by fetal ultrasound and 10 normal ones obtained from induced labor due to other non-cardiac causes.

**Results:** A total of 28 fetal cardiovascular casts were successfully prepared. The 10 normal fetal hearts generally showed a top-bottom spatial relationship between the atrium and ventricle at both the left and right sides, and a left-right spatial relationship between the two ventricles as well as between the two atriums. However, among the 18 fetal hearts with complex congenital heart diseases, one heart had a front-back spatial relationship between the left atrium and ventricle, three had a left-right spatial relationship between the right atrium and ventricle, and others showed a normal top-bottom atrium-ventricle relationship. In addition, one heart had a front-back spatial relationship between the left and right atriums, 12 hearts had a front-back

spatial relationship between the left and right ventricles, two hearts had a top-bottom spatial relationship between the left and right ventricles, while others showed a normal left-right relationship of the ventricles or atriums between the two sides.

**Conclusions:** Clarification of the spatial relationship between cardiac chambers in the fetal heart helps us understand the anatomical structure of the heart. Macrovascular corrosion casting can serve as an effective tool to intuitively and three-dimensionally demonstrate the spatial relationship between cardiac chambers of a heart with complex congenital heart disease. This technique can provide us with further information regarding the connection between the spatial relationship of cardiac chambers and congenital heart abnormalities to improve accuracy of ultrasonic diagnosis, thereby possessing important clinical significance to surgical treatment.

**The Sonograms and Autopsy Data of 3 Cases of Fetal Right Atrial Isomerism and Literature Analysis**

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**Objective:** Analysis sonograms feature of cardiovascular malformation and its associated anomalies in fetus with right atrial isomerism.

**Methods:** The sonograms and autopsy data of 3 cases found in 256 pregnant women and 676 cases found in literature with right atrial isomerism which confirmed by angiocardiography, autopsy, and surgical operation were analyzed retrospectively.

**Results:** In our 3 cases, the stomach and gallbladder were all located on the right side, asplenia in 2 cases, and the other was located in the right side. They were trilobites lung (asymmetric), and both sides were the right auricle (asymmetric). Associated anomalies included right valve atresia, single ventricle, single atrium, complete atrioventricular atrioventricular septal defect, double outlet of right ventricular, right aortic arch, pulmonary artery stenosis, total anomalous pulmonary venous connections, etc. According to the literature, the rate of right and left atrial isomerism was 2.5:1 (524:209), the age of children were from 0 to 15 years. The main cardiovascular abnormalities included anomalous pulmonary venous connections (57.6%), single ventricle (64.8%), single atrium (21.5%), endocardial cushion defect (37.8%), double superior vena cava (24.9%), double outlet of right ventricular (24.2%), pulmonary artery stenosis (33.9%), pulmonary atresia (19.7%), VSD, right aortic arch, PDA, and left superior vena cava, etc. In 284 cases, the median of liver (97%), asplenia (91.1%), abdominal

aorta and inferior vena cava located in the same side of spine (93.6%), bilateral trilobites lung (87.9%), bilateral right bronchial (100%), were the main abnormalities outside the heart.

**Conclusion:** Right atrial isomerism was combined complex cardiac anomalies, short-term and long-term prognosis were not optimistic. They always accompanied the median of liver, asplenia, abdominal aorta and inferior vena cava located in the same side of spine, anomalous pulmonary venous connection, etc. Prenatal ultrasound was effective method for diagnosis of the fetus with right atrial isomerism.



**ABSTRACTS**

Abstracts for Poster Presentations:

**The Clinical Value and Follow-up of Echocardiogram Diagnosis of Persistent Fifth Aortic Arch**

HY Yang,<sup>1,5</sup> XJ Ji,<sup>1,5</sup> C Wu,<sup>2,5</sup> ZX Pan,<sup>2,5</sup> L He,<sup>3,5</sup> J Li,<sup>4,5</sup> KF Jiang,<sup>1,5</sup> X Xiang,<sup>1,5</sup> X Zhu<sup>1,5</sup>

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**Objective:** Analyze the clinical classification, imaging features, clinical treatment and prognosis of persistent fifth aortic arch (PFAA) in our hospital, to summarize the echocardiographic diagnostic value of PFAA and its clinical curative effect.

**Methods:** Retrospectively analyzed the incidence, Echocardiogram (Echo) imaging feature of 8 selected PFAA cases during from January 2012 to February 2017 and compared with computed tomography angiography (CTA) or surgical results, follow-upped the Clinical prognosis.

**Results:** Eight cases of PFAA, their age are 12 days-11 years old, the average age are 1.73±2.32 years old; including 5 males (62.5%) and 3 females (27.5%); According to the Weinberg-type, 2 cases (25%) belong to Weinberg-type A, associated with patent ductus arteriosus (PDA, 1 case), atrial septal defect (ASD, 2 cases), ventricular septal defect (VSD, 2 cases), persistent left superior vena cana (PLSVC, 1 case); 5 cases (62.5%) belong to Weinberg-

type B, associated with interrupted of aortic arch (IAA, 4 cases), aortic stenosis (AS, 1 case), aortic coarctation (CoA, 1 case), left pulmonary artery stenosis (LPAS, 1 case), persistent foramen ovale (PFO, 1 case), persistent truncus arteriosus (PTA, 1 case), transposition of great arteries (TGA, 1 case), PDA (1 case), VSD (2 cases), ASD (2 cases); 1 case (12.5%) associated with PFO belong to Weinberg-type C. Echo can diagnose 5 cases of PFAA (type A 1 case, type B 4 cases), and the Echo result was conformed to the CTA or surgery result, Echo diagnosis rate was 62.5%. The earliest case of Weinberg-type C was conformed by the surgery. It was firstly missed diagnosed as the aortic-pulmonary window, the missed diagnosis rate of Echo was 12.5%. Six (75%) patients received the CTA examination, CTA can clearly display the space structure and pathological anatomy of PFAA. Four (50%) patients received surgery, LVEF and LVFS of post-operation was significantly increased, no complications such as anastomotic stricture, clinical prognosis is satisfactory.

**Conclusion:** Echo can be chosen as the first diagnostic tools of PFAA, its diagnostic accuracy is relatively high. Both therapeutic effect and the long-term curative effect of PFAA are satisfactory in our hospital.

**Pediatric Hemorrhagic Stroke After Interventional Treatment for Congenital Heart Disease: Six Cases Report And Literatures Review**

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**Object:** Six cases of hemorrhagic stroke have been collected and observed the major clinical characteristics, aim to enhance recognition of this rare complication.

**Method:** The clinical data of six cases with hemorrhagic stroke after percutaneous interventions for congenital heart disease were analyzed retrospectively.

**Result:** Six patients, four males and two females, were identified with median age of 35 months (6-61) and weight of 11 kg (8-17). Five patients were diagnosed with membranous ventricular septal defect (mVSD) with defect size of 4.1 mm (3-5) and one patients with aortic stenosis with gradient pressure 70 mmHg. The preoperative examination showed no contraindications for interventional surgery, like coagulation, electrocardiograph, and blood test were normal. Five patients received percutaneous transcatheter occlusion of mVSD and 1 patient received percutaneous balloon aortic valvuloplasty (PBAV). During the surgery, two patients were found bradycardia and bradypnea and accepted emergency thoracotomy, 4 patients with no clinical manifestations. The time from appearance of the hemorrhagic stroke, like headache, comatose, respiratory depression etc, to clearly diagnosis with central nervous hemorrhage by neuroimaging and (or) lumbar puncture was 9 hours (4-18). The diagnosis

and treatment of this complication with varying degrees of delay. Four patients without etiologic diagnosis received medical and supportive treatment, two patients were identified with middle cerebral artery aneurysm and spinal arteriovenous fistula respectively and accepted removal of hematoma. One patient cured, and three recovered with various degree of permanent central nervous system dysfunction, such as dyskinesia, epilepsy, paraplegia. One patient was died of multiple organ failure (MOF) and one patient gave up on therapy.

**Conclusion:** Although the complication of pediatric hemorrhagic stroke after percutaneous interventions for congenital heart disease is low, with difficulties in predicts diagnosis, treatment and poor prognosis. It is worth to increase acknowledge of this severe complication and improve prognosis.



## ABSTRACTS

### Abstracts for Poster Presentations:

#### **The Clinical Investigation of 137 Patients with Aortopulmonary Collateral Arteries**

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**Objectives:** To investigate the clinical manifestation of aortopulmonary collateral arteries without cyanotic congenital heart defect, and to evaluate the potential risk factors of the persistent APCAs

**Methods:** The clinical manifestations and imageology data of the 137 patients with aortopulmonary collateral arteries without cyanotic congenital heart defect. They were grouped into four categories according to the combined types of diseases: premature group, heart disease group, pulmonary disease group, and other disease group.

**Results:** The medical records of 137 patients showed as below: 40 premature case (29.2%), 80 heart disease case (58.3%), 16 pulmonary disease case (11.7%), and 1 other disease case (0.73%). There were 130 APCA (94.9%) originated from descending aorta, 5 (3.6%) originated from subclavian artery, 1 (0.73%) originated from intercostals artery, 1 (0.73%) originated from vertebral artery. Fifteen APCAs of the 18 followed patient (83.3%) were locked.

**Conclusion:** APCAs exist in the patients without cyanotic congenital heart defect, and APCAs will be narrowed and blocked gradually after birth. However, certain predisposing factors sustain the APCAs and increase the pulmonary flow.

#### **Prenatal Diagnosis of Fetal Aberrant Subclavian Artery: Associated Anomalies and Perinatal Outcome in 104 Cases**

HY Cao, L Hong, YF Hu, WY Huang, XY Song, MX Xie

Department of Ultrasound, Union Hospital, Huazhong University of Science and Technology, China

**Objective:** To analyze the sonographic features, associated anomalies and outcome in 104 fetuses with aberrant subclavian artery.

**Method:** Detailed fetal echocardiography was performed on 3192 pregnancies at a single referral center from January 2014 to November 2016. The three-vessel-trachea (3VT) view was chosen to detect the aberrant subclavian artery, including aberrant right subclavian artery (ARSA) and aberrant left subclavian artery (ALSA). Associated anomalies and perinatal outcome were also evaluated.

**Results:** Aberrant subclavian artery was detected in 104 out of 3192 fetuses (3.26%). Forty-three cases (41.3%) had aberrant right subclavian artery: in 27 cases (26.0%) it was an isolated aberrant right subclavian artery, and the other 16 cases (15.4%) were accompanied by other cardiac anomalies. Aberrant left subclavian artery was detected in 61 fetuses (58.7%), including 16 cases (15.4%) presented associated cardiac defects, the other 45 cases (43.3%) only had aberrant left subclavian artery with right aortic arch. Of the 72 cases of aberrant subclavian artery, 24 (33.3%) cases underwent termination of pregnancy, 66 (63.5%) resulted in a live birth at term, 6 (5.8%) were lost to follow-up, 9 (8.7%) pregnancies were ongoing.

**Conclusion:** Aberrant subclavian artery can be prenatally diagnosed by using the three-vessel trachea view. It can be isolated or associated with other fetal anomalies.

#### **Increased Serum Levels of Melatonin May Contribute to the Severe Heart Failure in Pediatric Patients**

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**Background:** Melatonin has a protective role in adults with cardiovascular disease, but the effects of melatonin in children with cardiac dysfunction are not well understood. This study was designed to explore the variation in melatonin, myeloperoxidase (MPO), and caspase-3 levels in children suffering from heart failure (HF).

**Methods:** Seventy-two pediatric patients with HF and twelve healthy children were enrolled in this study. A modified Ross scoring system was used to evaluate clinical cardiac function. Patients with a score of >2 points were included in the study and were divided into 3 groups according to severity of heart failure: mild (score: 3-6), moderate (score: 7-9), and severe (score: 10-12). Echocardiographic parameters, laboratory data, and serum levels of melatonin, MPO, and caspase-3 were measured and analyzed in all patients.

**Results:** Compared with patients with mild and moderate severity HF, patients in the severe HF group had significantly decreased left ventricular ejection fraction (LVEF) ( $p < 0.001$ ), and significantly increased serum melatonin levels ( $p = 0.013$ ) and MPO levels ( $p < 0.001$ ). Serum melatonin levels were positively correlated with serum caspase-3 levels ( $p < 0.001$ ). The optimal cutoff values of serum melatonin levels for diagnosis severe HF and primary cardiomyopathy in pediatric patients with HF were 54.14 pg/mL and 32.88 pg/mL, respectively.

**Conclusions:** Serum melatonin and MPO levels were increased in children with severe HF. We speculate that increasing melatonin levels may act as a compensatory mechanism in pediatric children with HF.