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PAEDIATRIC CARDIOLOGY ABSTRACTS

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Clinical Features and Prognosis of Chinese Childhood Pulmonary Arterial Hypertension-related Gene Mutation Carriers

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Background: Since identification of the BMP2 gene in families affected by PAH, mutations in several other genes have been discovered. The impact of these genes on the clinical phenotype are not yet fully understood, especially in childhood.

Methods: 114 consecutive patients with IPAH/HPAH whose diagnostic age <18 years were included. Gene sequencing used NGS-based targeted panel. Clinical characteristics and outcomes were collected in all patients. Results: Thirty-one BMP2, nine ALK1 and 33 other PAH-related gene mutation carriers were detected in this cohort. The median age at diagnosis of PAH was 5.9 (3.4, 10.3) years. Fifty PAH-related gene mutations were identified in 33 patients, including seven mutations in NOTCH3, six mutations in CPS1, five mutations each in TBX4, ABCA3 and KCNK3, four mutations each in SMAD9 and EIF2AK4, three in GDF2, two mutations each in TBS1, ENG and NOTCH1, one each in ABCD4, ATP13A3, ARHGAP31, CAV1 and HTR2B. 64 patients (46 mutation carriers) underwent cardiac catheterization examinations, with acute vasodilator testing performed simultaneously. BMP2 mutation carriers demonstrated the highest pulmonary vascular resistance index ($p=0.037$) and responded poorly to vasodilator (24.0 to 25.5 $WU \cdot m^2$, $p=0.785$). Other three cohorts all responded to vasodilator, with mutation noncarriers experiencing the greatest decline (16.2 to 9.6 $WU \cdot m^2$, $p=0.045$). Over all 5-year survival for all patients was 65.6%. Five-year survival was lower in ALK1 mutation carriers than mutation noncarriers (0% vs 73.7%, HR 48.1, $p=0.062$) and was similar with BMP2 mutation carriers (0% vs 32.4%, HR 1.1, $p=0.891$). Other PAH-related gene mutation carriers had a tendency to have better outcome than mutation noncarriers (5-year survival rate 95.5%, HR 0.33, $p=0.131$).

Conclusions: Chinese pediatric IPAH/HPAH patients with a ALK1 or BMP2 mutations demonstrated worst clinical outcomes. Other PAH-related gene mutation carriers and mutation noncarriers were more responsive to PAH specific therapies. It is important to consider aggressive treatment for pediatric IPAH/HPAH patients.

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Utility of a Modified Vascular Corrosion Casting Technique in the Diagnosis of Fetal Total Anomalous Pulmonary Venous Connection

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Background: This study investigated the characteristics and accuracy of prenatal ultrasound in the diagnosis of fetal total anomalous pulmonary venous connection (TAPVC).

Methods: We retrospectively identified patients hospitalized from May 2015 to May 2020 at our Maternal-Fetal Medicine Center who were reported to have TAPVC prenatally. Pre- and postnatal medical records, including results obtained by ultrasound, postpartum echocardiography and computed tomography angiography, as well as anatomic and cardiovascular casting findings were reviewed and analyzed.

Results: Of the 20 fetuses with a prenatal diagnosis of TAPVC, 80% (16/20) had intra- or extracardiac malformations. The TAPVC types were supracardiac (n=8), cardiac (n=6), infracardiac (n=4), and mixed (n=2). The diagnosis of 1 case each of supracardiac and cardiac TAPVC was modified to partial anomalous pulmonary venous connection; additionally, 4 malformations were missed and 2 were misdiagnosed. **Conclusion:** Prenatal ultrasound can be used to accurately diagnose most types of fetal TAPVC. By analyzing the characteristics of echocardiography, the specific types of fetal TAPVC can be distinguished. Postpartum cardiovascular casts can accurately depict the branch structure of the heart's larger vessels, and may be used as a clinical assessment and teaching method in complex cardiac malformations.

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Value of Color Doppler Ultrasound in the Diagnosis of Prenatal Pulmonary Sequestration

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Background: To analysis the ultrasonic manifestations of fetal pulmonary sequestration(PS) and investigate the diagnosis value of Color Doppler ultrasound for the fetal PS.

Methods: A Voluson E8 three-dimensional color Doppler ultrasonic apparatus was used to screen fetus abnormality in approximately 1,500 pregnant women in metaphase and terminal period A fetal four-chamber view, sagittal section of thorax, and coronal section were used to thoroughly observe the shape and size of fetal lung tissue and their surrounding tissue, to check whether there are abnormal echo, and observe the shape, size, blood supply type and whether combined with other deformities.

Results: Three cases of fetal PS were detected in a total of 1,500 cases. In the three case, one was extralobar PS combined with diaphragmatic hernia, one was extralobar PS combined with Type II congenital cystic

adenomatoid, and the other was intralobar PS; two of them located in right pleural, one of the in the left pleural. In the three of them, two accompany with the heart compressed and shift. The blood supply of two were originate from descending aorta, the other was from branch of aortic arch. All three pregnant patients under went induced labor and PS diagnosis of their fetuses was confirmed by autopsies and pathological examinations.

Conclusion: Color Doppler ultrasound can serve as an effective tool for prenatal diagnosis of PS. It can provides important reference value For clinical in early diagnosis and treatment of fetal PS.

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Study of Cystic Volume Ratio in Prenatal Assessment the Prognosis of Fetal Pulmonary Sequestrations

T Xu

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Background: To evaluate the prognostic risk of pulmonary sequestration (PS) by measuring cystic volume ratio (CVR) value in fetal congenital sequestration (PS).

Methods: 88 cases of fetal PS diagnosed by prenatal ultrasound in Xiangyang No.1 People's Hospital from March 2010 to June 2017 were measured of the fetal CVR, their clinical and outcomes were observed. According to the prenatal ultrasound CVR value, 49 fetuses diagnosed with pulmonary sequestration (PS) were divided into 2 groups, group 1: CVR ≥ 1.6 , group 2: CVR < 1.6 . To compare the incidence rate of fetal edema, respiratory distress symptoms and survival rate between the two groups. Single and multiple Logistic regression analysis were made to evaluate the risk factors of the fetal pulmonary sequestration. Correlation was used to evaluate the relationship between CVR and fetal prognosis.

Results: Of the 88 fetuses, 62 cases of PS (ILS) type (70.45%, 62/88, 19 cases of PS (ELS) type I (21.59%, 19/88 and 7 cases of PS (ELS) type II (10.20%, 7/88), 81 cases (93.88%, 81/88) born alive, 5 case (CVR ≥ 1.6) (7.95%, 5/88) of induced abortion, and 2 cases (CVR ≥ 1.6) (4.08%, 2/88) of stillbirths. In 24 group 1 (CVR

≥ 1.6) cases, 44 cases born alive, the incidence rate of newborn respiratory distress was 100% (36/44), fetal edema was 88.64% (39/44). In 44 cases of the group 2 (CVR < 1.6), 3 cases (6.82%, 3/44) were diagnosed with newborn respiratory distress, 3 cases (6.82%, 3/44) were diagnosed with fetal edema, and the rate of live birth was 100%. There was statistical significant difference between the PS with CVR < 1.6 and that with CVR ≥ 1.6 in the incidence rate of fetal edema, postpartum respiratory symptoms and survival rate. CVR is a risk factor for pulmonary sequestration and is associated with fetal prognosis.

Conclusion: CVR in second-trimester of pregnancy is an effective index to evaluate the prognosis of PS fetal. CVR ≥ 1.6 was associated with an increased risk of fetal edema, infant respiratory distress and intrauterine or postnatal death.

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Description of Misdiagnosis and Missed Diagnosis of Fetal Complex Heart Malformations by Fetal Echocardiography Combined With Cardiovascular Cast

Y Wang

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Background: We compared fetal echocardiography with cardiovascular casts and analyzed the causes of missed diagnosis and missed diagnosis of fetal cardiac malformations.

Methods: We retrospectively identified patients with a fetal diagnosis of severe congenital heart defects referred to our Maternal-Fetal Medicine center from 2013 to 2018 and selected those who had postnatal confirmation of cardiovascular anatomy. Prenatal and postnatal medical records, including echocardiographic reports and cardiovascular casts, were reviewed and cardiac abnormalities were compared and analyzed.

Results: The fetal cardiovascular casts showed that all of thirty-five cases of induced labors were confirmed to have complex cardiac malformations. Ninety cardiovascular malformations were demonstrated on casts, sixty-nine cardiovascular malformations were found on prenatal echocardiography. Twenty-one fetal cardiovascular malformations were misdiagnosed and missed diagnosed by prenatal ultrasound. Among them, seven cardiovascular malformations were misdiagnosed and fourteen cardiovascular malformations were missed diagnosed.

Conclusion: Our study shows that fetal echocardiography may misdiagnose and missed diagnose of abnormal DA, vascular deformities and other complex cardiac malformations. The cast specimens of fetal hearts and great vessels can visually display fetal cardiac malformations and abnormalities of macrovascular and its branches. Prenatal understanding of such malformations may help to improve prenatal diagnosis.

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

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Aims: 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 angiocardiology, 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.

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Efficacy and Safety of Subcutaneous Treprostinil Infusions in the Treatment of Pediatric Patients With Severe IPAH

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Background: Treprostinil, a prostacyclin analogue, is effective for the treatment of pulmonary arterial hypertension (PAH). However, information is scarce regarding treprostinil for treatment of severe pediatric idiopathic PAH (IPAH). The aim of this study was to examine the efficacy and safety of subcutaneous treprostinil in this setting.

Materials and Methods: A retrospective study was for 16 patients (under 18 years of age) with a diagnosis of IPAH admitted to Department of Pediatric Cardiology of Beijing Anzhen Hospital between May 2018 and December 2020. All the patients were arranged to receive baseline cardiac catheterization. Clinical status, laboratory tests, echocardiography, and adverse reactions were evaluated.

Results: Advanced IPAH patients with NYHA FC III or IV disease ($n=16$, age 9.13 ± 4.57 years, 10 females) received treprostinil, 9 (56.25%) patients had a history of syncope. The right atrial pressure was (11.00 ± 4.77) mmHg, mean pulmonary artery pressure was (82.27 ± 12.37) mmHg, mean aortic pressure (80.93 ± 17.31) mmHg, pulmonary vascular resistance index (PVRI) was (23.69 ± 6.77) wood·m², acute pulmonary vasodilation test (AVT) was negative. The interval between the initiation of treprostinil and the first comprehensive follow-up assessment was (68 ± 34) days. The mean final dose achieved was 20 ng/kg/min with a range of 10- 22.5 ng/kg/min. The heart function was improved obviously (15 with NYHA FC II and 1 with NYHA FC III), BNP from 380.06 ± 353.38 to 134.93 ± 97.72 ng/L. Echocardiography showed main pulmonary artery diameter decreased from 29.88 ± 6.46 to 27.50 ± 4.15 mm, tricuspid regurgitant pressure gradient from 88.00 ± 19.09 to 73.50 ± 19.48 mmHg, main pulmonary artery diameter /aortic dimension ratio from 1.62 ± 0.47 to 1.32 ± 0.22 , right ventricular anteroposterior diameter / left ventricular end diastolic dimension ratio from 0.94 ± 0.56 to 0.65 ± 0.32 (all $p<0.05$). In the first 2-5 days subcutaneous treprostinil, there were 2 (12.50%) patients had the initial pain subsides, 3 (18.75%) headache and 2 (12.50%) flushing. None stopped treatment because of intolerable.

Conclusions: Subcutaneous treprostinil infusion is an effective therapy without serious side effects in children with severe IPAH.

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Fetal Pulmonary Valvuloplasty of Pulmonary Atresia Associated With Intact Ventricular Septum With Hypoplastic Right Heart: Mid- term Follow-up Results

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Background: The goal of FPV is to decompress the hypertensive RV, which can improve fetal circulation with the growth of the TV and RV, making them amendable to biventricular repair postnatally. In the past ten years, there has been preliminary development of fetal cardiac interventions in China. However, there is little experience in the indications, technical procedures, and management of complications of FPV.

Methods: This study confirmed that the indicators of RV development in fetuses with PA/IVS improved continuously after FPV was performed under ultrasound guidance. Compared to intrauterine RV development, the tricuspid valve continues to develop rapidly after birth, while RV development is relatively slow. Bradycardia was found to be the chief complication of FPV.

Results: This study confirmed that the indicators of RV development in fetuses with PA/IVS improved continuously after FPV was performed under ultrasound guidance. Compared with those before FPV, the Z- score of TV in 5 fetuses with continued pregnancy decreased significantly at 2 and 6 weeks after FPV, while the ratio of TV/MV and RV/LV increased significantly ($P<0.05$), and massive tricuspid regurgitation improved significantly at 6 weeks after FPV ($P<0.05$).

Compared with 6-month-old and 2-year-old, the diameter of TV increased most rapidly in 1-year-old, and the Z-score of TV increased most significantly ($P=0.002$; $P=0.064$), compared with those at 6 months old and 2 years old, the diameter of TV increased most rapidly at the age of 1 year ($P=0.002$; $P=0.102$), and the Z-score of TV also increased most significantly. There was no significant difference in the growth rate and Z-score of right ventricle among different periods ($P<0.05$), but the growth rate of right ventricle at 6 months old was the fastest compared with that at 1 year old ($P=0.009$), and there was no significant difference at 2 years old ($P=0.497$). Bradycardia was found to be the chief complication of FPV (4/7, 57.12%) procedures. All the 4 fetuses were punctured in the right atrium and injected with epinephrine or atropine, and the fetal heart rate returned to normal. **Conclusion:** The study offers clinically significant insights into post-natal RV development following FPV for PA/IVS and shows that timely detection and correct treatment are crucial for ensuring the success of FPV.

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Aortic Arch Reconstruction in Infants and Young Children

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Background: The aim of this study was to review the surgical outcomes of aortic arch reconstruction in infants and young children with aortic arch anomalies.

Methods: Thirty-five consecutive patients with aortic arch anomalies undergoing aortic arch reconstruction between 2017 and 2020 were retrospectively reviewed. The aortic arch anatomy was either coarctation (CoA) with or without arch hypoplasia ($n=29$) or interruption (IAA, $n=6$). Repair techniques were designed according to individual anatomy based on the preoperative images and operative findings. Aortic arch reconstruction was performed by end-to-end anastomosis ($n=3$), extended end-to-end anastomosis ($n=16$), end-to-side anastomosis ($n=5$). Patch augmentation was performed in 11 cases. Nine patients underwent left posterolateral thoracotomy, while 26 underwent median sternotomy, cardiopulmonary bypass (CPB) and circulatory arrest, of which continuous antegrade cerebral perfusion (CACP) were performed in 19 patients.

Results: There were 22 male and 13 female. Median age at operation was 38 days (3 days - 6 years). Twenty-six were neonates. Median body weight were 4 kg (1.9-14.5 kg). Concomitant lesions include ventricular septal defects (VSD, $n=15$), left ventricular outflow tract obstruction (LVOTO, $n=5$) and other complex lesions ($n=10$). Median circulatory arrest and CACP time were 51 minutes (5-164 minutes) and 46 minutes (25-104 minutes), respectively. Median postoperative ICU stay was 8 days (1-26 days). Four patients had delayed sternal closure and 2 patients required peritoneal dialysis. There were two in-hospital deaths (mortality 5.7%). One neonate with fifth arch coarctation underwent emergency operation at day 3 after birth. He died from postoperative heart failure. Another 2-month-old baby with IAA/VSD/LVOTO died of pulmonary hypertensive crisis. Median follow-up was 18 months (1-38 months). Re-CoA occurred in 4 patients, one of which was treated successfully by balloon dilatation at postoperative 5 months. Another three were still closely followed up. One patient with CoA and double

outlet right ventricle (DORV) undergoing total correction in neonate developed LVOTO and was re-operated successfully at postoperative 11 months.

Conclusion: Management of aortic arch anomalies in infants and young children is challenging. Satisfactory results can be achieved when individualized arch reconstruction technique is applied.

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Cardiopulmonary Exercise Test is an Important Assessment Tool in Grown-up Congenital Heart Disease (GUCH)

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Background and objectives: There is increasing number of grown-up patients with congenital heart disease (GUCH) worldwide. Functional assessment is important to guide the management of these patients. While many guidelines stratified the management according to functional class, however, functional class may not be objectively adequate to determine the capacity of GUCH patients.

Methods: Parameters, including percent of predicted maximum oxygen consumption (Percent mVO₂), exercise duration (ex time), ventilation CO₂ production slope (VE/VCO₂), of cardiopulmonary exercise test (CPET) of 53 Chinese GUCH patients (27 male) were retrieved and were compared among different functional classes based on New York Heart Association functional class (NYHA) and Warnes-Somerville Ability Index (WSAI), and among different level of complexity, and illness severity. The comparison was made between CPET results and quality of life (QOL) assessment (SF36-PCS and SF36-MCS).

Results: Percent mVO₂ is lower in NYHA 3 than NYHA 1 ($p < 0.05$) but the difference between that of NYHA 1 and 2 and between NYHA 2 and 3 were insignificant. WSAI 2 has lower percent mVO₂ than WSAI 1 ($p < 0.01$). CPET parameters showed no difference among different complexity levels. Greater illness severity had incrementally lower percent mVO₂ and higher VE/VCO₂ slope (both $p < 0.001$). Percent mVO₂ was moderately correlated with SF36-PCS and SF36-MCS respectively (both $r = 0.33$, $p < 0.05$).

Conclusions: Functional class, complexity and QOL scores are not adequate to stratify patients with different level of cardiopulmonary capacity. Management of GUCH patients should rely on objective assessment using CPET.

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Interruption of Right Ventricular Pacing Improves Left Ventricular Diastolic Intraventricular Pressure Gradient and Synchronous Relaxation

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Background: Right ventricular (RV) pacing is associated with left ventricular (LV) diastolic dysfunction. We sought to determine the effects of temporary interruption of RV pacing on LV early diastolic intraventricular pressure gradient (IVPG) at isovolumic relaxation and LV mechanics and dyssynchrony in children and young adults with heart block.

Methods: 20 patients aged 20.3±9.0 who had undergone RV pacing for heart block for at least 6 months were studied before and after interruption of RV pacing for 5 minutes. The Left ventricular IVPG was assessed by vector flow mapping while LV mechanics and

dyssynchrony indices were assessed by speckle tracking and tissue doppler echocardiography.

Results: Upon pacing interruption, LV global systolic longitudinal ($p = 0.002$) and circumferential ($p = 0.026$) strain, early diastolic strain rate ($p = 0.013$), and mitral annular early diastolic velocity ($p = 0.011$) increased significantly. The LV systolic and diastolic dyssynchrony indices normalized for RR interval decreased significantly from 1.40±0.42 to 0.97±0.29 ($p < 0.001$) and 0.59±0.32 to 0.30±0.10 ($p = 0.001$), respectively. This was accompanied by significant increase in LV early diastolic IVPG from 0.19±0.08 mmHg/cm to 0.58±0.02 mmHg/cm ($p < 0.001$). Log LV IVPG was found to correlate negatively with normalized LV systolic ($r = -0.42$, $p = 0.007$) and diastolic dyssynchrony ($r = -0.47$, $p = 0.002$) indices. Multivariate analysis showed that age at study, gender, age at pacemaker implantation, and pacing mode were not significant determinants of LV IVPG at baseline or during pacing interruptions.

Conclusion: Temporary interruption of RV pacing in children and young adults with heart block acutely improves LV early diastolic IVPG coupled with improvement in synchronicity of systolic contraction and diastolic relaxation.

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Effectiveness of the Transition Care Program on Enhancing Knowledge Level Among Adolescents With Moderate to Complex Congenital Heart Disease in Hong Kong - Preliminary Experience

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Background: Most children born with congenital heart disease (CHD) can reach adulthood. However, they may still develop various medical problems and need life-long follow-up care. It is essential to transfer them to adult care settings when they grow up to ensure continuity of care. With various differences between paediatric and adult care settings, Transition Care Program is developed for adolescents with moderate to complex CHD to enhance their knowledge on CHD and self-management skills which facilitate them to manage their care in adult-oriented health care settings in future. We aimed to evaluate the effectiveness of the Transition Care Program on enhancing the knowledge of CHD and related issues in adolescents with moderate or complex CHD; and to assess satisfaction level of the patients and their parents.

Methodology: Adolescents aged 15-18 years with moderate to complex CHD were recruited into the Transition Care Program. Their knowledge of CHD were assessed by Congenital Heart Disease Self-Assessment Questionnaire (CHD-SAQ). Education and counselling were provided according to their response in questionnaires. Follow-up sessions were provided to re-assess their knowledge and recognition of the self-management related to their CHD. Results before and after the transition care were compared using paired t tests or McNemar's chi-square test where appropriate to evaluate the effectiveness of the program on enhancing adolescents' knowledge of CHD and related issues. Satisfaction level of adolescents and their parents towards the Program are assessed by questionnaire survey.

Results & Outcomes: From July 2018 to October 2020, 52 transition sessions were conducted for 35 adolescents. Seventeen adolescents completed 2 sessions. After the second session, the proportion of "fully correct" in 'name of heart defects' was increased by 17.6 percentage points (pp) ($p = 0.03$), 25pp on 'name of cardiac surgeries/interventions' ($p = 0.05$), and 12.5pp on 'knowledge'. There is insignificant increase in number of respondents recognizing shortness of breath (88.2% vs 82.4%), decreased exercise tolerance (88.2% vs 82.4%) and palpitation (76.5% vs 64.7%) as symptoms of deterioration. Mean composite score of knowledge on endocarditis prophylaxis was improved by 63% ($p = 0.006$). Adolescents girls showed increased recognition of their pregnancy risk (from 27.3% to 63.6%, $p = 0.13$). Both adolescents and

their parents showed overall satisfaction about the program (mean satisfaction score 4.27/5 among adolescents and 4.65/5 among parents respectively).

Conclusion: The structured transition care program helped improve the knowledge of CHD and related issues among adolescents with moderate to complex CHD, and achieved overall satisfaction from patients and their parents.

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Left Bundle Branch Pacing in Paediatric Centre - Initial Experience in Hong Kong

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Background: Physiological pacing, left bundle branch pacing (LBBP) in particular, has been increasingly used as a contemporary pacing technique. Paediatric data is scarce.

Methods: Retrospective review of all patients who attempted physiological pacing was conducted, in our only tertiary Paediatric cardiac centre in Hong Kong.

Results: Four patients were identified. Their demographics and clinical details were shown in table. They were all indicated for implantation of a new transvenous ventricular lead. LBBP was attempted, with the use of Medtronic SelectSecure 3830 pacing lead coupled with C315 HIS sheath.

LBBP can be successfully performed in three out of four patients. Their acute implantation parameters were shown in table. The QRS duration shortened after the change to LBBP system (from 172.3 ms to 92.7 ms, $p=0.028$). Echocardiogram demonstrated significant improvement in left ventricular synchronous contraction. Subsequent follow-up showed stable pacing lead parameters, with a mean pacing threshold of 1.04 +/- 0.44 V@0.4 ms. For the 4-year-old girl who failed to implant the LBBP lead, trans-oesophageal echocardiography (TEE) showed the interventricular septum (IVS) was measured 5.4 mm in diastole. LBB could be captured with good sensing and pacing parameters (Impedance 725 ohm, sensing threshold 21 mV, pacing threshold 1.0V@0.5 ms). 12-lead electrocardiogram showed non-selective LBBP with QRS duration of 110 ms and LV activation time of 70 ms. TEE confirmed the lead tip was embedded inside the IVS and angiogram suggested the lead tip was 5.2 mm inside the septum. However, dislodgement of lead was encountered during the subsequent fixation procedure. Despite further attempts of successful relocation of LBB pacing lead, the septum was unable to hold the engaged screwed lead with easy dislodgement. Therefore, LBBP was changed to conventional right ventricular apical pacing, with no complication.

Conclusion: LBBP can be successfully applied in paediatric patients but appeared limited by the septal strength with relatively thin IVS in very young child.

PAEDIATRIC CARDIOLOGY CASE ABSTRACTS

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Novel Use of Lignocaine and Calcium in Refractory Atrioventricular Block in Newborn With Calmodulin-related Long QT Syndrome

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Background: We reported a newborn with Calmodulin-related long QT syndrome (CALM-LQTS) whose refractory atrioventricular block converted to 1:1 AV conduction after intravenous lignocaine and calcium.

Case: The post-natal ECG of a newborn with antenatal bradycardia and intermittent 2:1 atrioventricular block (AVB) showed sinus bradycardia, markedly prolonged QT interval, long isoelectric ST segment and late-peaking T waves. Isoprenaline infusion did not improve conduction abnormalities. Since the T wave morphology was suggestive of LQT3, a bolus of lignocaine followed by infusion was given, with conversion to transient 1:1 conduction and improvement in metabolic acidosis (Fig 1b). However, 2:1 AVB recurred, therefore an epicardial dual-chamber pacemaker was implanted. During VVI pacing, there was intermittent 1:1 AV conduction without and with aberrancy followed with VVI paced beat in a trigeminal pattern. Serum ionized calcium was <1 mmol/L, therefore intravenous (IV) calcium bolus was given. Within a few minutes, there was 1:1 conduction with left bundle branch pattern.

Subsequent AAI pacing had sustained 1:1 conduction. Ionised calcium level was maintained ~1.3 mmol/L. Oral propranolol and mexiletine were started. Genetic test revealed a novel likely pathogenic heterozygous missense variation in exon six of the CALM2 gene - NM_001305624.1:c.532G>C p.(Asp178His).

Decision-making: Intravenous lignocaine and calcium was used to terminate refractory atrioventricular block in a newborn with Calmodulin-related long QT syndrome.

Conclusion: This report demonstrated the potential of using intravenous lignocaine and calcium to treat AV block in CALM-LQTS.

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Prenatal Ultrasound Combined With Cardiovascular Casts Diagnose Symmetrically Complex Cardiac Malformations in Two Fetuses

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Background: Dextrocardia with a ductus arteriosus (DA) malformation is extremely rare. Here, we present a case of dextrocardia complicated with a right DA that is circuitously connecting the pulmonary artery and the right brachiocephalic artery. Coincidentally, the deformities of this fetus are almost symmetrical with those in another fetus, which is astonishing and meaningful. Dextrocardia is rare, complicated, and not well understood. In this report, we carefully compared prenatal echocardiographic images and cardiovascular casts from two fetuses. Our report of these cases may provide new insights for cardiologists to better understand dextrocardia and its associated malformations.

Case: A 28-year-old primigravida woman and a 25-year-old pregnant woman (gravida 2, para 1) were referred to our maternal-fetal medical center at gestational weeks of 23±3 weeks and 25±6 weeks, respectively, for suspected fetal heart defects. Prenatal ultrasound revealed mirror symmetry in the hearts of each fetus. Fetal echocardiography in the first baby showed dextrocardia, situs solitus of the atria, an L-ventricular loop, a ventricular septal defect, a double outlet of the right ventricle (anatomic right ventricle), an L-mal/transposition of the great arteries with pulmonary stenosis, a right DA in which the DA circuitously connects to the pulmonary artery and the right brachiocephalic artery. The second fetus demonstrated levocardia, situs solitus, a D-ventricular loop, a ventricular septal defect, a double outlet of the right ventricle with pulmonary stenosis, a right aortic arch with mirror-image branching, and a left DA in which the DA circuitously connected to the left pulmonary artery and the left brachiocephalic artery. Each fetus died in utero, one as a result of an umbilical cord knot at the gestational age of 25±3 weeks and the other as a result of placenta

previa at the gestational age of 26±2 weeks. Both families voluntarily donated specimens to our maternal-fetal medical center. A subsequent anatomic and cardiovascular cast for each fetus confirmed the prenatal diagnoses.

Decision-making: Dextrocardia almost inevitably is combined with other cardiac malformations; these typically include ventricular or atrial septal defect, pulmonary stenosis, congenitally corrected transposition of the great arteries, and hypoplasia of the pulmonary artery. However, dextrocardia with a DA malformation is rare.

Conclusion: Fetal cardiovascular casting is a technique that can perfectly show the microscopic deformities of a fetal cardiovascular system, making it a good educational tool for students of congenital heart diseases.

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Two Cases of Paediatric Cardiac Tumour With Different Outcome

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Background: Primary cardiac tumours are rare in paediatric population with a reported prevalence of <0.1% to 0.28%. Majority are benign tumours and rhabdomyoma is the most common primary cardiac tumour in childhood. They can be clinically asymptomatic but at the other end of the spectrum, they can cause life-threatening arrhythmia, obstruction and functional impairment; depending on the size, numbers and location.

Case: Two newborns with incidental finding of heart murmur were found to have cardiac tumours on echocardiogram. Case one had a solitary lesion eventually diagnosed as cardiac fibroma with specific findings in magnetic resonance imaging (MRI); there were no associated complications. The lesion was left unresected as there was a considerable chance of damaging the mitral valve with surgery. Case two with multiple lesions was compatible with cardiac rhabdomyomas; and Wolff- Parkinson-White (WPW) syndrome was found on electrocardiogram (ECG). The patient developed further clinical features of tuberous sclerosis complex (TSC) in infancy. Following the well reported natural history, the cardiac lesions progressively regressed with complete resolution of the rhabdomyomas as well as the WPW around the age of two; during which he was put on everolimus for cortical tubers and recurrent seizures (after one years old).

Decision-making: Different types of primary cardiac tumours can usually be differentiated by their clinical characteristics without going into histopathology. MRI and relevant genetic studies are helpful tools. Surgical resection, either total or subtotal, is the treatment of choice for cardiac fibroma. The risk of ventricular arrhythmia is high if left unresected. The use of the inhibitor of mammalian target of rapamycin (mTOR inhibitor) in case two may have hastened the resolution of the cardiac rhabdomyomas.

Conclusion: Different types of primary cardiac tumours in children are associated with different outcomes. The use of mTOR inhibitor in symptomatic TSC-associated rhabdomyomas is currently under further clinical studies; hopefully will be the next FDA approved indication.

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Prospective, Single Arm, Single-center Pilot Study on the Safety and Efficacy of the Sterile Transcatheter Pulmonary Valve and Delivery System

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Background: Chronic pulmonary regurgitation (PR) in post-operative native right ventricular outflow tract (nRVOT) is one of the largest burdens on adult congenital heart disease service. Percutaneous pulmonary valve implantation (PPVI) with self-expandable valves for dysfunctional nRVOT is a promising strategy under investigation. This pilot study describes the feasibility of a novel self-expandable valve with a trileaflet porcine pericardial tissue valve for PPVI.

Methods: This is a pilot study assessing the safety and efficacy of PPVI using the PT Valve (Med-Zenith, Beijing). Five patients who fulfill conventional criteria for pulmonary valve replacement was enrolled with baseline cardiac MRI and ECG-gated CT performed. Two out of 5 patients were selected as pilot patients to receive the study valve after screening, while the intention was to recruit 15 patients. CT dataset of the RVOT were analyzed in a core lab with perimeter assessment of the potential valve landing zone at 6 levels to determine an appropriate valve size. Virtual simulation and trial implantation on patient specific 3D models were used to confirm the suitability of the chosen valve size. The baseline patient characteristics, procedural details, immediate procedural success, and post-procedural acute results were documented.

Results: Both patients were graded to have severe PR (PR fraction 44% and 29%) with dilated right ventricle (RVEDV: 164 and 157 ml/m²); the second patient also has significant right ventricular (RV) dysfunction (RVEF 20%). The procedures were performed under general anaesthesia in a biplane cardiac catheterization lab. The age at procedure was 36 and 42-year-old respectively. Both procedures were performed via right femoral venous access, with left femoral venous access for angiography during valve implantation. PT valves (size 3626 and 4626) were successfully implanted in both patients without procedural complications. In the second patient, the distal flare of the valve was partially folded during deployment, which did not require intervention as it did not affect valve function. Procedural time was 79 and 117 minutes. Post-procedural course was unremarkable other than low-grade fever for 3 days in the second patient with no evidence of infection. Post procedural follow-up showed excellent valve function and decreasing right ventricular dilatation at 1 month post procedure.

Conclusion: This pilot feasibility study on the Med-Zenith PT valve for treatment of dysfunctional nRVOT has demonstrated good acute result with no major adverse events. Expansion of the study and further follow up will allow better understanding on the medium-term efficacy of the device.

CLINICAL CARDIOLOGY CASE ABSTRACTS

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Cardiac Manifestation of Multisystem Inflammatory Syndrome in a COVID-19 Patient

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Background: In April 2020, a cluster of COVID-19 children developed hyperinflammatory shock similar to atypical Kawasaki disease in the United Kingdom, and the condition was later termed multisystem inflammatory syndrome in children (MIS-C). A few case reports described similar syndrome in young adults, and now termed MIS in adult (MIS- A). A man recently recovered from acute COVID-19 presented with possible MIS-A with cardiac involvement is presented.

Case: A 52-year-old man with good past health presented with cough, dyspnea, and loose stool for 6 days. COVID-19 PCR was positive. He required up to 2 L/min O₂. He was given antiviral and anti-inflammatory medication. SAR-CoV-2 IgG was positive on day 9 of hospitalization and was discharged home on day 13. He presented to the hospital again in 1 week after discharge (25 days from symptom onset) with fever without localizing sign. Initial blood

test, CXR and vital signs were all unremarkable. Repeated SAR-CoV-2 RNA RT-PCR was negative.

On day 5 of this second admission, his condition deteriorated with hypotension and respiratory distress. He developed rash and conjunctivitis. Blood test showed neutrophilia, deranged liver and renal function and increased inflammatory markers. (CRP 304 mg/L, Procalcitonin 8.89 ng/mL, ferritin 154848 pmol/L). His TropI was elevated to 1425 ng/L. ECG showed sinus rhythm with poor R wave progression. Repeated CXR showed new cardiomegaly.

The patient was transferred to ICU on day 5. Echocardiography showed impaired biventricular function with LVEF around 30%, with global hypokinesia.

On day 6, coronary angiography revealed distal LAD CTO. There was no coronary aneurysm. PCI was not proceeded in view of active inflammation. Endomyocardial biopsy revealed hemorrhage and acute inflammatory exudate but negative for SAR-CoV RT-PCR. The skin rash was also biopsied and revealed mild mononuclear and lymphoplasmacytic perivascular infiltrate in the dermis.

In view of possible MIS-A, he was given IV hydrocortisone, high dose IVIG, hemodialysis with EMiC2 filter for clearance of cytokines.

His condition improved with inotropes weaned off on day 8 and extubated on day 10. Repeated echocardiography on day 10 showed that the LVEF improved to 50%, and the RV systolic function also improved. The inflammatory markers also lowered dramatically. The patient was discharged on day 19.

Decision making: Cardiac manifestation of COVID-19 can be related to coronary thrombosis, myocarditis or hyperinflammation as in MIS-A. Echocardiography, coronary angiography and endomyocardial biopsy would guide appropriate treatment.

Conclusion: The cardiac involvement in COVID-19 MIS-A can be rapidly reversible.

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Diagnosis and Treatment of an 89 Year Old Woman With ST Segment Elevation, Fracture and Hyperthyroidism

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Background: An 89 year old woman was hospitalized in orthopedics department due to left intertrochanteric fracture with ST segment elevation and hyperthyroidism. Gadolinium contrast medium and IVUS were selected to complete CAG and diagnosis.

Case: A female, 89 years old, 45 kg, was admitted to orthopedics department for "swelling and pain of left hip caused by trauma for 1 day". Left hip X-ray showed: left intertrochanteric fracture, with a history of hypertension, denied diabetes and heart disease history.

Physical examination showed no abnormality. ECG: V2-6 ST segment elevation 0.2-0.5 mv. Troponin I: 10.569 ng / ml.

Thyroid function: TSH 0.000 mIU / L, FT3 5.34 pmol/l, FT4 35.53 pmol/l.

Diagnosis:

1. Coronary artery disease

Acute anterior myocardial infarction Cardiac function I (Killip grade)
2. Left intertrochanteric fracture Coronary angiography by gadolinium contrast medium 80 ml and IVUS examination: LM no abnormality, LAD proximal 50% calcified stenosis, middle myocardial bridge, diagonal branch proximal 50% calcified stenosis, LCX distal 66% stenosis.

Echocardiography showed that the apical beat was weakened.

Diagnosis: Stress cardiomyopathy (Takotsubo syndrome)

Decision-making: It looked like STEMI from patient's ECG and troponin, but she had no significant chest pain. Because of

hyperthyroidism, coronary angiography could not be performed with iodine contrast medium, gadolinium contrast medium and IVUS were selected to exclude STEMI. Combined with the results of echocardiography and the patient's history, stress cardiomyopathy was diagnosed.

Conclusion: The characteristics of this case are: 1. Patients with hyperthyroidism can choose gadolinium contrast medium; 2. Female's stress, ST elevation, troponin elevation, we could not only consider STEMI, but also consider stress cardiomyopathy.

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Failing Right Ventricle Following Inferior STEMI - Use of Impella RP Guided by Invasive Hemodynamic Assessment

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Background: Acute myocardial infarction (AMI) complicating with cardiogenic shock (CS) is associated with high mortality approaching 50%. Right ventricular (RV) ischemia following acute occlusion of right coronary artery (RCA) causes depressed RV function and compromised left ventricular preload. Here, we described our first Impella RP use in a patient with RV failure following inferior STEMI and acute stent thrombosis.

Case: A 70-year-old gentlemen presented to us with sudden onset of chest pain with hypotension. ECG showed inferior ST elevation with complete heart block. Cath lab was activated and primary PCI was performed. Transvenous pacing was inserted. Angiography showed acute proximal RCA occlusion. IVUS-guided PCI to RCA was performed with restoration of TIMI 3 flow. Blood pressure was stabilized with inotrope. However, he had subsequent rapidly downhill course in CCU with recurrent chest pain, persistent CS and intercurrent ventricular tachycardia and ventricular fibrillation. Echocardiography showed impaired LVEF 40-45%, dilated RV with reduced systolic function. Intra-aortic balloon pump (IABP) was inserted. Repeated angiography showed acute RCA stent thrombosis. Thrombectomy was performed to restore coronary flow. OCT showed heavy thrombus burden but no obvious mechanical factors of early stent failure. Coronary flow was further optimized with Penumbra and AngioJet. Unfortunately, he developed refractory CS despite volume expansion, vasopressor support and IABP, and required escalation of mechanical circulatory support (MCS) device. Swan-Ganz catheter revealed a RV-dominant CS (PAPi 0.5, RA pressure 16 mmHg and PCWP 12 mmHg). Impella RP was inserted for RV unloading. There was significant improvement after placement of Impella RP and vasopressor demand was reduced. Impella RP and IABP were weaned off on Day 6 and 7 respectively. He was discharged after a course of rehabilitation.

Decision-making: Regardless of a lack of benefit in routine use of pulmonary artery catheter (PAC) in heart failure, growing evidence supports the early invasive hemodynamic assessment in CS. PAC could identify the CS phenotype and guide the escalation of medical and device-based therapies. Our case demonstrated the use of invasive hemodynamics to reveal a predominantly RV failure, and therefore unload the failing RV with Impella RP.

Conclusion: Our case outlines the importance of invasive hemodynamic assessment to guide device selection. We presented our first experience of Impella RP as a salvage therapy in a predominant RV failure following inferior STEMI and acute stent thrombosis. With the evolving availability and growing experience in various MCS devices, we aim to improve the outcomes of patients with AMI and CS.

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The Danger of DDDR

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Background: The bradycardia programming of implantable cardioverter-defibrillators (ICD) deserves no less attention than anti-tachycardia therapies. We present a case in which DDDR pacing triggered ventricular tachycardia (VT).

Case: A 70-year-old man presented with his first discharge since implantation of a dual-chamber single-coil ICD for primary prevention for ischemic cardiomyopathy three years ago. He has a history of sick sinus syndrome. He was brisk walking and felt a shock without loss of consciousness. ECG showed sinus rhythm and evidence of prior anterior myocardial infarction. Device interrogation showed stable lead parameters; other settings are shown in the Table. An episode of VT was retrieved that corresponded to his symptom. A programming change was then made.

Decision making: Figure shows the onset of the VT episode. The patient was in sinus tachycardia that is faster than the maximum tracking rate. Some of the A signals were functionally undersensed (blue arrows) because they fell into the post-ventricular atrial refractory period (PVARP). PVARP can be inferred from the device setting by subtracting AV delay from maximum tracking cycle length yielding 270ms for paced AV and 300ms for sensed AV, respectively. Sensor-driven atrial pacing occurred at the maximum tracking rate as indicated by SIR marker. Functional atrial loss of capture (LOC) was noted due to competitive atrial pacing. At the beat marked by blue asterisk, the intrinsic V signal coincided with atrial pacing falling into the post-atrial pacing ventricular blanking period (PAVB) and was not sensed. Following a 300 ms AV delay, ventricular pacing was delivered landing on the T wave but hits the relative refractory period and did not capture. Ventricular LOC was recognized by the device and a remedial spike was delivered, capturing the ventricle but initiated monomorphic VT. The beat that follows is a fusion beat. The VT was unresponsive to anti-tachycardia pacing and was only terminated with a shock. The ICD was programmed from DDDR to DDI to minimize V wave undersensing. **Conclusion:** Appropriate choice of bradycardia programming in ICD is important to avoid V wave undersensing and device-related arrhythmia.

Table

A sense	2.2 mV
V sense	6.8 mV
A threshold	0.5V@0.4 ms
V threshold	0.75@0.4 ms
Auto-capture	On
A impedance	450 ohm
V impedance	540 ohm
Shock impedance	68 ohm
Mode/ rate	DDDR (base rate 45 bpm, max track rate 105 bpm)
Paced AV delay	300 ms
Sensed AV delay	275 ms
Anti-tachycardia therapy	VT: ATP x 3 then shock VF: ATP during change then shock

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When the Right Meets the Left

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Background: Arrhythmogenic right ventricular cardiomyopathy (ARVC) classically involves the right ventricle (RV) resulting in

arrhythmias, sudden cardiac death and RV failure. However, preferential LV involvement is being increasingly recognized and presents unique challenges in diagnosis.

Case: A 45-year-old man presented with recurrent ventricular tachycardia (VT). Four years prior, he received an implantable cardioverter-defibrillator (ICD) for VT. He subsequently underwent repeated ablation for outflow tract VT without success. He continued to experience episodes of VT and ICD shocks despite being on bisoprolol. Cardiac magnetic resonance imaging (CMR) prior to ICD implantation reported mild left inferolateral hypokinesia but no evidence of RV dysfunction.

Decision making: Review of CMR showed intramyocardial fatty infiltrate in inferior septum and inferolateral wall, although RV size and systolic function was normal. The VT had an inferior axis and left bundle-branch block morphology. Signal averaged ECG was positive. The patient met 1 major and 2 minor criteria and a diagnosis of ARVC was established four years after presentation.

Preferential LV involvement has been described and increasingly recognized in ARVC. Some consider it as a separate entity and named "arrhythmogenic left ventricular cardiomyopathy" (ALVC). In the absence of RV involvement, ECG findings such as T wave inversion in V1-3 and epsilon waves may not be apparent. Similarly, the current imaging criteria, designed to capture RV dysfunction and dilation, may not be applicable. Establishing the diagnosis can be challenging especially in the early course of the disease.

Conclusion: Preferential LV involvement can be seen in ARVC and may predate RV dysfunction.

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Hemopericardium After Myocardial Infarction Complicated With Left VVentricular Aneurysm - Is It Rupture?

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Background: In a patient with hemopericardium after myocardial infarction (MI) complicated with left ventricular (LV) aneurysm, how could we definitely rule out concealed rupture, which requires emergency open repair?

Case: A 67-year-old man with hypertension and diabetes presented to the emergency department with on-and-off chest pain starting 4 days prior to admission. ECG showed ST-elevation over anterolateral and inferior leads. Emergency coronary angiogram showed culprit total occlusion of distal left circumflex artery (LCX); the LCX was stented with 3 drug-eluting stents. Post-PCI, patient developed recurrent fevers, dyspnea, and atrial fibrillation with rapid ventricular rate, and was treated with intravenous antibiotics, amiodarone, and parenteral anticoagulation. On day 10, bedside echocardiogram noted 3 cm-thick pericardial effusion with tamponade features. Urgent pericardiocentesis yielded bloody pericardial fluid. Serial echocardiogram showed interval reduction in pericardial effusion, and a small (1 x 1 cm) out-pouch at the apico-lateral LV wall, corresponding to the location of MI. This patient remained stable with defervescence and decreasing pericardial drain output. Contrast echocardiogram, left ventricular cine-angiogram, computed tomography (CT) of the heart, and magnetic resonance imaging (MRI) were performed.

Decision-making: Should we send this patient to cardiothoracic surgery for suspected concealed rupture?

Conclusion: Multimodality imaging of post-MI LV aneurysm is of paramount importance, particularly when hemopericardium is present. The decision of whether to proceed to further imaging tests depends on the acuity of presentation, the institutional availability of each imaging test, and the clinical probability of LV rupture.

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Acute Pericarditis - A Cause Not to Be Forgotten

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Background: A 26-year-old man presented to the A&E department with a 2-week history of fever and cough and new onset of chest pain and dyspnea for 5 days. He came from Myanmar and started working in Macao as security since 1 year ago.

Case: Temperature at arrival was 39°C and tachycardia (HR 123 bpm) was recorded at triage. ECG showed sinus tachycardia with diffuse mild ST segment elevation. CXR revealed a mass like image in left upper lung. Further Chest CT scan found multiple bulky lymphadenopathies with abscess formation in mediastinum, left supra-clavicular and axillar region. The biggest one measuring about 7.8x4.7x4.5 cm located in the para-aortic region. Moderate amount of pericardial effusion was noted.

Decision-making: Diagnostic pericardiocentesis was performed and blood tests for auto-immune diseases, tumor markers and infection study including HIV antibodies were done. GeneXpert assays for mycobacterium tuberculosis (mTb) from pericardial fluid was reported positive within 48 hours. HIV antibodies was reported positive 4 days later. Lymph node biopsy revealed granulomatous lymphadenitis with presence of acid-fast bacilli. Anti-Tb treatment with isoniazid, rifampin, pyrazinamide, ethambutal and levofloxacin were started. Prednisolone (1 mg/kg) together with ibuprofen and colchicine were also prescribed for prevention of constrictive pericarditis. Control echocardiography 1 week after steroid treatment revealed thickened pericardium with worrying sign of future constriction.

Conclusion: Tuberculous infection is no longer an uncommon cause for acute pericarditis in the era of HIV. The role of steroid in the prevention of constrictive pericarditis is still inconclusive.

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Aortic Dissection in a Chinese Patient 31 Years After Surgical Repair of Tetralogy of Fallot (TOF)

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Background: There has been increasing concern of aortic involvement on long-term follow-up of various congenital heart diseases especially tetralogy of Fallot. Serious complication of aortic dissection can develop, although the prevalence is estimated to be low.

Case: A male patient with surgical repair of TOF at 4 years-old remained asymptomatic on follow-up. Serial CMRI as part of follow-up protocol, at 29 years-old and 32 years-old respectively, revealed mild dilation of right ventricle, satisfactory right ventricular function, mild pulmonary regurgitation, but mild interval growth of aortic root dilation from 4.8 cm to 5.1 cm. Losartan was started, but he defaulted follow-up and stopped losartan. He returned to follow-up at 35 years-old and reported intermittent chest discomfort for few months. BP was normal (114/64 mmHg). TTE showed markedly dilated aortic root (7.96 cm) with a flap-like structure. Urgent CT aortogram revealed aortic dissection extending from ascending aorta just distal to the aortic valve to the descending thoracic aorta at the level of 9th thoracic vertebra. He showed no feature of Marfan syndrome and negative family history of aortic dissection.

Decision-making: Bentall operation was urgently performed. Intra-operatively, a dissecting ascending aortic aneurysm with a tear just above the non-coronary cusp commissure was found. Histology showed the dissection flap involving the outer third of the aortic wall and small pools of mucin within the elastic lamina, compatible with cystic medial degeneration. Histology of aortic valve showed myxoid

degeneration and focal calcification with no evidence of infective endocarditis. He made satisfactory recovery. CT aortogram one year post-operatively showed residual aortic dissection distal to the origin of the left subclavian artery to 8th thoracic vertebra level with no progression. TTE showed good function of prosthetic aortic valve.

Conclusion: Progressive aortic root dilation, albeit the progression being rate, appeared preceding aortic dissection in repaired TOF and warrants regular monitoring for potential aortic dissection.

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Post Infarct Left Ventricular Aneurysm Presented With Malignant Arrhythmia: Management Decisions and Endocardial Scar Resection

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Background: Post infarct left ventricular (LV) pseudoaneurysm is lethal, caused by the mechanical and functional complications including malignant arrhythmia caused by the endocardial scar tissue. We reported a case of post infarct LV apical aneurysm presented with malignant ventricular tachycardia (VT). Management decisions pathway and on table decisions of surgical aneurysmectomy with endocardial scar resections are discussed.

Case: A 76-year-old lady with no family history of sudden death was admitted for palpitation and chest discomfort for 2 days. Non-sustained ventricular tachycardia was noted on presenting electrocardiogram (ECG) with elevated troponin. Echocardiography and computed tomography revealed a large LV apical aneurysm of 3.8cm with a narrow neck. Coronary angiogram showed a significant 70% stenosis over the distal left anterior descending artery.

The non-sustained VT was recurrent, electrical cardioversions and amiodarone infusion were attempted to stabilize her status. However, suspected a large scar tissue load, the hemodynamic significant non-sustained VT was not completely controlled; hence an intra-aortic balloon pump (IABP) was inserted and emergency surgery was offered. Intra-operatively, the LV aneurysm was identified and resected together with scarred endocardium under cardiopulmonary bypass. Defect was repaired with bovine pericardium. The post-operative recovery included continuous inpatient telemetry monitoring showed no single recurrence of arrhythmias. Reassessment CT showed no residual LV aneurysm. Discharged on post-op day 8 with the follow-up ECG in sinus rhythm.

Decision-making: Left ventricular aneurysm is a mechanical complication from myocardial infarction associated with arrhythmia. The decision making based on early diagnosis, workup and stabilization for surgical repair. The communication between medical and surgical teams shed light on decision makings in these cases.

The acute presentation of post infarct pseudoaneurysm, size of the aneurysm and the presence of recurrent non-sustained VT are the major clinical determinants. Survival is better with surgical treatment in large LV aneurysm with less recurrence of mechanical and functional complications.

Another crucial decision was on endocardial scar resection, which aimed at eliminating the arrhythmogenic foci and consequently to lessen the recurrent arrhythmias. The intraoperative decision to resect till normal myocardium was reflected a correct decision with the patient having no recurrence of VT.

Conclusion: In conclusion, acute post infarct LV aneurysm carries significant risk of fatal complications. Emergency operation should be offered with endocardial resection to lower post-operative recurrence of arrhythmias and might prevent the need for implantable cardioverter defibrillator.

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Rare Presentation of Ball Valve Thrombus in Right Atrium

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Background: Cardiac thrombi are mostly seen on the left side of the heart. In a setting of rheumatic heart disease, it assumes a ball valve configuration in the left atrium. Such a thrombus is a rare occurrence in the right atrium (RA).

Case: A 32-year-old female, 3 months post-partum came to our tertiary care center with the chief complaints of left lower limb swelling since a month and acute-onset dyspnea NYHA class III since 1 day. Imaging studies revealed deep vein thrombosis (DVT) of external iliac, femoral and popliteal veins and pulmonary thrombo-embolism with ball valve thrombus in RA. A bad past obstetric history and positive anti-cardiolipin antibody (IgM titer 32.3) hinted towards a possibility of antiphospholipid antibody syndrome.

Decision making: Pulmonary thrombo-embolism was performed by median sternotomy and cardiopulmonary bypass. A right atriotomy revealed a 2.8 cm, pebble-shaped, smooth-surfaced, white, free floating thrombus and an irregular 1.5 cm thrombus attached to the chordae of the septal tricuspid leaflet (causing mild tricuspid regurgitation). Histo- pathological examination confirmed an organized thrombus with focal calcification. An infra-renal inferior vena caval (IVC) filter was inserted. She had an uneventful recovery and was advised follow-up in a rheumatological clinic.

Conclusion: Ball valve thrombus occurring in RA is an exception. Our patient underwent surgical thrombo-embolism with good surgical outcome with IVC filter insertion and appropriate anti-coagulation.

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An Unexpected Cause of Heart Failure: Chagas Cardiomyopathy

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Background: Chagas cardiomyopathy is a classic finding of advanced Chagas disease due to chronic infection by the protozoan parasite *Trypanosoma cruzi* and can result in progressive heart failure, arrhythmias, and sudden cardiac death caused by destruction of the heart muscle and its nervous system.

Case: An 83-year-old male who recently emigrated from Ecuador to the U.S. came to the emergency room because of worsening shortness of breath for 2 weeks. He has no significant medical history in the past. A diagnosis of new-onset heart failure was made and treatment with diuretics was initiated. Initial electrocardiogram (ECG) revealed frequent premature ventricular contractions and bifascicular block with right bundle branch block and left anterior fascicular block. Echocardiogram showed ejection fraction (EF) of 25-30%, global left ventricular dysfunction, and interventricular septal motion that was consistent with conduction abnormality. Additional studies to evaluate for ischemic cardiomyopathy including nuclear stress test and cardiac catheterization could not be performed at the time as patient was very restless and unable to lay still. He subsequently developed supra-ventricular tachycardia (SVT) and had to be placed on high-dose beta-blocker. Also, a restrictive diet had to be introduced because of frequent aspiration episodes. Eventually he was discharged on medications for heart failure and rate-control.

Decision-making: Given his strange symptoms and recent immigration history, we decided to test for Chagas disease on the advice of a

Hispanic colleague. *Trypanosoma cruzi* antibody was ordered and returned positive a few weeks after our patient was discharged. On an outpatient follow-up visit with cardiology a nuclear stress test was successfully performed which confirmed the presence of a myocardial scar involving the basal and inferolateral walls consistent with Chagas cardiomyopathy. He was referred to infectious diseases specialist who decided against anti-parasitic therapy after weighing benefits and risks. Patient continues to be treated for heart failure according to standard guideline and is currently under consideration for implantable cardioverter defibrillator (ICD) and pacemaker to prevent sudden cardiac death.

Conclusion: This case underscores the importance of taking into consideration patient's immigration background in approaching diseases with unusual presentations. In addition, cardiac or gastrointestinal symptoms in a patient from Latin America should prompt consideration of chronic Chagas disease.

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An Unusual Left-ventricular Mass

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We present a case of culture-negative infective endocarditis presenting as a left ventricular mass. A 52-year-old man presented with acute onset right lower limb weakness for 2 days. He was afebrile. Physical examination was unremarkable except for reduced power 4/5 in the right lower lip. There was no murmur audible on auscultation. The magnetic resonance imaging of the brain revealed multiple infarcts. A workup for cardioembolic stroke was performed. An electrocardiogram showed sinus rhythm. An echocardiogram showed a 2.8 cm mass in the left ventricle attached to the inferior wall and trivial mitral regurgitation. Six sets of blood culture were negative. Serology for *Coxiella Bartonella* chair related. Immune markers were negative. The mass was excised to prevent further embolization. Pathology revealed microabscess formation and inflammation. Tissue culture was negative. Polymerase chain reaction on the tissue was positive for *Streptococcus*. The patient completed 6 weeks of antibiotics. The case highlights an atypical presentation of infective endocarditis and the need of a high index of suspicion.

CARDIAC INTERVENTION CASE ABSTRACTS

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A Case of Coronary Artery Perforation During PCI in a Post CABG Patient, A Devastating Complication

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Background: A patient undergoing coronary angioplasty with a history of coronary artery bypass surgery is very vulnerable to mortality if the coronary artery gets perforated. These patients can develop localized pericardial effusion which may be very difficult to tap.

Case: A 65-year-old Asian man presented with new-onset angina. He underwent CABG three years back by putting LIMA to LAD and SVG to PDA grafts. The patient's electrocardiogram revealed T wave inversion in inferior leads. An echocardiogram showed inferior wall hypokinesia with an ejection fraction of 45%. Coronary angiogram revealed patent LIMA to LAD and occluded SVG to PDA graft. LCX had proximal CTO, RCA revealed significant proximal stenosis. PTCA to proximal RCA was done successfully.

Decision making: PTCA to LCX was done by antegrade wire escalation technique by putting one DES. After post dilatation of stent, the patient had ELLIS class III perforation. Immediately perforation was sealed by

balloon inflation and pericardiocentesis was performed due to hemodynamic compromise. We tried to place one covered stent but it was not able to cross the lesion. Then we used guidezilla to cross the covered stent but unfortunately, it was also not going in LCX. Then we used balloon-assisted advancement of guidezilla (telescoping method) in LCX and successfully placed a covered stent to seal the perforation with the acceptable distal flow.

Conclusion: Coronary artery perforation is a very rare but catastrophic complication during angioplasty. Patients with a history of bypass surgery can develop localized tamponade due to adhesions. In the case of coronary perforation, impending cardiac tamponade requires rapid and accurate measures by the interventionist, at the risk of emergency surgery or death of the patient. In this case, patient developed coronary perforation after post dilatation of stent, which was successfully treated by putting covered stent with the help of guide catheter extension.

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A Tough One to Crack

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Background: Our patient is a 75 year-old lady from Grantham Hospital, who has a history of DM, hyperlipidaemia and ischaemic cardiomyopathy (LVEF 35%). She is known to have triple vessel disease, with multiple PCIs done before. She presents to us for persistent angina after a recent PCI attempt. We present a case of Impella-assisted PCI with atherectomy to an un-dilatable ISR lesion.

Case history: Our patient has a long history of CAD. PCI was done to LAD and LCX in 2000, and repeated to LAD, RCA in 2007. PCI was done again in 2009 and 2019 to RCA ISR. She was also found to have a LCX-OM1 CTO in 2019, which was successfully re-vascularised. Most recently, she had an episode of NSTEMI in August 2020. The coronary angiogram showed mild dLM stenosis, mLAD 80% calcified ISR, LCX patent stents, and a long diffuse 50% RCA ISR. PCI was targeted towards the mLAD ISR. However, the lesion was un-dilatable despite high pressured OPN balloon inflation and Shockwave treatment, so much so that we could not pass an IVUS. Hence, we decided that stenting was not suitable, and proceeded with DCB to the lesion. The final angiogram showed a residual 50% mLAD ISR.

During follow up, the patient complained of having persistent angina, requiring regular TNG. She refused CABG after discussion. In view of her poor LVEF and anticipated difficult procedure, we decided to perform a complex, high risk PCI with atherectomy under Impella support.

Decision making: During the procedure, we first set up the Impella device, and proceeded to lesion preparation. Since the patient had already failed balloon-based atherectomy and also Shockwave therapy, we decided to prepare the mLAD ISR using Diamondback device. Although it was successful, during subsequent balloon pre-dilatation, the patient developed severe hypotension and required resuscitation. After stabilisation, the lesion was stented with a DES. During post-dilatation, the patient developed severe hypotension again, which resolved after reperfusion. IVUS showed excellent results. In view of unstable haemodynamics, we decided to conclude the procedure at that point.

Conclusion: This case illustrates the importance of mechanical circulatory support in high risk patients, such as those with poor LV function, multi-vessel disease or difficult coronary anatomy. It also highlights the need for out-of-the-box thinking and off-label use of newer technologies in difficult ISR lesions.

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How to Treat Stent Insufficient Expansion at the Site of Severe Coronary Calcification After Coronary Rotation? Excimer Laser Ablation is a Good Choice

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Background: Coronary rotation is very effective to facilitate the procedure of coronary calcification lesion intervention. However, in some condition, the procedure is not very smooth even after coronary rotation.

Case: A 68-year-old man was admitted to Fuwai Hospital with paroxysmal chest discomfort for 3 years. Coronary angiography was performed for him to show that distal left anterior descending (LAD) total occlusion with severe calcification of proximal LAD. 7F EBU3.5 guiding was engaged to the ostial of left main (LM), fortunately soft wire passed through the total occlusion of LAD. We used post-dilation balloon to dilate the lesions including distal and proximal parts, however, the balloon couldn't expand fully at the site of severe calcification, and coronary dissection was found in the middle of LAD. Coronary rotation was performed by using 1.5 burr for 10 rounds. Two stents were implanted from the distal to proximal of LAD with Firebird2 2.5*13 mm and Firebird2 3.0*26 mm. Unfortunately, maximal lumen area (MLA) of the most stenosis part of the proximal stent was only 2.51 mm².

Decision-making: We tried to settle it by tolerated-high pressure balloon dilation on the site of insufficient expanded stent, however we failed. So we chose excimer laser ablation for severe calcification lesion, MLA of most stenosis part of the stent became 4.77 mm².

Conclusion: Excimer laser is a good choice to treat stent insufficient expansion at the site of severe coronary calcification after coronary rotation.

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Multimodality Imaging To Guide Transcatheter Edge-to-edge Repair in a Patient With Severe Symptomatic Atrial Functional Mitral and Tricuspid Regurgitation

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Background: Transcatheter edge-to-edge repair is proven to confer survival benefits in patients with severe functional mitral regurgitation secondary to LV dysfunction despite medical therapy. It is recently proven to be feasible in patients with severe functional tricuspid regurgitation.

Case: We described a successful percutaneous repair in an 81-year-old patient with atrial fibrillation, gross bi-atrial enlargement (LA area 58.0 cm² and RA area 75.3 cm²), severe symptomatic atrial functional mitral and tricuspid regurgitation due to dilated mitral and tricuspid annuli. The patient had been repeatedly admitted for acute pulmonary edema, ascites and limb edema, signifying biventricular heart failure despite best medical therapy. Echocardiogram showed severe (4+) MR and TR with systolic flow reversal in pulmonary and hepatic veins. After heart team discussion, she was brought to the cath lab.

Decision-making: Under TEE guidance, two MitraClip devices (NTW and NTR) were deployed in the medial (A3-P3) and central (A2-P2) scallops with MR reduction to 1+. The same delivery system was used in the TV using a "miskey" technique. However, due to grossly enlarged atria, the TV was in the far-field rendering TEE image quality unsatisfactory. Transthoracic echocardiogram yielded better imaging quality of TV but failed to produce excellent grasping view of the antero-septal commissure. Eventually clipping of TV anterior & septal leaflets was performed with an XTW device under intracardiac echocardiogram and fluoroscopic guidance, reducing TR to 2+. She remains in NYHA class 1.

Conclusion: Multimodality imaging is essential in contemporary structural heart interventions.

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Acute Stent Thrombosis

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A 59 years old gentleman, non-smoker admitted for non-ST elevation Myocardial Infarction. Coronary angiogram shows dual vessel disease with LAD eccentric 50% ostial disease and midsegment 90% tandem lesions involving Diagonal 1 which was directly stented and The LMS-LAD bifurcation was also treated with a stent (T-stenting). Patient was well throughout admission and discharged well with triple therapy (Started on Warfarin as developed paroxysmal Atrial Fibrillation in ward) with plan for surveillance coronary angiography in 6 months. However patient developed recurrent chest pain 10 days after discharge and presented with acute anterolateral Myocardial Infarction and rushed to the Intervention Cardiac Lab (ICL) for primary PCI. Intra-procedure noted large thrombus in distal LAD stent as evidence of acute stent thrombosis. Proceeded with thromboaspiration with Export Advanced Aspiration catheter which was successful and distal LAD subsequently treated with drug eluting balloon. This case served as a good and typical case presentation of acute stent thrombosis and should be swiftly recognized as one of the major complications after coronary angioplasty that demanded urgent cardiology intervention.

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Orbital Atherectomy for Calcified Ostial Lesion

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Background: Mr Yu was admitted for elective coronary angiogram for stable angina with suspected 3-vessels disease by CTCA.

Case: He was a 76-year-old gentleman, who was an ex-smoker with hypertension, diabetes and hypercholesterolaemia. Echocardiography was unremarkable.

Coronary angiogram showed right-side dominance, mild left coronary disease, heavily calcified ostial right coronary critical stenosis. 6 Fr JR 4 guiding and NS runthrough were used. IVUS advancement was failed initially, hence ostial lesion was predilated with 2.5 mm semi-compliant balloon. IVUS showed diffuse eccentric calcification with 2 mm thick calcified nodule and ostial MLD was 2 mm. Ostial vessel size was 5 mm, distal reference size 4.5 mm.

Orbital atherectomy at low then high speed, in 8 runs totally, was performed in retrograde fashion, afterwards with the aid of disengaged and caudally displaced JR guiding to achieve wire-bias inferiorly. Type 3 dissection was noticed at ostium. Further predilatation with 4.0 non-compliant balloon. Ostial-to-proximal RCA was stented with 4.0x33 mm DES, which was postdilated with 4.0 mm and 4.5 mm non-compliant balloons. Final angiogram showed satisfactory result with completely sealed off dissection.

Decision-making: Orbital atherectomy was chosen because outcome of balloon angioplasty is unlikely satisfactory, the maximum rotational burr size was only 1.5 mm in the laboratory, and eccentricity and calcified nodule predicted unfavourable outcome and perforation for rotational atherectomy. Retrograde atherectomy avoided unconstrained orbit resulting in severe ostial injury. Absent pitch change after only 1-2 runs during coaxial and superior alignment of JR guiding indicated inferior eccentricity of the calcified nodule, inferiorly-biased orbital atherectomy resulted in excellent calcified nodule ablation.

Regular angiogram or intracoronary imaging is necessary in between orbital atherectomy, especially for ostial lesion, to prevent tragedy.

Conclusion: Orbital atherectomy generates satisfactory outcome for ostial lesion with heavy calcification and calcified nodule. Specific

strategies, retrograde ablation and wire bias for instance, are necessary in such condition to avoid severe complication and improve outcome.

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Novel Management for Coronary Perforation During Chronic Total Occlusion Percutaneous Coronary Intervention

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Background: Mr Hung was arranged for elective coronary angiogram due to recent non-ST elevation myocardial infarction with reduced LVEF.

Case: He was a 70-year-old ex-smoker with hypertension, diabetes and hypercholesterolaemia. Echocardiography showed LVEF 45% with left ventricular anterolateral hypokinesia. Coronary angiogram showed right-side dominance, proximal LAD CTO with retrograde collateral flow from RCA via septal branches. Proximal LCX and RCA were mildly stenosed. The CTO segment was calcified and >20 mm long (J-CTO score: 2). Seven French EBU 3.5 and 6 French AL 0.75 guiding catheters via bilateral femoral arteries were used. Unsuccessful antegrade approach by UB3, Gaia first and Conquest Pro wires with Turnpike microcatheter, followed by retrograde approach by Sion wire with Caravel microcatheter. Subsequent antegrade angiogram showed type 3 coronary perforation via subintimal space created by antegrade wires. The perforation was failed to be closed by intermittent prolonged low pressure inflation of 1.25 mm semi-compliant balloon. A 5 mm Vicryl absorbable braided suture was advanced through Turnpike and deployed before

perforation by UB3 wire. Coronary angiogram 1-2 minutes after suture deployment showed successful closure of perforation. Pericardiocentesis was performed for impending cardiac tamponade. Vital signs were all along stable, pericardial drain was removed on post-procedure day 2 and patient was discharged on day 5.

Decision-making: The mechanism of type 3 coronary perforation proximal to CTO is similar to type 5 perforation. Suture is readily available at extremely low cost; it's easily prepared, handled and administered compared with autologous fat or blood clot. The CTO anatomy is least affected by absorbable suture, hence facilitating subsequent reattempt intervention, compared with covered stent or coil embolization.

Conclusion: Absorbable suture embolization provides a perfect option for managing coronary perforation proximal to CTO lesion, due to its unique properties and the special coronary anatomy.

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His Bundle Pacing is a Feasible and Physiologic Alternative in Patients With Congenitally Corrected Transposition of Great Arteries

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Background: Complete heart block is prevalent among patients with congenitally corrected transposition of great arteries (CCTGA). However, the optimal pacing strategy in this group of patients remained unknown.

Case: A 65-year-old man with CCTGA and situs solitus had history of atrial septal defect and ventricular septal defect repair and pulmonary valvotomy done in 1976. He had long-standing complete heart block

but refused permanent pacing previously. Patient developed dyspnea and decreased exercise tolerance 6 months ago. Cardiac MRI showed CCTGA without residual ASD or VSD, with right ventricular ejection fraction 54% and right ventricular end diastolic volume index 167 ml/m². Coronary angiogram showed no significant coronary artery disease. ECG revealed junctional escape rhythm at 44 beats per minute. Patient finally agreed for pacemaker implantation.

Decision-making: We proceeded to permanent pacemaker implantation with left cephalic cut-down approach. Intra-operatively, patient was noted to have atrial fibrillation. Cardiac monitor guided selective His bundle pacing was successfully performed. The paced QRS duration was the same as preoperative intrinsic QRS. The threshold of His lead was 0.5V at 0.4 millisecond postoperatively and remained the same 5 months post implantation. NYHA class was improved.

Conclusion: His bundle pacing in patient with CCTGA and chronotropic incompetence is feasible without electroanatomical mapping system.

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Retrieval of Dislodged Stent During Bifurcation Stenting in a Calcified Lesion

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Background: Complications during percutaneous coronary interventions in a calcified bifurcation lesions are high including stent dislodgement but successful retrieval and completion of procedure is satisfying.

Case: 66 years, gentleman, hypertensive, had h/o ACS 4 months back, coronary angiography revealed critical LAD and LCx-OM bifurcation lesions with calcification. In view of persistent symptoms and no willingness for CABG, PCI planned. PCI to LAD done uneventfully. During LCx-OM bifurcation PCI, stent bed prepared with sequential pre-dilatation by different sized balloons with the help of Guidezilla guide extension catheter (6F, 120cm, Boston Scientific). During stent (3x24 mm Ultimaster DES, Terumo) delivery, the stent got dislodged. Fortunately some part of dislodged stent remained inside the Guidezilla.

Decision-making: Another 0.014" coronary guidewire put across the deflated dislodged stent and then anchored by the 2x12 mm semi compliant balloon inside the guide extension catheter and whole assembly including the guiding catheter (7F Extra Back Up) pulled out. Subsequently successful bifurcation PCI done using two Ablumina DES (Concept medical) 3.0x16 mm in LCx to OM and 2.75x12 mm in LCx with T and Protrusion (TAP) technique. Final kissing balloon and proximal optimization done with good end results.

Conclusion: Complications are the part and parcel of the cardiac interventions but one should know how to bailout. Use of guide extension catheter makes the things simple and should be used frequently if required.

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Back to Basic

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Background: Though not recommended routinely in primary percutaneous coronary intervention (PCI), thrombus aspiration might be a cornerstone treatment for patient's survival. We report a case in which very difficult intracoronary thrombectomy was successful for ST-segment elevation myocardial infarction (STEMI) due to a huge intracoronary saddle embolus in distal left main (LM).

Case: The patient was an 87-year-old woman with diabetes mellitus, hypertension, atrial fibrillation (AF) on reduced dose ApixabanTM and chronic kidney disease, who presented with sudden chest pain and an electrocardiogram (ECG) showing posterior STEMI. She was in cardiogenic shock requiring inotrope and temporary transvenous pacing support. Baseline clotting parameters were normal. Echocardiogram showed dilated right ventricle, fair left ventricular systolic function and moderate functional mitral regurgitation.

Urgent coronary angiography showed saddle thrombus in distal LM and total thrombotic occlusion of left circumflex artery (LCX) with TIMI-0 flow. The left anterior descending artery (LAD) had a proximal thrombus with TIMI-3 flow. The rest of LAD and right coronary artery had mild disease. Mechanical thrombectomy via LCX wire with PenumbraTM catheter was attempted and met with resistance and the patient developed pulseless electrical activity arrest. Angiogram showed clot plowing effect to LAD with reduced flow. Thrombus-aspiration to LAD was performed with ExportTM catheter and there was return of spontaneous circulation. Ping Pong guiding technique was adopted to protect the LAD with another wire. Intravascular ultrasound (IVUS) to LAD showed ostial LCX clot protruding into distal LM and ostial LAD and no dissection and minimal plaque burden over LAD. Multiple passes of thrombectomy resulted in repeated clot dislodgement to LAD with subsequent blood pressure drop, while the thrombus reduction in ostial LCX remained angiographically insignificant.

Decision-making: We thought PenumbraTM catheter was the most powerful thrombectomy device and considered options of simple ballooning or direct stenting. However, the attempt of balloon dilatation of ostial LCX resulted in another blood pressure drop.

We finally decided to switch to Pronto V4TM thrombus aspiration system, which is a simple extraction catheter allowing manual suction. Pronto catheter was advanced through LAD and successfully removed ostial LCX and ostial LAD clots with TIMI-3 flow achieved in both vessels. IVUS showed no significant lesion in distal LM, ostial LAD and LCX, confirming a thromboembolic event.

Conclusion: Simple manual clot aspiration may be a good option for selected patient. The ability to continuously reflect and explore possible options with an open mind is the key for a successful intervention.

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When a Coronary Hardware Became an Innovator in Peripheral Intervention - Failed AV Fistula Successfully Treated With OPN NC Balloon in a Fibrotic Lesion

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Background: We describe a novel technique where a coronary hardware OPN NC balloon has been used in venous interventions like arterio-venous (AV) fistuloplasty to break the fibrotic lesion and led to successful intervention.

Case: 62 year old male known diabetic and chronic kidney disease (CKD) on maintenance hemodialysis came with inadequate flow during dialysis and loss of thrill. Fistulogram after initial Doppler revealed significant stenosis at right brachiocephalic fistula at anastomotic site. The stenosis was initially dilated with low pressure 6*40 balloon which did not yield at anastomotic site. Subsequently 5*40 high pressure Bard balloon at 30 ATM, 6*40 high pressure Mustang balloon at 20 ATM and 8*40 high pressure Mustang balloon at 22 ATM were used to dilate the lesion but did not yield. We tried to break the fibrotic lesion with high pressure OPN NC 3*10 at 36 ATM following which 8*40 Mustang yielded at 22 ATM. A good fistula flow and palpable thrill was achieved.

Decision making: As both low and high pressure balloons failed to open the lesion, we thought of using coronary hardwares which are traditionally used for fibrotic and calcified lesions. Initially we tried to open the lesion with 4 mm non compliance balloon at high pressures however it did not yield the fibrotic lesion. So a 3 mm OPN NC was used which broke the fibrotic lesion at 36 ATM following which a 8 mm high pressure balloon successfully opened the lesion.

Conclusion: Fibrotic and calcified lesions in peripheral interventions are difficult to treat and not many devices are currently available for the same. AV Fistula remains an important access in management of patients with CKD and every attempt should be made to keep it patent. Here we describe one such case where a coronary hardware was used to manage fibrotic lesion in a highly stenotic AV fistula. This marks an innovation and remains the first documented case in literature where an OPN NC balloon was used for managing a fibrotic lesion in a peripheral intervention. This case opens the ways for its use in future management of such cases.

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Complete Surgical Removal of a Left Atrial Appendage Occlusion Device Complicated by Persistent Device - Related Thrombosis

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Background: Surgical removal of a left atrial appendage occlusion (LAAO) device complicated by device related thrombosis (DRT) is rare, and complete removal of the device can be difficult. We present a patient with progressive DRT of the AMPLATZER™ Amulet™ device which required removal with open heart surgery.

Case: The patient was a 76 year old lady with a history of non-valvular atrial fibrillation and ischemic stroke. The CHA2DS2-VASc score was 7 and she was started on warfarin. Subsequently she was diagnosed with idiopathic thrombocytopenic purpura and was offered percutaneous LAAO. The Amulet™ device was implanted successfully and she was discharged with aspirin and clopidogrel. Routine transesophageal echo 2 months post procedure found a 3x1.9 cm thrombus attached to the disc of the device. The thrombus persisted for 3 years despite adequate anticoagulation with warfarin and aspirin, and progressively enlarged after substituting warfarin with dabigatran. Open surgical removal of the thrombus via median sternotomy was performed. Intraoperatively, immature thrombus was removed from the disc of the Amulet™ device and complete removal of the device was smooth. The left atrial appendage was closed externally by a surgical clip. The patient recovered uneventfully and was discharged 7 days post operation.

Decision-making: The progressive nature of the thrombus warranted exclusion of the LAAO device from the left atrium. This could be achieved either by complete extraction of the device or by covering the disc with a pericardial patch. Significant left atrial injury and left circumflex artery compromise could occur with forceful removal of the disc and lobe of a fully endothelialized device. In our patient, the endothelialization was incomplete and removal of the device was surprisingly smooth. To prevent future left atrial appendage clot formation, an external surgical clip was implanted with excellent sealing of the appendage.

Conclusion: Persistent DRT of LAAO device despite adequate anticoagulation and antiplatelet therapy is an indication for surgical intervention. Complete removal of the device is possible in cases with incomplete device endothelialization.

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A Case of Left Main Trifurcation PCI Loaded With Complications

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Background: Left main trifurcation PCI is a complex procedure which needs to be done with great caution and expertise.

Methods: A 58 years old male presented to us with class 3 exertion angina and was taken up for coronary angiogram which revealed critical disease of ostial LMCA, and 70% stenosis of ostioproximal LCX. LAD and rams were normal. Plan was to do LMCA-LCX Stenting (provisional Stenting approach).

Decision-making: Immediately after Stenting from LMCA to LCX, after adequate bed preparation, we realised that there is a new stenosis distal to stent. On IVUS it revealed a stent edge dissection with intramural hematoma. So another stent was deployed distally. After that the Ramus got severely pinched, which needed to be dilated. However, at this momental hardware came out. That was a tricky situation as we were not able to re-engage the guiding catheter because of excessive postal protrusion of left main stent. We decided to crush the ostial part of stent and then proceeded with wires in all three branches. Then Stenting to Ramus was done using TAP technique, followed by triple kissing inflation. This was followed by another LMCA stent across the uncovered LMCA ostium.

Conclusion: This case was full of complications at all steps. While attempting such complex cases, interventional radiologist should anticipate all possible complications and must be well versed with handling them. Intravascular imaging is of paramount importance.

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Percutaneous Coronary Intervention in a Distal Left Main Bifurcation (Medina 1,1,1) Disease - Provisional Versus Dedicated Two-stent Approach?

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Background: Provisional cross over Stenting is the preferred approach in majority of bifurcation lesions. In distal left main bifurcation lesions, choosing the right approach is of paramount importance. Recent trials have shown superiority of 2-stent techniques in complex bifurcation lesions. Severity of stenosis in the side branch and the length of disease in side branch are the major criteria while assessing the complexity of bifurcation lesions.

Methods: A 53-year-old male presented with ST elevation myocardial infarction and was subjected to rescue PCI after failed thrombolysis. On coronary angiography, he had distal left main coronary artery (LMCA) bifurcation disease (Medina 1,1,1) with nearly 95% stenosis of distal LMCA and ostial left anterior descending artery (LAD). Left circumflex (LCX) also showed 90% stenosis but lesion was very focal and limited to 1-2 mm from the ostium.

Decision Making: Keeping in mind the focal nature of disease in the side branch, patient was treated with LMCA-LAD Stenting using provisional cross over approach. Proximal optimisation (POT) was done followed by kissing balloon inflation and repeat POT. Final optical coherence tomography scan showed an optimal result.

Conclusion: Recent data have shown that upfront 2-stent strategy is better when length of disease in side branch is more than 10 mm. This case was very intriguing since the side branch ostium showed critically stenosis but the length of disease was very focal. Provisional approach was used which proved to be a good choice and once again highlighted the usefulness of "keep it simple and safe" principle.

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To Ro or Not to RoYH Cheng¹, YH Chan²¹ Pok Oi Hospital² CU Medical Center, Hong Kong SAR

Background: Calcium is one of the major obstacles in modern day percutaneous coronary intervention. Adequate preparation of lesion is necessary for good stent expansion.

Case: Here we present a case with calcified vessel with severe stenosis detected on both coronary angiogram as well as OCT. Calcium modified technique was used to well prepare the lesion.

Decision-making: Instead of tradition scoring balloon or rotablator, we decided to use Diamondback 360 coronary orbital atherectomy system. Rather than using the device for several runs, we polished the lesion extensively for best debulking. Various methods of calcium modification techniques will be discussed with pros and cons explained.

Conclusion: Nowadays, more advanced equipment is available to cardiologists and we need to learn the role of each and when to use them in specific situation in order to achieve best patient outcome.

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Patient Prosthesis Mismatch: Re-operative Aortic Root Enlargement by Combined Konno and Manougian EnlargementICH Siu, K Lim, JYK Ho, SCY Chow, MWT Kwok, RHL Wong*Division of Cardiothoracic Surgery, Department of Surgery, Prince of Wales Hospital, Hong Kong SAR*

Background: We describe a case of a re-operative combined root enlargement and aortic valve replacement, for a patient with severe patient prosthesis mismatch (PPM) following aortic valve replacement (AVR).

Case: A 44-year-old lady with history of diabetes mellitus and hypertension presented with heart failure and angina. Echocardiography showed progression of a known supra-ventricular aortic stenosis. First operation with supra-ventricular patch aortoplasty was performed, noting a small native sinotubular junction with hypoplastic non-coronary cusp. Mean gradient remained elevated after aortoplasty, signifying native valvular stenosis. Mechanical valve replacement was performed, requiring a concomitant posterior aortic root enlargement (Nick's technique) using pericardial patch. However, only a size 16 valve could be implanted with reduced gradient.

Patient initially remained asymptomatic, but recurrence of heart failure symptoms with progressively elevated trans-prosthetic gradient occurred 6 months post operation. In view of clinically significant PPM, re-operation with combined posterior and anterior annular enlargement was performed.

The size 16 aortic valve was explanted. A repeated posterior annular enlargement by Manougian technique was performed, with a pericardial patch. The posterior enlargement was deemed inadequate for root enlargement treating PPM. Further enlargement was achieved via an anterior approach (Konno-Rastan procedure). The anterior portion of the aortic annulus was incised towards the inter-ventricular septum and the right ventricular outflow tract. The annulus was reconstructed with pericardial patch.

The reconstruction allowed for a size 22 mechanical valve, and pericardial patch reconstruction of the aortic sinus, sinotubular junction and right ventricular outflow tract was completed. Postoperative trans-oesophageal echocardiography showed a mean gradient of 2 mmHg.

Decision-making: In the era of trans-catheter aortic valve implantation for aortic stenosis, special anatomical considerations are becoming

more common in surgical AVR. The decision of proceeding to AVR in supra-ventricular aortic stenosis and the subsequent PPM managements requires regular review and surveillance. The heart team approach in managing this group of patients is pivotal.

Surgical decision of a concomitant anterior and posterior root annular enlargement is crucial to reconstruct a neo-annulus for a suitable size prosthesis to prevent PPM. Root enlargement techniques are important to be developed and maintained for patients with small aortic root and unusual anatomy.

Conclusion: In patients undergoing surgical aortic valve replacement, aortic root enlargement should be considered in small or hypoplastic aortic roots to avoid patient prosthesis mismatch. A combination of techniques as opposed to a single technique, is safe, and can be utilised to improve success rate of suitably sized prosthesis implantation.

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Rapid Deployment Prosthetic Valve in Minimally Invasive Cardiac Surgery for Aortic Regurgitation: A Novel TechniqueMKH Wong, DTL Chan, TWK Au*Queen Mary Hospital, Hong Kong SAR*

Background: Minimally Invasive Cardiac Surgery (MICS) via hemi-sternotomy has been well established in its benefits compared to full median sternotomy. The development of rapid deployment prosthetic valves has allowed cardiac surgeons to shorten cross clamp times, bypass times and further improve clinical outcomes. However, these valves are designed for patients with aortic stenosis to anchor the valve within the aortic annulus.

Case: We present a 67-year-old man with severe aortic regurgitation and atrial fibrillation with tachy-brady syndrome. We performed aortic valve replacement with a rapid deployment Intuity valve and left atrial appendage occlusion with Atriclip via hemi-sternotomy, using a novel surgical technique.

Decision making: The patient was a young and fit gentleman who preferred a MICS aortic valve replacement. Myocardial protection and suture placement are key considerations in aortic regurgitation during MICS. We opted for rapid deployment valve to further improve on the benefits of MICS.

Conclusion: We present a first-in-man novel modified surgical technique for rapid deployment Intuity Valve in MICS approach.

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New Device for Mechanical Thrombectomy for Patient With Submassive Pulmonary EmbolismCLH Ng*Princess Margaret Hospital, Hong Kong SAR*

Background: Catheter directed mechanical thrombectomy for patient with submassive pulmonary embolism is still controversial. This case was presented to illustrate using a new device i.e. Penumbra Indigo system Catheter and Separator is safe and effective for management of patient with submassive pulmonary embolism.

Case: A 54-year-old lady with past history of diabetes mellitus and hyperlipidemia was clinically admitted to neurosurgical unit for left cerebellopontine angle tumor. Operation was done on 17/5/2021. On post operation day 8, she developed hypotension and desaturation. ECG showed new S1Q3T3 pattern and D dimer was elevated to ~6000 ng/ml. Urgent CT thorax showed filling defect in main pulmonary arteries and mild right heart ventricle with straightening of inter-ventricular septum suggestive of right heart strain. Patient was treated as submassive pulmonary embolism with enoxaparin given.

Decision-making: As her hemodynamics was borderline and she had contraindication to thrombolytic, we offered mechanical thrombectomy in cardiac cath laboratory. Urgent pulmonary angiogram showed big clots over right distal pulmonary artery and multiple small clots over left distal pulmonary artery. Mechanical thrombectomy was done via Penumbra indigo system CAT8 and SEP8 repeatedly. Large amount of clots were aspirated and right lung perfusion improved. Patient recovered well afterwards.

Conclusion: Indigo aspiration system was effective and safe device for mechanical thrombectomy for patient with submassive pulmonary embolism.

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Running Out of Options! Hybrid Percutaneous Pulmonary Valve Implantation With Surgical Right Ventricular Outflow Tract Plication

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Background: Patients with dysfunctional right ventricular outflow tract (RVOT) late after surgical repair of congenital heart disease are occasionally poor candidates for surgical or transcatheter pulmonary valve replacement. We describe a hybrid approach to render the dysfunctional RVOT manageable in a patient with complex comorbidities using currently available equipment.

Case: A twenty-year-old male, with tetralogy of Fallot (TOF) and oesophageal atresia, had pre-sternal gastric pull-through at birth and subsequently TOF total repair via right thoracotomy. He suffers from thoracic scoliosis, severe restrictive lung disease and DiGeorge syndrome. Chronic severe pulmonary regurgitation with right ventricular dilatation and dysfunction has qualified him for pulmonary valve replacement. However, the pre-sternal gastric conduit and comorbidities has rendered open heart surgery very risky, while the pyramidal shaped RVOT has made percutaneous pulmonary valve implantation (PPVI) relatively contraindicated. It was hence decided that the patient should undergo a hybrid intervention with RVOT plication to create a tubular landing zone for percutaneous PPVI.

Decision-making: Procedure was performed in a single-plane fluoroscopy hybrid theatre under general anaesthesia. Decision was made for left anterior thoracotomy for RVOT plication to avoid jeopardizing the vasculature of the gastric conduit. Right femoral venous access was used for PPVI, right internal jugular vein for angiogram and left groin prepared for partial cardiopulmonary bypass to reduce tension at the RVOT during plication. Staged RVOT plication was performed with radio-opaque liga-clips used as markers for potential landing zone. Repeated balloon interrogation of the plicated RVOT was performed to determine the adequacy of plication. A self-expandable valve (P28-20 Venus P valve, Venus Medtech, Shengzhen, China) was implanted successfully via the transfemoral route. A single stay-suture was used to improve stability of the valve at the RVOT. The procedure yielded excellent result with marked improvement in right ventricular dimension at 1-year follow up.

Conclusion: Hybrid PPVI has made management of high risk patient possible who otherwise would have minimal treatment options.

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An Unusual Perforation in VF Arrest

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We present a case of a 65 year-old man with VF arrest with bystander CPR followed by ECMO ECPR-guided primary PCI to an occluded

RCA where the wire inadvertently entered subintimal space in proximal RCA, had subintimal tracking with dissection re-entry into the true lumen and reaching PL branch. Predilation and stenting of the lesion without awareness of the subintimal nature of the wire led to spiral dissection distal to stent. Further stenting at matched size led to Ellis 3 perforation. The complication was managed by placement of 2 cover stents and prolonged balloon inflation with heparin reversal. A review of the IVUS showed the subintimal nature of the wire. The patient eventually had TIMI 3 flow to both PDA and PL and no further bleeding with pericardiocentesis was performed on-table with 500 ml aspirated. It is always important to pay attention to the position and the course the wire position. Intravascular imaging can provide crucial information even in emergency setting.

Guiding: 6Fr JR4 Sion: Sion Blue

Thrombus aspiration: Penumbra x 2 passes Predilation: 3.0x15

Stent: p-mRCA 4.0x38 DES, 4.0x22 DES

Cover stent: 4.5x20 Papyrus, 3.5x15 papyrus

Postdilation / balloon tamponade: 4.0/15 NC balloon, 4.0/38 stent balloon. Max postdilute at 18atm

Imaging: IVUS

Medication: Heparin, Eptifibatide, Protamine.

ABSTRACTS: ADULT CONGENITAL HEART DISEASE

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Survival of Chinese Patients With Pulmonary Arterial Hypertension Associated With Congenital Heart Disease in the Modern Treatment Era - A Single Center Experience

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Background: In 2020, as some of the PAH-specific drugs are covered by medical insurance, the choice and efficacy of patient treatment will surely be greatly improved.

Methods: A retrospective cohort study was undertaken in 525 consecutive patients diagnosed pulmonary arterial hypertension associated with congenital heart disease (PAH-CHD) between 2007 and 2019. Patients from at least 27 regions in China were referred to our center. A contemporary group of idiopathic PAH/familial PAH patients was utilized for comparison. Their baseline clinical data of demographic, clinical manifestations, auxiliary examination, and right heart catheterization were collected.

Results: Of 525 patients, 249 had Eisenmenger syndrome; 43 had PAH associated with prevalent systemic-to-pulmonary shunts; 48 were diagnosed with PAH with small/coincidental defect; and 185 had PAH after defect correction. The median age at diagnosis was 20.7 (11.2, 30.3) years. Children (<18 years) accounted for 43.8%, women accounted for 68.8%. The median follow-up time was 4.5 years. 180 patients had PAH symptoms at diagnosis, and 350 (84.3%) patients received PAH targeted medication at the last follow-up, including 141 with irregular medication. Because of financial constraints, 78 patients were NYHA III-IV at diagnosis but none of them accepted initiation of i.v./s.c. prostanoids. At the last follow-up, only 1.7% (6 cases) (NYHA FC at the first visit were II) received continuous subcutaneous prostanoids for more than 3 months. 47 patients (9.0%) died, and heart failure was the most common cause of death (27.7%). Survival rates of end-point-free events at 1, 3, 5 and 10 years after diagnosis of PAH patients were 98.0%, 95.4%, 89.9%, and 84.4%, respectively; there were statistically significant differences in survival among the subgroups (Log-rank $p=0.016$). NYHA cardiac function was grade III and IV, frequently occurrences syncope occurred and only one-time syncope at diagnosis are independent risk factors for lung transplantation or death. Cox multivariate analysis showed that NYHA cardiac function deterioration, occurrence/worsening of 2 PAH symptoms, PAH-related

hospitalization and syncope has a high predictive value for lung transplantation or death. The survival of the 41 IPA/HPAH patients with PAH related gene mutations appeared to be worse when compared with the PAH-CHD subgroups.

Conclusion: The overall long-term prognosis of CHD-PAH patients in this study is relatively good, and the survival status of patients in each subgroup is significantly different. Earlier use of PAH targeted combination therapy and improved compliance with PAH-specific therapy are expected to improve the prognosis of patients with CHD-PAH.

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Quality of Life, Psychological Resilience, Personality Traits, and Illness Perception Among 1,028 Grown-up Congenital Heart (GUCH patients) in a Tertiary Centre

PC Chow

Hong Kong Children's Hospital, Hong Kong SAR

Background: Studies suggested heterogeneity of physical and psychosocial predictors on quality of life (QOL) among patients with congenital heart diseases. This cross-sectional study aimed to examine the relationships of QOL, resilience, personality traits, illness perception, and clinical data of grown-up congenital heart (GUCH) patients in a tertiary centre.

Methods: One thousand and twenty-eight GUCH patients (male =530) attending Adult Congenital Heart Disease Clinic in Queen Mary Hospital were invited to complete the self-administered questionnaires, including: 36-items Short Form Health Survey version 2 (SF36), satisfaction with life scale (SWLS), Connor-Davidson Resilience Scale (RISC), Hospital Anxiety and Depression Scales (HADS), and NEO Five Factor Inventory (NEOFFI-3), Brief Illness Perception Questionnaire (BIPQ). Clinical information (disease complexity and illness severity), and functional status (New York Heart Association (NYHA) class and Warnes-Somerville Ability Index (WSAI)) of the patient were retrieved from the clinical record. Predictors of SWLS, SF36-PCS (physical component summary) and SF36-MCS (mental component summary) were assessed by correlation analysis and multivariate regression.

Results: Nine hundred and ninety-six patients filled the questionnaires, and data was complete for analysis in 973 patients. Greater disease severity was associated with lower QOL scores respectively ($p < 0.01$). Worse functional class was associated with lower QOL scores ($p < 0.01$). QOL scores were correlated with RISC, HADS, NEO-FFI-3, and illness perception respectively (all $p < 0.001$). In multivariate regression, WSAI, RISC, and illness perception (consequences, treatment control, and identity) were predictors of SF36-PCS respectively (all $p < 0.05$). RISC, neuroticism, anxiety and depression, and illness perception (concern and emotion) were predictors of SF36-MCS respectively (all $p < 0.05$). RISC, anxiety and depression, illness perception (consequences), and extraversion were predictors of SWLS respectively (all $p < 0.05$).

Conclusion: QOL among GUCH patients was associated with both physical and psychological attributes. Resilience and illness perception appeared having a role and might be the potential targets of intervention.

ABSTRACTS: ARRHYTHMIA AND ELECTROPHYSIOLOGY

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SIRT1 Regulated Post-translational Crotonylation Modification: A Novel Regulation of Cav1.2 Channel in Murine Myocytes

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Objectives: Post-translational modification of protein is closely related to its function and crotonylation is a novel protein modification regulated by SIRT1. Little is known regarding the effect of SIRT1 on Cav1.2 protein crotonylation modification and whether Cav1.2 protein crotonylation modification is involved in Cav1.2 channel dysfunction. **Methods:** Cre-Loxp technology was used to generate conditional cardiac knockout SIRT1 mice (SIRT1 KO). L-type calcium channel current (ICa) was recorded through patch clamp technique. Immunoprecipitation and western blot were performed to examine the crotonylation of Cav1.2 and Cav1.2 protein expression.

Results: In SIRT1 KO cardiomyocytes Cav1.2 channel protein was significantly crotonylated compared to WT and SIRT1fl/fl mice. SIRT1 KO reduced ICa in a voltage-dependent manner, and ICa in SIRT1 KO was significantly down-regulated compared to WT and SIRT1fl/fl mice (-3.57 ± 0.29 pA/pF vs. -5.89 ± 0.32 pA/pF and -5.71 ± 0.26 pA/pF, $p < 0.001$). However, SIRT1 KO did not affect Cav1.2 channel electrophysiological property with the V1/2 of activation in WT, SIRT1fl/fl, and SIRT1 KO of -14.74 ± 0.64 , -15.36 ± 1.02 , and -17.17 ± 0.89 mV, respectively. Similarly, the V1/2 of inactivation in WT, SIRT1fl/fl, and SIRT1 KO were -27.09 ± 0.67 , -26.50 ± 1.03 , and -28.12 ± 0.90 mV, respectively; In addition, the τ of recovery from inactivation in WT, SIRT1fl/fl, and SIRT1 KO were 221.36 ± 9.57 , 213.62 ± 6.98 , and 211.01 ± 9.04 ms, respectively.

Conclusion: Conditional cardiac knockout SIRT1 down-regulates ICa through upregulating the crotonylation modification of Cav1.2 channel protein. However, there is no effect on Cav1.2 channel electrophysiological property.

This work was supported by the National Natural Science Foundation of China [81870288]; the Non-profit Central Research Institute Fund of Chinese Academy of Medical Sciences [2020-PT310-007 & 2018TX31002]; Tianjin Science and Technology Project [18PTZWHZ00060].

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Quantitative Proteomics Profiling of Lysine 2-hydroxyisobutyrylation in Right Atrial Appendage From Rheumatic Heart Valve Disease Patients

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Purpose: Histone lysine (K) 2-hydroxyisobutyrylation (hib) is a novel post-translational modification (PTM). The biological significance of Khib in the mechanism of atrial fibrillation (AF) in rheumatic heart valve disease remains largely unknown. We explored the role of Khib in AF by comparing Khib in right atrial appendages of rheumatic heart valve disease patients with AF and sinus rhythm (SR).

Methods: A total of 4 acylation types (acetylation, succinylation, crotonylation, and Khib) were screened in right atrial appendages from 5

AF and 5 SR patients who underwent heart valve replacement. Tandem Mass Tag proteomics method was used to identify the protein profiles and Khib sites. Bioinformatic tools, including Gene Ontology, Kyoto Encyclopedia of Genes and Genomes, and protein-protein interaction, were also used to explore the biological function between AF and SR.

Results: A total of 448 proteins based on 3,234 peptides and 2,217 Khib sites were identified. After setting the quantification ratio >1.20 and <0.83 , 35 and 48 proteins were classified as upregulation and downregulation respectively in AF patients compared to SR. Moreover, 124 and 67 sites exhibited upregulated and downregulated Khib. Bioinformatic analysis demonstrated that proteins with Khib were significantly enriched in different biological approach, such as cysteine and methionine metabolism, cGMP-PKG signaling pathway, and glucose-responsive energy metabolism including galactose metabolism, fructose and mannose metabolism, amino sugar and nucleotide sugar metabolism, and starch and sucrose metabolism.

Conclusions: The present study for the first time revealed larger number of differentially expressed proteins with Khib sites in AF patients with rheumatic valve disease that are involved in diverse cellular processes including energy metabolism. The study suggests that glycolysis/ gluconeogenesis may be regulated by these Khib sites, resulting low level production of energy that could lead to AF. Further studies are warranted to reveal the precise role of these Khib sites and PTM in the mechanism of AF.

This work was supported by the National Natural Science Foundation of China [81870288]; the Non-profit Central Research Institute Fund of Chinese Academy of Medical Sciences [2020-PT310-007 & 2019XK310001 & 2018TX31002]

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Yield and Stroke Risk of Atrial Fibrillation Detected by Single Timepoint Hand-held ECG Screening in a Younger Chinese Population Aged 55-64

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Background: Current guidelines recommend opportunistic screening for atrial fibrillation (AF) in people aged 65 years. However, the age threshold for AF screening is uncertain, given the higher reported risk of ischemic stroke in Asian patients <65 years. This study aimed to evaluate the yield of opportunistic AF screening in a Chinese population aged 55-64 during outpatient clinic visits, the risk of stroke of screen- detected AF, and to compare the yield of single timepoint screening with that observed in patients aged 65 years.

Methods: Consecutive patients aged >55 years attending medical outpatient clinics underwent AF screening using a handheld single-lead ECG device (AliveCor) from Dec 2014 to Dec 2017. Diagnostic yield was defined by detection of new AF.

Results: Of 15,898 subjects screened, 3,926 (24.7%) were aged 55-64 years and 8.6% ($n=338/3,926$) had known AF. In the remaining 3,588 patients without AF, the yield of new AF at initial screening was 0.8% ($n=28/3,588$) in the younger age group, compared to 2.3% ($n=223/9,736$) in those aged 65 years ($p<0.01$). Mean age for newly diagnosed AF was 60.8 ± 2.5 years for those aged 55 <65 , and mean CHA2DS2-VASc score was 1.9 ± 1.4 . In just over one third of the patients ($n=10/28$) with screen-detected new AF, there was a class 1 indication for oral anticoagulation (OAC, i.e., CHA2DS2-VASc 3 in female or 2 in male). Oral anticoagulant was taken by 36% ($n=10/28$) patients with AF and 80% ($n=8/10$) with a class 1 indication for OAC. At a median follow-up duration of 1.8(IQR=1.5-3.3) years, 7% ($n=2/28$) AF patients experienced ischemic stroke, both with a Class 1 indication for OAC but neither was on OAC at time of stroke.

Conclusions: Opportunistic AF screening may be considered in the Chinese population at a younger age below 65 years. Although diagnostic yield of AF is lower in this age group, a significant number of these patients are at risk of stroke and warrant treatment with OAC.

ABSTRACTS: CARDIAC IMAGING

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Clinical Predictors of Coronary Calcium Score in a Local Hospital

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Background: Cardiac computed tomography is being increasingly utilized in the management of acute or chronic chest pain. Despite advances in technology, coronary calcification remains a major cause of non-diagnostic studies.

Methods: This is a retrospective observational study of all patients that underwent CTA and coronary calcium scoring (CAC) at United Christian Hospital from January 2016 to September 2020. Clinical and laboratory data were retrieved for each patient regarding age, date of CTA, gender, coronary calcium score, creatinine, urine albumin-creatinine ratio, number of hypertension and diabetic drugs, insulin prescription, hemoglobin A1c, major adverse cardiovascular events and escalation in hypertensive or diabetic treatment. We developed a CAC score, based on patient demographic and clinical information, that correlates with the probability of encountering coronary calcium score of greater than 400.

Results: We showed that age, male gender, the number of hypertensive and diabetes medications, kidney function and albuminuria are independent predictors of high coronary calcium score. A CAC score is derived to predict the likelihood of CAC greater than 400. The score comprises age, gender, number of hypertension and diabetes treatment, presence of albuminuria and creatinine more than 100 $\mu\text{mol/L}$, with different weights assigned to each variable. It is a weighted sum of the variables with higher scores indicating increasing likelihood of high CAC. The score is positively correlated with CAC ($p<0.01$, $r=0.48$) and has a ROC area of 0.81 ($p<0.01$) for CAC greater than 400. At a cut-off of 2.5, the sensitivity is 64.84% (CI 54.61%-73.86%) and specificity 79.8% (CI 76.89%-82.43%).

In addition, we are the first to report that high CAC is associated with renal deterioration in chronic kidney disease (CKD) stage 1-2 patients, as well as escalation in hypertension or diabetes medication, opening a new avenue for risk stratification in CKD and chronic disease patients.

Conclusion: We report for the first time in the literature the derivation of a novel score that predicts the likelihood of high CAC based on demographic and clinical information with good accuracy.

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Association of Pulmonary Hypertension With Subsequent Risks of Adverse Renal Outcomes in Patients With Type 2 Diabetes Mellitus

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Background: Diabetic nephropathy is a major complication which contributes to the end-stage renal disease and renal deaths in patients with type 2 diabetes mellitus (T2DM). The aim of our study was to investigate the role of pulmonary hypertension (PHT) in the development of adverse renal outcomes in patients with T2DM.

Methods: A total of 1279 diabetic patients (mean age 67 ± 13 years; women, 45.4%) were recruited. Pulmonary artery systolic pressure

(PASP) was estimated by transthoracic echocardiography at baseline. Adverse renal outcomes were defined as a composite endpoint of a sustained 40% decline in eGFR, end-stage renal disease requiring renal replacement therapy, kidney transplantation or renal deaths. Cox regression hazard model was used to assess the association between PHT and incident adverse renal outcomes.

Results: Patients were divided into three groups based on their baseline PASP as follow: no PHT (PASP=28 mmHg; n=971, 75.9%), mild PHT (PASP=39 mmHg; n=248, 19.4%) and significant PHT (PASP=60 mmHg; n=60, 4.7%). A total of 336 adverse renal outcomes occurred during a median follow-up of 55 months, Crude incidence of renal outcome was highest in those with significant PHT (45.0%), followed by mild PHT (33.9%) and no PHT (23.2%). Kaplan-Meier survival curve demonstrated that patients with significant PHT had highest risk of adverse renal outcomes. Multivariate cox regression, after adjustment with age, gender, smoking, hypertension, hyperlipidemia and HbA1c level, revealed that both mild PHT (HR=1.53, 95%CI 1.18, 2.00, P<0.01) and significant PHT (HR=2.04, 95%CI 1.35, 3.09, P<0.01) were independently associated with the incident adverse renal outcomes.

Conclusion: The presence of PHT was independently associated with adverse renal outcomes in patients with T2DM. Monitoring of PASP by echocardiography may be of clinical relevance in identifying those who are at risk of diabetic nephropathy.

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Assessment of Right Ventricular Systolic Function in Patients with Pulmonary Hypertension

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Introduction: The right ventricle (RV) is structurally complex chamber of the heart. However, its functional assessment has remained an elusive clinical challenge.

Objective: The pulmonary hypertension was categorized by clinical examination and by echocardiography. Another was to study the utility of echocardiographic indices of right ventricular systolic function and their correlation with the severity of pulmonary hypertension. **Methodology:** 120 patients were selected with symptoms and clinical signs suggestive of PH were studied using echocardiography. Patients were divided into three groups according to the RVSP calculated from Tricuspid regurgitation (TR) jet velocity using Bernoulli formula. RA (major and minor) dimensions, RV dimensions (basal, mid-cavity and longitudinal), RV free wall thickness (RVFWT), RVOT proximal and distal diameters (RVOTDP and RVOTDD), RV area [end-diastolic (RVEDA) and end-systolic area (RVESA)] and volumes [end diastolic volume (RVEDV) and end systolic volume (RVESV)] and RV ejection fraction method, were measured. Tricuspid annular motion (TAM / TAPSE) was measured with the help of 2DE and M-mode. Using Doppler, RV myocardial performance index (RVMPI) and pulmonary vascular resistance (PVR) were calculated. RV fractional area change (RVFAC) was indirectly calculated from RVEDA and RVESA. The correlation of these parameters with the severity of PH, RV systolic function and with each other was studied.

Result: Patients with low TAM/TAPSE in MILD and SEVERE group had mean of 1.4 cm and 1.1 cm respectively (p<0.001). TAM/TAPSE value had significant correlation with severity of PH, RVMPI and PVR (Pearson's correlation at <0.01). Mean of abnormal RVMPI was 0.5 in MILD PH as compared to 1.1 in SEVERE PH (p<0.001). PVR was elevated (i.e. >1.5 woods units) in 16 (40 %) patients with MILD PH and 38 (95 %) patients with SEVERE PH (p<0.001) with a mean value of 1.7 and 3.08 for these groups respectively. A significant correlation of mean values of PVR was observed with the severity of PH (p<0.001)

and TAM. (p<0.01). TAM/TAPSE, RVMPI, PVR were found to be strong predictors of severe PH. (p<0.01)

Conclusion: Tricuspid annular motion / Tricuspid annular plane systolic excursion, Right ventricular myocardial performance index, Pulmonary vascular resistance (PVR) are strong predictors of severity of PH and correlate with each other significantly reflecting RV dysfunction and the prognosis.

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Prognostic Value of Pre-operative Left Atrial Strain on All-cause Mortality in Patients Who Received Aortic Valve Replacement for Severe Aortic Stenosis

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Background: Severe aortic stenosis (AS) is the most common primary valvular heart disease, treatable only by aortic valve replacement (AVR). Literatures have shown that impaired left atrial (LA) function is frequent in patients with severe AS. However, predictive value of pre-operative LA function on post-operative all-cause mortality is uncertain. The purpose of our study was to evaluate the prognostic value of pre-operative LA strain on all-cause mortality in patients with severe AS undergoing AVR.

Methods: A total of 105 patients (age 65±9.1 years, 57% men) with severe AS were assessed using speckle-tracking echocardiography pre-operatively. Patients with underlying lung disease and cancer were excluded. Peak Atrial Longitudinal Strain (PALS) was measured as a surrogate of LA function. Patients were subsequently stratified into low (n=53) and high (n=52) PALS by the median. Patients were followed up until death. Data on mortality was obtained from Clinical Management System under the Hospital Authority. The association between LA function and all-cause mortality was evaluated by Cox Proportional Hazards analysis.

Results: Patients were followed up for a median period of 3.96±2.43 years during which 15 patients died. Lower PALS, indicative of LA dysfunction was associated with higher risks of all-cause mortality (HR, 0.25; 95% CI 0.07-0.93, p=0.04). The association between PALS with all-cause mortality remained significant after adjustment for age and EuroSCORE II.

Conclusion: LA dysfunction, measured by PALS is associated with a higher risk of all-cause mortality in patients with severe AS undergoing AVR, independently of age and EuroSCORE II. Evaluation of LA function by assessing speckle tracking derived PALS may aid in prognostication for patients undergoing AVR.

ABSTRACTS: CARDIAC PACING AND IMPLANTABLE CARDIOVERTER DEFIBRILLATOR

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A Novel Cardiac Resynchronization Implantation Approach Under Electrocardiographic Imaging Guidance With Physiological Pacing Options for Better Resynchronization in Non-left Bundle Branch Block Patients - A Pilot Study

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Background: The response rate of CRT in non-left bundle branch patients (non-LBBB) patients is low. A novel Electrocardiographic

Imaging (ECGi) guided CRT implantation method was studied in non-LBBB patients.

Methods: Twenty-one consecutive patients with left ventricular ejection fraction (LVEF) 35%, QRS duration 120 ms and non-LBBB morphology (13 RBBB and 8 IVCD) were recruited. During CRT implantation, right ventricular, coronary sinus, His-bundle and/or left bundle branch leads were inserted. A 252-electrode vest (CardioInsight, Medtronic) was worn by the patient during the procedure to measure the total activation time (TAT) when different pacing combinations of biventricular pacing (BVP), His-bundle pacing (HBP) and/or left bundle branch pacing (LBBP) were tested. The combination that resulted in the shortest TAT would be chosen. Clinical response was defined by 1 NYHA class improvement and echocardiographic response by LV end-systolic volume reduction 15% and/or LVEF improvement 10% at 6-month follow-up.

Results: Final pacing configuration involved HBP in 38%, LBBP in 33%, BVP in 15% and RV or LV pacing alone in 15% of patients. Mean QRS duration shortened from 164±18 ms to 132±19 ms and LVEF improved from 26±6% to 34±12% (both $p<0.01$). NYHA class improved from 3.1±0.5 to 2.0±0.6 ($p<0.01$). Clinical and echocardiographic response rates were 71% and 62%, respectively. Two patients died of decompensated heart failure. One patient had CIED infection requiring device removal. Current approach resulted in better electrical resynchronization when compared to BVP, as mean TAT (59 ms vs 88 ms) was significantly lower and TAT reduction (37% vs 7%) was significantly greater with final pacing-configuration compared to BVP, respectively (both $p<0.01$).

Conclusion: ECGi guided CRT implantation in non-LBBB patients is feasible and may associate with better resynchronization results.

ABSTRACTS: CARDIAC REHABILITATION

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Reduced Inspiratory Muscle Strength Increases Pneumonia in Patients with Acute Myocardial Infarction

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Background: Inspiratory muscle strength is associated with pneumonia in patients after surgery or those with subacute stroke. However, inspiratory muscle strength in patients with acute myocardial infarction (AMI) has not been studied.

Methods: Patients with AMI were consecutively enrolled from March 2019 to September 2019. Measurements of maximal inspiratory pressure (MIP) were used to estimate inspiratory muscle strength and mostly were taken within 24 hr after culprit-vessel revascularization. Patients were divided into 3 groups by MIP tertile (T1: <56.1 cm H₂O, n=88; T2: 56.1-84.9 cm H₂O, n = 88; T3: >84.9 cm H₂O, n=89). The primary endpoint was in-hospital pneumonia.

Results: Among 265 enrolled patients, pneumonia developed in 26 (10%). The rates of pneumonia were decreased from MIP T1 to T3 (T1: 17%, T2: 10%, T3: 2%, $P=0.004$). In-hospital all-cause mortality and major adverse cardiovascular events (MACEs) did not differ between groups. Multivariate logistic regression confirmed increased MIP associated with reduced risk of pneumonia (odds ratio 0.78, 95% confidence interval 0.65-0.94, $P=0.008$). Receiver operating characteristic curve analysis indicated that MIP had good performance for predicting in-hospital pneumonia, with an area under the curve of 0.72 (95% confidence interval 0.64-0.81, $P<0.001$).

Conclusions: The risk of pneumonia but not in-hospital mortality and MACEs was increased in AMI patients with inspiratory muscle weakness. Future study focused on training inspiratory muscle may be helpful.

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Effectiveness of Smartphone Apps in Promoting Zero-time Exercise and Fitness in Patients With Coronary Heart Disease: A Pilot Randomized Controlled Trial

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Background: Physical inactivity is an important risk factor of coronary heart disease (CHD). Physical activity adherence was promoted by starting from ZTE_x with the support of a ZTE_x smartphone app and WhatsApp anti-inertia reminder (AIR). Zero-time exercise (ZTE_x) refers to the integration of simple strength- and stamina-enhancing PA into daily life, which can be done anytime, anywhere and by anyone. **Objective:** To examine the feasibility of using ZTE_x smartphone app and WhatsApp AIR to promote PA adherence in patients with CHD. **Methods:** Study design and setting: A pilot randomized (1:1) control parallel trial with quantitative and qualitative evaluation at week 12. **Intervention:** The intervention group (EXP) (n=70) received a 10-minute individual education session on ZTE_x, ZTE_x App and WhatsApp AIR for behavior change. The control group (CON) (n=69) received WhatsApp messages on food choice.

Main outcomes and measures: Linear mixed models were used to examine the difference in PA and walking steps between 2 groups, adjusted for age, sex and baseline values. PA level was measured by the International Physical Activity Questionnaire Short Form for all participants at baseline and week 12. The 12-week daily steps was measured by Fitbit in 25 participants in each group. Intention-to-treat analysis was conducted.

Results: 139 patients with CHD (male: 71%, mean age 59.8±6.6 years) were recruited from 3 Cardiology Specialty Out-patient Clinics. At week 12, the EXP had significantly higher proportion of patients engaged in moderate PA (difference: 23.7%, $p<0.05$), spent significantly more walking time (mean difference: 176 minutes, $p<0.05$, Cohen's d: 0.40) than the CON. Among the Fitbit users, the EXP had more walking steps/day than the CON (mean difference: 2137, $p=0.079$). In the walking time of all patients, the interaction of group and Fitbit use (interaction term: Group x Fitbit) was significant ($p=<0.001$). Subgroup analysis showed that patients of the EXP with Fitbit use had significant higher walking time than the EXP without Fitbit use (ES: 0.56, $p<0.05$) and the CON without Fitbit use (ES: 0.81, $p<0.05$).

The qualitative feedback from 20 patients (n=10 from each group) reported that they did not have the habit of using e-diary in the ZTE_x App. However, they appreciated the WhatsApp AIR, which enhanced their intention of doing ZTE_x and PA.

Conclusions: The digital ZTE_x intervention was feasible to promote PA in patients with CHD with preliminary evidence in increasing PA. The AIR were well-accepted by the patients, but not the ZTE_x App.

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Cardiac Rehabilitation Tools in a Pocket! - Initiation of Telehealth in a Regional Hospital

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Background: Cardiac rehabilitation (CR) is the core component to reduce mortality rate for cardiac patients. In the era of COVID-19 pandemic, the comprehensive CR services in terms of education and exercise classes are suspended. An online education program came into play to reduce the risk of myocardial infarction.

Objective: To enhance patients' knowledge and care in coronary artery disease. To increase patient's confidence in risk factor modification.

Methodology: Telehealth for CR was newly initiated in United Christian Hospital during pandemic in 2020. Twenty patients were recruited for CR online program after revascularization from December 2020 to April 2021. The program was still in progress. Pamphlets with Quick Response (QR) codes of 4 educational videos prepared by nurses, clinical psychologist (CP), occupational therapist (OT), physiotherapist (PT) and social worker from health resource centre (HRCSW) were distributed to the participants. They were instructed to view 4 educational videos within 2 weeks via QR codes and completed the post-video questionnaires with 4 questions using e-form accordingly. The participants would receive tele-consultation before and after the program. Patient satisfaction survey was conducted by the end of tele-consultation.

Outcomes: 90% of participants completed the post-video questionnaires, 5% of them was illiterate and 5% of them were not familiar with smart technology. Average score of questionnaires related to different disciplinary was as follows, nursing: 89.6/100, OT: 75/100, CP: 77.8/100, PT: 81.3/100 and HRCSW: 95.8/100. The results indicated a positive learning experience of participants through online program.

Overall patient satisfaction of the online program was 4.75 using 5-point scale. The rating for enhancing participants' knowledge and care about coronary artery disease was 4.5. The rating of confidence empowerment in risk factor modification was 4.58. The length of the program was appropriate with rating at 4.5.

The average reduction in low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C) and triglyceride (TG) within 3 months was 1.08 mmol/L, 0.16 mmol/L and 1.23 mmol/L respectively.

Conclusion: The goals of the online program are achieved. Online education program is an effective and alternative learning tool for cardiac patients in the era of COVID-19 pandemic.

ABSTRACTS: CARDIAC SURGERY

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Peri-Procedural Trans-esophageal Echocardiographic Guidance During Edwards INTUITY Valve Implantation

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Background: The Edwards INTUITY rapid deployment valve was anchored on the left ventricular outflow tract (LVOT) by radial force akin to transcatheter balloon-expandable valves. This design feature facilitates minimally invasive and complex procedures but comes at the price of compressing the atrioventricular conduction bundle and potential requirement for pacemaker implantation.

Methods: A retrospective observational study was conducted on 30 consecutive patients who received the INTUITY valve at our institution from August 2018 to January 2021. Demographical, clinical and echocardiographic parameters were collected for 90 days postoperatively. We performed retrospective virtual sizing of the native LVOT at the landing site of the sub-annular stent. A line was drawn from the inner edge of the septal endocardium to the inner edge of the anterior mitral leaflet in mid-systole, parallel to the aortic annulus, 6 mm to 8 mm apical to the aortic annulus depending on the valve size and the

corresponding stent length. Risk factors associated with new onset conduction disturbances, defined as the occurrence of bundle branch block or complete heart block, were analyzed.

Results: Operative mortality was 3.3%. Two patients (5.9%) had moderate PVL by the third month of follow-up. Two patients (6.7%) had pacemakers preoperatively and were excluded from the subsequent analysis. New onset conduction disturbances occurred in 4 of the remaining 28 patients (14.3%). This included two cases of persistent left bundle branch block and two cases of permanent pacemaker implantation due to complete heart block. Univariate analysis identified over-sizing of the native LVOT by 5 mm or more as a significant risk factor associated with conduction disturbance.

Conclusion: During INTUITY valve implantation, in addition to the aortic annulus, the landing site of the sub-annular stent within the native LVOT should also be sized pre-bypass. Over-sizing the native LVOT by 5 mm or more is associated with an increased risk of new onset conduction disturbances and should be avoided.

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Cardioplegic Protection of Cardiac and Endothelial Functions During Ischemia/Reperfusion: Comparison of Three Methods

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Purpose: This study was aimed to compare the protective effect of del Nido (DNC), Histidine-tryptophan-ketoglutarate (HTK) and cold blood cardioplegia (BC) followed by HTK on cardiac and endothelial function in ischemia/reperfusion (I/R) rat model.

Methods: Sixty male Wistar rats were randomly allocated into five groups: Control, I/R group, DNC group, HTK group, and BC+HTK group. Rat hearts were conducted with or without 120-min global ischemia at 4°C followed by 90-min reperfusion with 37°C Krebs-Henseleit buffer. Hemodynamic parameters were continuously recorded. The isometric study of the left anterior descending artery was determined in myograph. The protein expression of cardiac Troponin T (cTnT), creatine kinase MB (CKMB) was measured by western blotting.

Results: The diastolic function after 120-min ischemia and 90-min reperfusion was preserved better in the DNC group with lower LVEDP, and better +dp/dtmax and -dp/dtmax. Whereas the endothelial-dependent vasorelaxation was significantly improved by HTK or BC+HTK administration. The upregulated protein expression of cTnT and CKMB was suppressed by all the three cardioplegias.

Conclusions: DNC shows a better recovery in diastolic function, whereas HTK or BC+HTK exerts better protection in coronary endothelial function. All these three cardioplegias could ameliorate the myocardium injury at the protein level.

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Current Study on Risk Factors for Development of Acute Renal Failure Requiring Dialysis in Patients Undergoing Coronary Artery Bypass Grafting Surgery

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Purpose: Acute renal failure (ARF) is one of the major complications after coronary artery bypass grafting (CABG) surgery. Dialysis is an effective treatment of ARF after CABG surgery. Due to technical evolution, risk factors may change from time to time. This study was aimed to investigate the risk factors for ARF in the current era.

Methods: Five thousand and seventy-seven consecutive patients who underwent CABG from April 2012 to November 2019 were analyzed retrospectively. The patients were divided into ARF group requiring dialysis (n=53, 1.04%) and non-ARF group (n=5,024, 98.96%) according to whether ARF occurred post-operatively requiring dialysis. Univariate analysis was performed to find possible factors associated with ARF. Any variables that had trends to be associated with ARF (p<0.1) were included in stepwise multiple logistic regression analysis.

Results: Cardiopulmonary bypass (CPB) time (113.2± 49.8 vs. 227.3±129.8 min, p=0.006), application of intra-aortic balloon pump (IABP, p=0.000), and preoperative ejection fraction (EF, 62.5±6.4 vs. 52.75 ± 12.8, p=0.000) are independent risk factors for development of ARF requiring dialysis in patients undergoing CABG Surgery.

Conclusions: Our study identified risk factors for development of ARF in the current era. The study suggests that efforts should be made to shorten CPB time and that renal protection should be enhanced in patients with low ejection fraction and insertion of IABP.

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Contemporary Outcomes of Acute Type A Aortic Dissection in Hong Kong: Review From a Single Institute

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Background: Acute Type A Aortic dissection is a devastating clinical emergency, urgent surgery to restore the true lumen perfusion and to correct malperfusion is the essence for survival. International registry data showed improving, still substantial of around 15% trend of operative mortality over years. We reviewed surgical outcomes in acute Type A aortic dissection of our institute as a representation of local data.

Methods: Between 2/2017 to 5/2021, 136 patients in our institution (mean age 57) have undergone open aortic surgery for acute Type A aortic dissection, extend of surgeries involved hemi-aortic arch replacement (87.5%), and total arch replacement (12%). Perioperative parameters were retrospectively reviewed and analysed.

Results: All patients had emergency surgery. An 18% of patients presented with shock or malperfusion syndrome. The overall in-hospital mortality was 5.1% (n=7/136). Mean operative time was 396 min. All

patients had moderate hypothermic circulatory arrest (mean arrest time of 56 min) and mean selective antegrade cerebral perfusion time of 55 min during the aortic surgery.

Conclusion: Acute type A aortic dissection as a lethal disease holds true, in particular with malperfusion syndrome. Contemporary outcomes showed improving surgical outcome worldwide with aortic specialists. Local experience offers insights on the understanding of the disease and technical considerations.

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Post-infarct Ventricular Septal Rupture Repair - A Review of 16 Cases in 8 Years

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Background: Ventricular septal rupture (VSR) is a rare but devastating complication after myocardial infarction, with historical operative mortality up to 52.5% if percutaneous closure is not feasible. Numerous surgical techniques have been described to minimize fatal post-operative complications including bleeding, patch dehiscence and ventricular dysfunction. A novel technique of double-patch repair with infarct exclusion has been developed recently with promising results.

Methods: All cases of post-infarct VSR repair between January 2013 and April 2021 were reviewed. Primary outcome was operative mortality. Baseline characteristics, intra-operative findings and post-operative outcomes were reported.

Results: 16 cases of VSR repair were performed in the past 8 years. Average patient age was 68 years old (range 56-79), with equal sex distribution. All VSR occurred after STEMI, with 62.5% having delayed presentation. The majority (64.3%) involved LAD territory, leading to apical or anteroseptal VSR. Average size of VSR was 1.8 cm, ranging from 1-4 cm. 78.6% required pre-operative intra-aortic balloon pump support, while 7.1% required ECMO support. 87.5% were repaired through left ventriculotomy, and 25% required concomitant CABG. The first 10 cases (cohort 1) were treated with single patch VSR repair and direct primary closure of ventriculotomy, while the latest 6 cases (cohort 2) were repaired with double-patch for the VSR and infarct exclusion technique for ventriculotomy. 30-day mortality of cohort 1 was 50% while that of cohort 2 was 0%. Causes of death in cohort 1 included 3 cases of ventricular failure, 1 case of bleeding and 1 case of ischemic bowel related to inotropic use. There is a trend towards survival when delayed repair (>7 days between diagnosis of VSR and surgery) was feasible. Among patients repaired with double patch technique, post-operative echocardiogram showed no shunt in 50% and trivial 1-3 mm shunt in the rest. None required additional intervention or was readmitted for congestive heart failure or hemolysis. Mean post-operative length of stay was 12.7 days.

Conclusion: Post-infarct VSR carries a 31.3% risk of operative mortality in our series, but the novel technique of double-patch infarct-exclusion was able to minimize our recent operative mortality to 0% by providing secure hemostasis and preventing patch dehiscence. Delayed surgery, if haemodynamically feasible, may confer survival advantage due to fibrosis of infarcted myocardium allowing more durable repair.

ABSTRACTS: CORONARY ARTERY DISEASE

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Efficacy and Safety of Intracoronary Transplantation of Peripheral Blood-derived Mononuclear (PBMNCs) Autologous Stem Cells in Patients With Acute Myocardial Infarction: A Prospective Pilot Study from North India (ITPASC study)

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Background & Objectives: Myocardial necrosis starts rapidly after coronary occlusion, usually before reperfusion can be achieved. Cardiac transfer of bone marrow and human peripheral blood mononuclear cells (PBMNCs) - derived stem cells can have a favourable impact in patients with myocardial infarction. Our study using transplantation of non-expanded PBMNCs improved the cardiac function in patients with myocardial infarction and is safe and feasible.

Methods: It's a prospective pilot study from region with six months of follow-up. Ten patients of ST-elevation acute anterior wall myocardial infarction with occlusion of left anterior descending were taken for Echocardiography (2 blind operators) before coronary intervention. Percutaneous coronary intervention of left anterior descending (LAD) by drug eluting stent followed by intracoronary infusion of PBMNCs was done. Ten patients of acute anterior wall myocardial infarction were taken as control in whom only LAD stenting was done. Echocardiography was carried out on follow up for assessment of functions.

Results: After six months of follow up in both case and control group there was improvement in left ventricular functions. But left ventricular functions improvement in cases where intracoronary stem cell therapy was given in addition to LAD stenting which was statistically significant (P-value <0.05) in stem cell therapy group.

Conclusion: Intracoronary PBMNCs infusion is a less invasive, more feasible, safer and a novel therapy for acute myocardial infarction patients who have depressed cardiac function. It causes significant improvement in ejection fraction and wall motion score index which are most important prognostic factor in myocardial infarction patients.

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Identification of Candidate Biomarkers for Early Risk Stratification of STEMI and Prediction of Post-STEMI Heart Failure Via Gene Expression Analysis

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Objective: Acute myocardial infarction (AMI) with the presence of ST-segment elevation (STEMI) remains a common cardiac emergency incidence worldwide. We aimed to explore the molecular mechanism and search for the candidate biomarkers with the predictive and prognostic potentiality that detectable in the whole blood of STEMI patients and post-STEMI HF patients.

Materials and Methods: Microarray profiles of 46 STEMI patients and 84 healthy controls were collected to explore differentially expressed genes (DEGs). Gene ontology and pathway enrichment were performed and protein interaction network was constructed. LASSO logistic regression algorithm and ROC analysis were performed to build machine learning models for predicting STEMI. Hub genes for further validated in post-STEMI HF patients.

Results: We identified 99 DEGs convergence in these samples ($|\log_2FC| \geq 0.8$ and adjusted p-value <0.05). They were mainly enriched in terms relating to cytokine secretion, pattern recognition receptors signaling pathway, and immune cells activation. A cluster of 8 genes including MCEMP1, PLAUR, GPR97, ITGAM, CLEC4D, SLC2A3, BST1, and MMP25 was found to be significant. A machine learning model built by GPR97, SLC2A3, CLEC4D, PLAUR, and BST1 exerted great value for STEMI prediction. Besides, BST1 and ITGAM might be candidate prognostic biomarkers for post-STEMI HF.

Conclusions: We re-analyzed the integrated transcriptomic signature of STEMI patients showing predictive potentiality and revealed new insights and specific prospective biomarkers for STEMI risk

stratification and HF development, which might allow the early risk stratification of STEMI by simple RT-qPCR at the emergency department.

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The Evolving Characteristics and Outcomes of Acute Myocardial Infarction in Hong Kong, 1999 - 2018

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Background: The burden of myocardial infarction (MI) with its assorted comorbid complications is increasing. Characterisation of patient characteristics complications is critical. Nonetheless, data on the evolving profiles of patient features and outcomes, particularly in an Asian population, remain sparse. We aim to describe the evolving characteristics and outcomes of MI patients in Hong Kong in the past 2 decades.

Methods: From a territory-wide database in Hong Kong, we included patients with incident acute MI from 1999-2018. The primary outcome was 30-day all-cause death, while secondary outcomes include haemorrhagic stroke, and pneumonia, at both 30 days and 5 years. Temporal trends in baseline characteristics were evaluated using Poisson regression, while trends in outcomes were evaluated using multivariate Cox regression.

Results: A total of 130,218 patients (age 73.6 ± 13.9 years, 40% female) were included. Over time, mean age (annual percentage change [APC] 0.23% [0.21 to 0.24], $P < 0.001$), mean CCI (APC 5.1%, [4.8 to 5.3], $P < 0.001$), and patients suffering from baseline comorbidities (range of APC 1.7% to 4.3%; all $P < 0.001$) increased significantly. The adjusted all-cause 30-day mortality rate increased significantly (APC 0.3% [0.1 to 0.5], $P = 0.005$). Strikingly, there is an alarming increase in the rate of haemorrhagic stroke (APC 3.4% [2.3 to 4.4], $P < 0.001$) and pneumonia (APC 1.5% [1.3 to 1.7], $P < 0.001$) at 30 days. Although the rate of 5-year all-cause death declined slightly (APC -0.8% [-0.9 to -0.6], $P < 0.001$), there were increasing rates of haemorrhagic stroke (APC 1.0% [0.3 to 1.7], $P = 0.004$) and pneumonia (APC 3.8% [3.6 to 4.1], $P < 0.001$).

Conclusions: Patients with MI have evolved to be older and more comorbid. Alarmingly, despite reduction in long-term all-cause death over time, the reduction was small; risk of death in short-term significantly increased and patients suffer from more complications including haemorrhagic stroke and pneumonia. These results highlight the emergence of extra-cardiac outcomes that drive poor prognosis and accentuate the need to develop tailored strategies to tackle these potentially lethal complications.

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Trends and Sex Differences in Characteristics and Outcomes in Myocardial Infarction: A 20-year Analysis

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Background: The recent temporal trends in sex differences in characteristics and outcomes among patients with myocardial infarction (MI), particularly in an Asian population, remain poorly understood. We aim to evaluate the evolving nature of sex differences over the past 2 decades in patients with MI.

Methods: From a territory-wide database in Hong Kong, we included patients with incident acute MI from 1999-2018. Outcomes of interest include, at 30 days, all-cause death, new-onset heart failure (HF), and ischaemic stroke. Trends in sex differences in baseline characteristics

were evaluated using linear and Poisson regression, while differences in outcomes were evaluated using multivariate Cox regression. Fine-Gray model was used to evaluate account for competing risk, with all-cause death defined as competing event.

Results: A total of 130,218 patients (age 73.6 ± 13.9 years, 40% female) were included. Women were older (79.5 ± 11.7 vs. 69.6 ± 13.8 years, $P < 0.001$) and had a more pronounced increasing trend in age over time (interaction $P < 0.001$). Women were also more comorbid overall (Charlson Comorbidity Index [CCI] 1.25 vs 0.85, age-adjusted $P < 0.001$). Women had more baseline hypertension, diabetes, and severe renal disease than men (age-adjusted $P < 0.001$), while the increasing trends in these comorbidities were all more pronounced in men than in women (all interaction $P < 0.001$). Women were more likely to have ST-elevation overall ($P < 0.001$).

Although the crude 30-day mortality rate was higher in women (32.6% vs 23.9%), after covariate adjustment, they had a lower risk of death (hazard ratio [HR] 0.97, 95% CI [0.96 to 0.99], $P = 0.003$), with no significant interaction with time ($P = 0.787$). Women had a higher risk of developing HF (HR 1.04 [1.01 to 1.08], $P = 0.012$) and ischemic stroke (HR 1.36 [1.24-1.48], $P < 0.001$) in 30 days.

Conclusions: Women MI patients were older and more comorbid compared to men, which contributed to the higher risk of death, HF, and ischemic stroke among women.

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Restrictive Versus Liberal Red Cell Transfusion Strategies in Patients With Acute Myocardial Infarction: A Systematic Review and Meta-analysis

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Background: Anemia is frequent in patients with acute myocardial infarction (AMI), and the optimal red blood cell transfusion strategy for patients with AMI and anemia is still controversial. We aimed to compare the efficacy of restrictive and liberal red cell transfusion strategies in patients with AMI and anemia.

Methods: We systematically searched PubMed, EMBASE, Web of Science, Cochrane Library, and Clinicaltrials.gov, from their inception until March 2021. Inclusion criteria were clinical trials that compared the efficacy of restrictive and liberal transfusion strategies in patients with AMI and anemia on all-cause mortality and major adverse cardiovascular events. The primary outcome was all-cause mortality, including overall mortality, in-hospital, or follow-up mortality. Risk ratios (RR) with 95% confidence intervals (CI) were presented and pooled by random-effects models.

Results: The search yielded a total of 6630 participants in six studies. Among the included patients, the average age ranged from 69.0 to 79.5 years and 2950 (44.5%) were men. A total of 2008 patients received restrictive red blood transfusion while 4622 patients were given liberal red blood transfusion. No difference was found in overall mortality and follow-up mortality between restrictive and liberal blood transfusion groups (RR=1.07, 95% CI=0.82-1.40, $P = 0.62$; RR=0.89, 95% CI=0.56-1.42, $P = 0.62$). However, liberal transfusion seemed to be related to lower in-hospital mortality (RR=1.22, 95% CI=1.00-1.50, $P = 0.05$). No secondary outcomes, including follow-up reinfarction, stroke, and acute heart failure, differed significantly between the two groups. In addition, subgroup analysis showed no differences in overall mortality between the two groups based on sample size and design.

Conclusion: Restrictive and liberal red blood transfusion have a similar effect on overall mortality and follow-up mortality in patients with

AMI and anemia although liberal red blood cell transfusion tended to reduce in-hospital mortality. The findings suggest that restrictive transfusion strategy might be the optimal red blood cell transfusion strategy for such patients considering the clinical benefits and cost.

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High Intensity Statin Versus Low Density Lipoprotein Cholesterol Target For Patients Undergoing Percutaneous Coronary Intervention: Insights from a Territory-wide Cohort Study in Hong Kong

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Background: Different guidelines recommend vastly different approaches to the lipid management strategy in patients undergoing percutaneous coronary intervention (PCI).

Method: This was a retrospective cohort study conducting in patients who underwent first-ever PCI in Hong Kong between 2004 and 2017. All participants were grouped according to attainment of low density lipoprotein cholesterol (LDL-C) target of < 55 mg/dL and with $\geq 50\%$ reduction from baseline without high intensity statin (group 1), or received high intensity statin without attainment of LDL-C target (group 2), or attainment of LDL-C target with high intensity statin (group 3). The primary endpoint was MACE, defined as a composite outcome of all-cause mortality, myocardial infarction, stroke and any unplanned coronary revascularization, in a time-to-first-event analysis up to 5 years after PCI. The secondary endpoints were individual components of MACE and a composite endpoint of mortality, myocardial infarction and stroke.

Results: A total of 8,650 patients were analysed with a median follow up period of 4.2 years. After adjustment of baseline characteristics and other medication prescriptions, the risks of MACE at 5 years were significantly lower with group 2 (hazard ratio [HR], 0.82; 95% confidence interval [CI], 0.74 to 0.93, $P = 0.003$), and group 3 (HR, 0.75; 95% CI, 0.62-0.90; $P = 0.002$). The primary outcome occurred at similar rates between group 2 and group 3. Patients in both group 2 and group 3 had lower risks of composite endpoint of mortality, myocardial infarction and stroke.

Conclusions: Among patients undergoing first-ever PCI in Hong Kong, high intensity statin, with or without attainment of guideline recommended LDL-C target, was associated with a lower adjusted risk of MACE at 5 years, compared with patients who attained LDL-C target without high intensity statin.

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Impact of COVID-19 Pandemics on ST-segment Elevation Myocardial Infarction Care in a Tertiary Center in Hong Kong

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Background: The first case of COVID-19 infection in Hong Kong was confirmed on 23rd January 2020, and the Hospital Authority announced the activation of Emergency Response Level in public hospitals on 25th January 2020. The reduction of Emergency Room attendance, number of ST-segment elevation myocardial infarction (STEMI) cases with variable outcomes have been described. This study describe the impact of COVID-19 on STEMI care in a tertiary center providing cluster-based 24-hour primary percutaneous coronary intervention (PPCI) service.

Method: Two periods were identified: February 2019 to January 2020 (Pre-COVID) and February 2020 to January 2021 (COVID). STEMI cases of Kowloon Central Cluster, namely Queen Elizabeth Hospital and transferral from Kwong Wah Hospital after office hours were included. Consecutive cases of STEMI from these hospitals with PPCI performed in Queen Elizabeth Hospital were analyzed.

Results: 326 and 235 patients underwent PPCI during Pre-COVID and COVID period respectively, with 27.9% decrease in the latter period. Drop of cases >30% was observed in April, May, July, September 2020 and January 2021. Compared with pre-COVID period, patients in COVID period were younger (65 vs 63 years, $p=0.029$), with lower proportion of age ≥ 75 years (26.1% vs 15.7%, $p=0.003$). The mean AED door to balloon (DTB) time was longer during COVID period (89.2 mins vs 95.9 mins, $p=0.03$).

There were no significant statistical differences of proportion of cardiogenic shock (CS) case (12.6%vs10.6%, $p=0.48$), use of mechanical circulatory support devices (MCS) (11.6%vs8.9%, $p=0.30$) and crude in-hospital mortality (12.6% vs 10.6%, $p=0.48$).

Splitting the patients into CS and non-CS groups, there were also no statistically significant differences in in-hospital mortality (CS group: 46.3%vs56%, $p=0.45$; non-CS group: 7.7%vs5.2%, $p=0.27$). The rate of mechanical complication (cardiac rupture, ventricular septal rupture and acute severe mitral regurgitation) over the 2 periods were 1.5% and 2.1% respectively ($p=0.39$).

To reduce the infection risk, specific protocol has been derived to handle cases of STEMI with uncertain or suspected COVID status. Thrombolytic may be an alternative therapy in suitable patients who have no contraindications. During COVID period, 6 patients were given thrombolytic, with 4 due to uncertain or suspected COVID status. One patient was given thrombolytic in Pre-COVID period.

Conclusion: In our experience, there was a substantial reduction of STEMI cases with younger patient age and longer DTB time during COVID period. The proportion of CS cases, use of MCS, mechanical complication and mortality rate did not show significant differences between 2 periods. The observations could be multi-factorial and merit further investigations.

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Heart Failure Hospitalization and Related Mortality Following Percutaneous Coronary Intervention in Ischemic Stable Coronary Artery Disease Based on a Novel Index: Computational Pressure-flow Dynamics Derived Fractional Flow Reserve

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Background: Patients with coronary artery disease (CAD), especially those with significant myocardial ischemia, is at risk of heart failure (HF). Computational pressure-flow dynamics derived fractional flow reserve (caFFR) is a novel index to assess myocardial ischemia of CAD, without the need of invasive pressure wire and hyperaemic stimulus, as required by conventional FFR. The diagnostic performance of caFFR has previously been validated. The clinical value of caFFR on HF outcomes is, however, uncertain in patients with ischemic CAD. This study evaluates the role of percutaneous coronary intervention (PCI) on HF hospitalization and HF-related mortality in ischemic CAD patients, stratified by caFFR.

Methods: A total of 724 patients (mean age 66.2 ± 10.6 ; male 75.0%) with stable CAD and functional ischemia defined as caFFR=0.80 were

identified. Patients were subsequently stratified into those with PCI (n=540) and without PCI (n=184). The primary endpoint was defined as a composite of HF hospitalization and HF-related mortality.

Results: The number of obstructive lesions was 2.6 ± 1.5 in patients with PCI and 2.7 ± 1.6 in those without PCI ($P=0.495$) and the severity of CAD assessed by SYNTAX score was similar between the two groups (19.8 ± 9.8 vs. 17.9 ± 8.4 , $P=0.071$). Patients were followed up for 3 years and a total of 46 events occurred (34 HF hospitalization and 12 HF related mortality). The 1-year incidence rate of composite endpoint was 1.9% in patients with PCI and 6.4% without PCI ($P<0.05$). Following multivariable adjustment, the rate of primary endpoint was significantly lower in those with PCI compared to those without PCI (3.9% vs. 8.2%; adjusted hazard ratio: 0.475; 95% confidence interval: 0.229-0.984; $P=0.045$).

Conclusions: In stable CAD patients with myocardial ischemia defined by caFFR ≤ 0.80 , PCI significantly reduces the subsequent rate of HF hospitalization and HF-related mortality.

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Clinical Significance of Per-vessel Treatment Adherence in Stable Coronary Artery Disease Based on a Novel Index: Computational Pressure-flow Dynamics Derived Fractional Flow Reserve

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Background: Computational pressure-flow dynamics derived fractional flow reserve (caFFR) is a novel index for assessing myocardial ischemia in patients with coronary artery disease (CAD), without the need of invasive pressure guidewire and hyperaemic stimulus required in conventional fractional flow reserve (FFR) measurement. Adhering to functional myocardial ischemia assessment when deciding to perform percutaneous coronary intervention (PCI) has been shown to improve clinical outcomes, based on per-patient level studies. However, the clinical significance of such treatment adherence at per-vessel level remains undetermined.

Methods: A total of 928 stable CAD patients (mean age 66.2 ± 10.5 , male 72.7%) who had caFFR obtained for all three major coronary vessels were included. The FFR threshold of 0.8 was adopted as the threshold for caFFR to indicate functionally significant artery stenosis which warrants PCI, and vice versa. Based on the caFFR of each major coronary vessel and whether PCI was performed to the respective vessel, patients were stratified into 0-1 vessel with treatment adherence group (group 1) (n=105), 2 vessels with treatment adherence group (group 2) (n=338), and 3 vessels with treatment adherence group (group 3) (n=485). The primary endpoint was major adverse cardiac events (MACE), defined as the composite of all-cause mortality, non-fatal myocardial infarction and any subsequent revascularization.

Results: The severity of CAD based on SYNTAX score assessment was 18.6 ± 10.2 in group 1, 14.6 ± 8.9 in group 2, and 11.5 ± 9.9 in group 3 ($P<0.001$). The MACE rates at 3 years were significantly different across groups 1, 2 and 3 (17.1% vs. 12.1% vs. 7.4%; $P=0.004$). Compared to group 3, the risk of MACE at 3 years was increased in group 2 (adjusted hazard ratio [HR]=1.597; 95% confidence interval [CI]=1.020-2.501; $P=0.041$), and further increased in group 1 (adjusted HR=1.933; 95% CI=1.081-3.457; $P=0.026$).

Conclusions: In patients with stable CAD, the risk of MACE is incremental when fewer major coronary vessels are treated adhering to caFFR threshold of 0.8.

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3-year Outcomes in Patients with Stable Coronary Artery Disease Treated With Optimal Medical Therapy Alone Based On A Novel Index: Computational Pressure-flow Dynamics Derived Fractional Flow Reserve

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Background: Computational pressure-flow dynamics derived fractional flow reserve (caFFR) is a novel index to determine the fractional flow reserve (FFR) in patients with coronary artery disease (CAD), without the need of invasive pressure wire and hyperaemic stimulus in conventional FFR. The aim of the study is to evaluate the clinical value of caFFR in patients with stable CAD who were treated by optimal medical therapy alone.

Methods: A total of 272 stable CAD patients (mean age 66.39, 65% male) with 367 lesions were included. All of them did not undergo percutaneous coronary intervention and were treated with optimal medical therapy alone. Among 367 lesions, 333 of them were classified into proximal (n=228) or distal lesions (n=105). The primary endpoint was 3-year major adverse cardiovascular events (MACE), defined as a composite of death, myocardial infarction or any unplanned revascularization.

Results: The mean caFFR was 0.88±0.10 in 367 lesions. During a median follow-up of 36 months, 39 composite events occurred, including 19 death, 3 myocardial infarction and 17 unplanned revascularization. After multivariate adjustment, caFFR was an independent predictor of MACE (adjusted hazard ratio [HR]=0.98 per 0.01 increase in caFFR; 95% confidence interval [CI], 0.97-0.99; P=0.01) and death (adjusted HR=0.97 per 0.01 increase in caFFR; 95%CI, 0.95-0.99; P<0.01). In the proximal lesions, there was a significant inverse relationship between caFFR and MACE (adjusted HR=0.96; 95%CI, 0.94-0.98; P<0.01). The risk of MACE (adjusted HR=6.89; 95%CI, 3.38-14.04; P<0.01) and death (adjusted HR=7.94; 95%CI, 3.12-20.25; P<0.01) was significantly higher in those with caFFR ≤0.8. However, such association was not observed in distal lesions.

Conclusion: In patients with stable CAD treated with optimal medical therapy, a lower caFFR was associated with more severe myocardial ischemia and higher risks of adverse outcomes, especially in the proximal lesions. The finding thus supports the use of caFFR to improve risk-stratification, and predict adverse outcomes in patients with stable CAD.

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Integration of Global caFFR and Per-vessel caFFR for Improved Risk Stratification in Stable Coronary Artery Disease Patients Without Ischemia

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Background: Computational pressure-flow fluid dynamics derived fractional flow reserve (caFFR) is a novel angiographic-derived index that correlates closely with conventional fractional flow reserve (FFR) without the need of wire introduction and hyperemia induction. The

aim of our study is to investigate whether the integration of global caFFR (caFFR summation of the three coronary arteries) would enable better risk stratification in stable coronary artery disease (CAD) patients without ischemia-inducing stenosis.

Methods: We studied a total of 819 patients with non-ischemic lesions on the basis of per-vessel caFFR (i.e. caFFR >0.80, or PCI-treated ischemic lesions with post-PCI caFFR >0.90). Patients were subsequently stratified into low (n=261), mid (n=289) or high (n=269) tertiles of global caFFR (<2.70, 2.70-2.76, >2.76, respectively). The primary endpoint is major adverse cardiovascular events (MACE) at 3 years, defined as all-cause death, non-fatal myocardial infarction and any subsequent revascularization.

Results: During a median follow-up of 32.8 months, 72 MACE occurred, including 35 all-cause mortality, 16 myocardial infarction, and 29 subsequent revascularization. Among patients with non-ischemic per-vessel caFFR values, those in lowest tertile of global caFFR showed the highest 3-year MACE rate compared with those in the mid or high tertiles of global caFFR (12.3% vs 8.7% vs 5.6%, respectively; P=0.025). Following multivariate adjustment for demographics, baseline comorbidities and medications, the measurement of myocardial ischemia by global caFFR, as a continuous parameter, showed a significant inverse relationship with MACE (adjusted Hazard Ratio [HR]= 0.138, 95% Confidence Interval [CI]= 0.012-0.708, P=0.012), and recurrent episode of angina (adjusted HR=0.113, 95% CI=0.539-0.840, P<0.001).

Conclusion: Even in the absence of significant ischemia (i.e. caFFR >0.8 in any of the three coronary arteries), patients with a lower global caFFR present a higher risk of MACE at 3-year follow-up. Our findings suggest that the integration of global caFFR to per-vessel caFFR would improve risk discrimination of patients with non-significant ischemic CAD.

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Determinants of Late Potentials in Acute Myocardial Infarction Patients

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Background: Ventricular tachyarrhythmia increases the risk of mortality after acute myocardial infarction. One of the recommended noninvasive techniques for ventricular arrhythmia risk stratification in post-myocardial-infarction patients is detecting late potentials (LP) in signal averaged-electrocardiography (SA-ECG). This study aims to determine the prevalence of LP and to identify the determining factors of LP in Indonesian acute myocardial infarction patients.

Subjects and methods: This cross-sectional study was conducted from December 2019 to April 2020 at Cipto Mangunkusumo National General Hospital, Jakarta, Indonesia. Data were collected via interviews and observation and/or obtained from the medical records provided in our unit. SA-ECG recordings were taken in the first 48 hours and the fifth day after the onset of chest pain. Independent variables were gathered during the patients' stay in the hospital.

Results: We observed 53 subjects, in whom the prevalence of LP was 34%. The proportion of LP was higher in subjects with prior myocardial infarction (50% vs. 30.2%; p=0.205), left ventricle hypertrophy (37.5% vs. 31.0%; p=0.621), diabetes mellitus (35.3% vs. 33.3%; p=0.563), decrease of eGFR (40% vs. 31.6%; p=0.560), hypertension (83.3% vs. 19.2%; p=0.026), hypokalemia (28.6% vs. 15.6%; p=0.555), hyperkalemia (100% vs. 31.4%; p=0.111), hypomagnesemia (100% vs. 30%; p=0.035), and hypocalcemia (41.5% vs. 15.4%; p=0.095). In

bivariate analysis, hypertension and hypomagnesemia were associated with LP. In multivariate analysis, hypertension was associated with increased risk of LP ($p=0.031$; OR=3.900; IK95%=1.136-13.387).

Conclusion: LP is associated with hypertension.

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How to Bridge Residual Distance to Reach Low-density-lipoprotein Cholesterol Targets in Acute Coronary Syndrome Patients After Initial Statin Therapy

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Background: Current guidelines recommend intensive low-density-lipoprotein cholesterol (LDL-C) lowering by $\geq 50\%$ to target LDL-C < 1.4 mmol/L after acute coronary syndrome (ACS). Residual distance to LDL-C target can help select treatment strategy after initial statin therapy.

Purpose: We evaluated residual distance to guideline recommended target LDL-C and the proportion of ACS patients who are projected to reach target LDL-C by different statin and non-statin lipid-lowering strategies.

Methods: We retrospectively analyzed 46,114 patients admitted with ACS who survived 1 year from 18 acute hospitals in Hong Kong between Jan 2014 and Dec 2018. Patients were divided into (i) high potency (HP-S; rosuvastatin ≥ 20 mg, atorvastatin ≥ 40 mg or simvastatin ≥ 80 mg); (ii) non-high potency (NHP-S; other statin doses) statin users and (iii) no statin therapy. We calculated the mean distance and percentage LDL-C reduction required to reach dual LDL-C targets ($> 50\%$ reduction from baseline and < 1.4 mmol/L). We assumed up-titration from NHP-S to HP-S would further reduce LDL-C by approximately 5-10%; addition of ezetimibe 15-20% and PCSK-9 inhibitor 50-60%.

Results: Of 46,114 patients (60.7% males, mean age 76.2 ± 13.3 years), 80.4% ($n=10945/13614$) had LDL-C ≥ 1.4 mmol/L at 12-month after index ACS with 60.2% ($n=18319/30450$), 31.9% ($n=9726/30450$) and 8.0% ($2405/30450$) of patients on no statin, NHP-S and HP-S, respectively. 86% of HP-S and 93% of NHP-S users did not reach dual LDL-C targets at 12-month. Among patients on NHP-S and HP-S, the mean LDL-C at 12-month was 2.0 ± 0.7 and 2.1 ± 0.9 mmol/L; and mean percentage LDL-C reduction required to reach dual LDL-C targets was $22.4 \pm 33\%$ and $18.8 \pm 36\%$, respectively. Projected proportion of NHP-S users to reach LDL-C targets is 11% ($n=430/3966$) by up-titrating to HP-S, 21% ($n=828/3966$) by up-titration to HP-S plus ezetimibe and 100% ($n=3966/3966$) with PCSK-9 inhibitor plus HP-S and ezetimibe. Projected proportion of HP-S users to reach LDL-C targets is 13% ($n=143/1099$) by ezetimibe and 100% ($n=1099/1099$) with addition of PCSK-9 inhibitor.

Conclusions: The use of high-potency statin was low and almost all statin users did not reach dual LDL-C targets at 12-month after index ACS. High potency statin plus ezetimibe is projected to bridge about a fifth of these patients to target LDL-C. PCSK-9 inhibitor is likely needed in the majority of patients who have not achieved target LDL-C at 12-month after ACS to reach guideline recommendations.

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Colchicine in Patients With Acute Myocardial Infarction: An Updated Meta-analysis of Randomized Controlled Trials

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Background: Improvement in cardiovascular outcomes and treatment with anti-inflammatory agents have been the subject of

many research for decades. Colchicine inhibits tubulin polymerization and has been used in cardiovascular practice mainly for the treatment of pericarditis. However, recent studies have shown its benefit when used for acute coronary events. The objective of this meta-analysis is to reexamine the role of colchicine in reducing cardiovascular events in acute coronary syndromes in the light of more recent trials.

Methods: A systematic search for randomized controlled trials which involves use of colchicine and acute coronary syndrome was done using PubMed, Google Scholar, MEDLINE and Clinicaltrials.gov. Studies done in the last decade and those that involved human subjects were included in the study.

Results: Seven RCTs ($n=11,282$ participants) were included in this meta-analysis comparing colchicine vs. placebo for patients being treated for acute coronary syndrome. Dose ranged from 0.5 mg/day to 1 mg/day. Among patients being treated for acute coronary syndrome, colchicine was associated with a significant reduction in composite cardiovascular outcomes (RR 0.69, 95% CI 0.60-0.79, $P < 0.00001$, I² 31%), unstable angina (RR 0.67, 95% CI 0.55-0.82, $P < 0.0001$, I² 53%) and myocardial infarction (RR 0.75, 95% CI 0.62-0.92, $P < 0.005$, I² 41%). Serious gastrointestinal events were evident in the colchicine group with no statistical difference between the two treatment arms (RR 1.28, 95% CI 0.98-1.67, $P = 0.07$, I² 12%).

Conclusion: Use of colchicine reduces the risk if composite cardiovascular outcomes, recurrence of unstable angina and myocardial infarction among patient who had acute coronary syndrome. There was no statistically significant difference between colchicine and placebo in terms of serious gastrointestinal events. It may be possible that colchicine may be part of the standard treatment in patients with acute coronary syndrome.

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An Android App "Apo B Calculator" Calculates Apolipoprotein B

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Background: Apolipoprotein B an important risk predictor for ASCVD is not freely available.

Objectives: To derive the Apo B from a lipid profile, using a regression equation and a neural network and compare the results. LDL-C by both Friedewald equation and direct LDL C were compared with special reference to low LDL. An android app "Apolipoprotein B Calculator" was developed to calculate and show the predictive accuracy of these results

Methods: 885 persons were split into a training and validation set of 442 and 443 persons.

Results: The regression equation $\text{Apo B} = 25.199 + 0.266 (\text{LDL}) + 0.062 (\text{TGL}) + 0.248 (\text{Non-HDL-C})$ was the best predictor of Apo B when directly measured LDL-C was used and $\text{Apo B} = 25.077 + 0.528 (\text{F.LDL}) + 0.138 (\text{TGL})$ when Friedewald equation was used. The predictive accuracy of Apo B from direct, and Friedewald LDL was 87.4% and 86.4% with regression equation and 75% and 85% with neural network. When LDL-C was < 70 mg%, the accuracy of the Friedewald equation was a better predictor of Apo B (70% vs 59.8%).

Conclusion: The regression equation derived from directly measured LDL-C and Friedewald equation derived LDL-C, and the neural network using the Friedewald equation showed near similar efficacy in predicting the Apo B value (87.4%, 86.4% and 85%). A regression equation using a Friedewald formula is a better predictor of Apo B at LDL-C levels < 70 mg%. The app "Apo B Calculator" can predict the Apo B from both directly measured and Friedewald equation derived LDL-C and give the predictive accuracy for the method.

ABSTRACTS: HEART FAILURE

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Stress (Tako-tsubo) Cardiomyopathy in Critically-ill Patients in ICU Setting at a Tertiary Care Center in North India: A 2 Year Study

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Background: Tako-tsubo Cardiomyopathy also called as Stress Cardiomyopathy (SC) is a transient ventricular dysfunction associated with regional wall abnormalities but normal coronaries, has been reported in the critically ill patients in ICU setting.

Method: This is a prospective observational study of critically-ill patients who got admitted to the ICU at tertiary cardiac center over a period of two years (2016-2017) & detected to have Tako-tsubo cardiomyopathy.

Results: Out of 1636 critical patients admitted in the ICU, 16 patients (0.9%) were diagnosed to have SC with male/female ratio of 1:4.2. 50% patients presented with dyspnea while 75% presented with chest pain & 62.5% patients were having features of heart failure. All patients had ECG, cardiac enzymes & Echocardiography were done while Coronary angiography (CAG) was done only in 13 (81.25%) cases. ECG suggestive of Acute Myocardial Infarction was seen in 12 (75%) patients. Typical Tako-tsubo cardiomyopathy changes were seen on echocardiography in 14 (87.5%) and atypical in 2 (12.5%) of cases. CAG done in 13 patients showed no significant epicardial coronary artery disease. Out of 16 patients, one patient died in the hospital. All patients showed complete reversal of Left Ventricular dysfunction & Regional Wall Motion abnormalities (RWMA) in 3 to 6 months.

Conclusions: Tako-tsubo cardiomyopathy is reversible cardiac disorder which may rarely be detected in the critically-ill patients who are admitted in ICU. It can precipitate arrhythmias and/or heart failure which may lead to increased mortality. High index of suspicions is required for the early detection.

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Statin Use is Associated With Lower Risk of New Onset Dementia in Patients With Heart Failure: A Population-based StudyQW Ren¹, YK Tse¹, HL Li¹, SY Yu¹, PF Wong¹, MZ Wu¹, HF Tse², KH Yiu²¹ *The University of Hong Kong*² *Queen Mary Hospital, Hong Kong SAR*

Background: Increasing number of heart failure (HF) patients diagnosed with dementia due to improved treatment and aging population. Data relating to the association of statin use on the risk of dementia incidence among patients with HF are sparse.

Methods: Using a previously validated territory-wide clinical information registry, statin use was ascertained among all eligible patients with HF (N=241,995) from 1996 to 2019. Propensity score matching was used to balance baseline covariates between statin nonusers (167,738 patients) with statin users (74,257 patients). Competing risk regression with Cox proportional-hazard models was performed to estimate the risk of incident dementia associated with statin use.

Results: Of all eligible subjects, the mean age was 76.5±13.0 years, 115,371 (47.7%) was male. Over a median follow-up of 2.7 years (interquartile range [IQR]: 0.6 to 6.7), 13,482 (5.6%) patients were diagnosed with dementia including Alzheimer's disease (N=5,253), senile dementia uncomplicated (N=4,273), arteriosclerotic dementia (N=3,262), and others (N=694). Statin use (vs. none) was associated with a 58% lower risk of dementia incidence (multivariable-adjusted

sub-distribution hazard ratio [SHR]=0.42; 95% Confidence Interval [CI], 0.38 to 0.46) after accounting for death as a competing risk. Moreover, the male gender was associated with a 51% lower risk of dementia incidence (multivariable-adjusted SHR=0.59; 95%CI (0.54-0.65) compared with females.

Conclusions: Our study suggests that there is substantial sex difference in the incidence of dementia among HF patients. Moreover, statin use is associated with a significantly lower risk of incident dementia in HF.

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Heart Failure Outcomes After Percutaneous Coronary Intervention in Non-ischemic Stable Coronary Artery Disease Patients Based on a Novel Index: Computational Pressure-flow Dynamics Derived Fractional Flow ReserveCKL Leung¹, LY Lam¹, KY Li¹, SY Yu², MZ Wu², QW Ren², PF Wong², YK Tse¹, SY Yu¹, HL Li¹, Y Feng³, Y Huo³, HF Tse², KH Yiu²¹ *The University of Hong Kong, Hong Kong SAR*² *Queen Mary Hospital, Hong Kong SAR*³ *PKU-HKUST Shenzhen-Hongkong Institution, Shenzhen, China*

Background: Computational pressure-flow dynamics derived fractional flow reserve (caFFR) is a novel index to evaluate the extent of functional myocardial ischemia in coronary artery disease (CAD) patients, eliminating the need of an invasive pressure wire and hyperaemic stimulus needed in conventional fractional flow reserve measurement. The diagnostic performance of caFFR has been validated previously and is potentially useful in guiding percutaneous coronary intervention (PCI) treatment in CAD patients. However, the clinical value of caFFR on heart failure (HF) outcomes is uncertain in CAD patients who do not have significant functional myocardial ischemia. This study aims at evaluating the impact of PCI on HF hospitalization and HF associated mortality in non-ischemic stable CAD patients as stratified by caFFR.

Methods: A total of 420 patients (mean age 66.9±11.0; male 69.0%) with stable CAD without significant functional myocardial ischemia as defined by caFFR>0.80 were included. Patients were subsequently stratified into those with PCI (n=307) and without PCI (n=113). The primary endpoint was defined as a composite of HF hospitalization and HF associated mortality.

Results: The number of obstructive lesions was 1.8±1.1 in patients with PCI and 1.4±0.8 in those without PCI (P=0.001). The severity of CAD assessed by SYNTAX score was higher in patients with PCI compared to those without PCI (10.1±5.8 vs. 6.2±3.9, P<0.001). A total of 37 events occurred at 3 years (28 HF hospitalization and 9 HF associated mortality). The 1-year incidence rate of primary endpoint was 3.3% in patients with PCI and 3.5% in those without PCI (P=1.000). With multivariable adjustment, the primary endpoint rate at 3 years was similar between patients with PCI and those without PCI (8.1% vs. 6.2%; adjusted hazard ratio=1.039; 95% confidence interval=0.438-2.468; P=0.931).

Conclusion: In stable CAD patients without significant functional myocardial ischemia, defined by caFFR>0.80, PCI does not prevent HF hospitalization and HF associated mortality.

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The Influence of Dapagliflozin on Functional Heart Parameters in Patients With Type 2 Diabetes Mellitus and Prior Myocardial InfarctionL Zhuravlyova, M Filonenko, M Kulikova, N Sokolnikova
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Background: Sodium-glucose cotransporter-2 inhibitors are the new promising oral hypoglycemic drugs, which potentially may reduce the risk for cardiovascular mortality or heart failure hospitalization.

Purpose: To determine the effect of dapagliflozin on left ventricular systolic function in patients with type 2 diabetes mellitus (T2DM) and prior myocardial infarction (MI).

Methods: A total of 35 patients with T2DM and prior MI were examined (mean age 59±8, body mass index 32.6±4.7, HbA1c 9.2±2.1). Cardiac ultrasonography was performed twice with 6-month interval within the first year post-MI. All patients had reduced ejection fraction (EF<45%). All patients received metformin initially, dapagliflozin was added to improve glycemic control. Metabolic parameters measured included fasting plasma glucose, immune-reactive insulin, glycosylated hemoglobin and HOMA-IR index.

Results: During the studied period, examined patients demonstrated a significant decrease in left ventricular end diastolic volume (-15.3%; 53.2±3.7 mm; p=0.02) and left ventricular end systolic volume (-18.5%; 38.3±3.3 mm; p=0.03), while EF increased +5.4% (45.8±2.4%; p=0.006). An increase in EF was noted in total of 82.3% of patients by the time of the second visit. Also, a significant improve of glycemic control was found in examined patients - HbA1c decreased by 1.03 (8.2±2.2%).

Conclusion: The obtained data suggest that the use of dapagliflozin in combination with metformin not only improves glycemic control in patients with T2DM and prior MI, but also promotes the recovery of left ventricular systolic function and myocardial contractility, thus slowing down the development of heart failure in such patients.

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The Study of the Relationship Between Left Atrial Volume and Left Ventricular Diastolic Dysfunction and Left Ventricular Hypertrophy: Correlation of Left Atrial Volume With Cardiovascular Risk Factors

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Introduction: In approximately 30-50% of the individuals who develop congestive cardiac failure the systolic function as assessed by left ventricular (LV) ejection fraction is either normal or relatively normal. **Aim:** To study the relationship between left atrial (LA) volume and LV diastolic dysfunction and LV hypertrophy and correlate LA volume with cardiovascular risk factors.

Methodology: A total of 400 patients were included in the study. These patients underwent a screening echocardiography to diagnose left ventricular hypertrophy and diastolic dysfunction.

Result: There is a significant correlation between left ventricular hypertrophy and diastolic dysfunction. 86% patients with evidence of diastolic dysfunction by tissue Doppler had a higher left atrial volume.

Conclusion: Increased left ventricular mass is associated with increasing severity of diastolic dysfunction. Increased left ventricular mass is also associated with increased left atrial volume indexed to body surface area. Left atrial volume correlates with the duration of type 2 diabetes. Increasing severity of left ventricular diastolic dysfunction correlates significantly with left atrial volume indexed to body surface area. At milder degrees of diastolic dysfunction, left atrial enlargement may not be the best predictor of severity. But with increasing severity of diastolic dysfunction in left ventricular hypertrophy, left atrial volume indexed to body surface area may be a sensitive and easy marker for assessment of severity and thus the long-term prognosis in terms of atrial fibrillation, stroke and mortality.

ABSTRACTS: HYPERTENSION AND HYPERLIPIDAEMIA

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Aggressive Lipid Lowering After CABG: What is the Ideal Target?

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Background: Secondary prevention is critical to long-term event-free survival after CABG. Although the use of high-intensity statins are highly recommended by most American and European guidelines, data regarding the ideal low density lipoprotein (LDL) and non-high-density lipoprotein (non-HDL) cholesterol target is scarce.

Methods: We performed a retrospective analysis of 335 consecutive patients who underwent isolated CABG from 1st January 2007 to 31st December 2008 at the Prince of Wales Hospital. Available lipid measurements in the years following CABG were obtained, and annualized lipid exposure was calculated for LDL and non-HDL. Database lock date was 15th August 2020.

The primary endpoint was cardiac death. The secondary endpoint was non-fatal cardiac events, which is a composite of (1) fatal and non-fatal myocardial infarction, (2) target lesion revascularization (TLR) and (3) hospitalization for unstable angina.

Survival estimates were generated with the Kaplan-Meier method. Event-free survival models were developed based on time to the earliest event. Cox proportional hazards regression was used to calculate hazards ratio.

Results: There were 3 inpatient deaths (0.90%). Follow-up was complete in 97.6%. 22.4% had a cardiac event and 9.6% requiring TLR.

The regression model included the seven clinical factors of the SYNTAX II score as well as the presence of diabetes. Non-HDL and LDL were incorporated separately to avoid collinearity. Left ventricular ejection fraction, the presence of diabetes, LDL and non-HDL were independent predictors of cardiac death. However, neither LDL nor non-HDL predicts cardiac events.

Area under the receiving operating characteristics curve (AUC) analysis was performed to determine an ideal LDL and non-HDL target associated with reduced cardiac death. The AUC was 0.694 [95% CI 0.575-0.813] (p=0.002) for non-HDL and 0.660 [95% CI 0.533-0.787] for LDL (p=0.009) respectively. The Youden Index was 0.076 at a cut-off of 1.963 mmol/L for non-HDL and 1.475 mmol/L for LDL.

Conclusion: Exposure to elevated LDL and non-HDL cholesterol independently predicts cardiovascular mortality after CABG.

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Proportion of Patients Taking Indapamide Developing Severe Hypokalaemia

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Background: Indapamide was by far the most commonly used diuretic for hypertension in Hong Kong. Yet, hypokalaemia is a well-recognized adverse effect. To evaluate the proportion of patients taking indapamide who developed severe hypokalaemia, defined as requiring hospitalization, we searched the Hong Kong Hospital Authority Clinical Data Analysis and Reporting System, a territory-wide database of computerised medical records.

Methods: All hypertensive patients prescribed indapamide monotherapy in 2007-2016 and all admissions due to hypokalaemia in 2007-2018 were traced. Factors associated with hospitalisation were studied using multivariable logistic regression.

Results: During the study period, 62,881 patients were started on indapamide and 509 (0.81%) were hospitalised for hypokalaemia. 59% of these hospitalisations occurred within 16 weeks. Female sex (OR=1.73; 95%CI, 1.43-2.09) and immediate-release formulation (OR=1.44; 95%CI, 1.16-1.78) were associated with hospitalisation. In the multivariable model, advanced age was not a significant predictor. There were no deaths during hospitalisation and the median length of hospital stay was one day.

Conclusion: In this large population-based study with 147614 person-years of follow-up, severe hypokalaemia requiring hospitalisation was uncommon among hypertensive patients on indapamide. Half of these occurred during the first 16 weeks. Female sex and the immediate release formulation increased the risk. We conclude that using indapamide to treat hypertension is safe, even in the elderly, especially if the sustained release formulation is used and electrolytes are monitored periodically.

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Prevalence of Metabolic Syndrome in the United States National Health and Nutrition Examination Survey (NHANES) 2011-2018

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Background: Metabolic syndrome (MetS) is a cluster of risk factors presaging the development of cardiovascular disease and diabetes. It is a risk factor for severe coronavirus disease 2019 (COVID-19). To estimate the prevalence of MetS in the US National Health and Nutrition Examination Survey (NHANES) 2011-2018.

Methods: This cohort study included 22370 eligible participants aged ≥ 20 years from the NHANES 2011-2018. MetS was defined as the presence of at least three of these components: central obesity, reduced high-density lipoprotein, elevated triglycerides, elevated blood pressure and elevated fasting blood glucose. The prevalence of MetS was estimated taking into account the complex sampling. The time trend was evaluated using logistic regression. Annual percentage changes (APC) were measured trend in MetS prevalence.

Results: The prevalence of MetS was 36.2% (95% CI, 32.3-40.3), 34.8% (95% CI, 32.3-37.4), 39.9% (95% CI, 36.6-43.2) and 38.3% (95% CI, 35.3-41.3) in 2011-2, 2013-4, 2015-6, 2017-8, respectively (P for trend =.08). Among the MetS components, the prevalence of elevated glucose increased from 48.7% (95% CI, 45.9-51.5) in 2011-2 to 64.3% (95% CI, 61.0-67.4) in 2017-8 [P for trend <0.001; APC=11.7, (95% CI, 3.5-21.0)]. The prevalence of MetS in non-Hispanic Asian increased from 21.8% (95% CI, 16.7-28.0) in 2011-2 to 31.2% (95% CI, 27.4-35.3) in 2017-8 [P for trend <.001; APC=14.6, (95% CI, 2.5-34.8)].

Conclusion: The prevalence of MetS remained stable during 2011 to 2018. Lifestyle modification is needed, especially among non-Hispanic Asians to prevent the metabolic syndrome and the associated risks of diabetes and cardiovascular disease.

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A Connection of Resistin With Arterial Hypertension in Patients With Diabetes Mellitus

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Background: Even a slight increase in blood pressure (BP) contributes to the progression of cardiovascular pathology in patients with diabetes mellitus (DM). Currently, a plenty of data are available on the influence of various factors, such as oxidative stress, arterial hypertension (AH), obesity, etc., on the development of non-coronary myocardial diseases in diabetic patients. However, the existence of relationships between adipokines (in particular, resistin) and hypertension in patients with type 2 diabetes remains understudied.

The aim of our study was to identify the relationship of resistin with the level of blood pressure in patients with type 2 diabetes with and without hypertension.

Methods: The first group consisted of 65 patients with type 2 diabetes with concomitant hypertension, the second group included 37 patients with type 2 diabetes without hypertension. Groups were comparable in age and gender. Systolic blood pressure (SBP), diastolic blood pressure (DBP) were measured; the average hemodynamic blood pressure (AHBP) was determined in all patients. The resistin level was determined by the sandwich immunoassay method.

Results: In the 1st group of patients, the level of SBP (mm Hg) was 147.84 ± 2.21 , DBP (mm Hg) - 93.52 ± 1.83 , AHBP (mm Hg) - 11.73 ± 2.98 . In the 2nd group of patients, the SBP level was 124.22 ± 2.08 , DBP - 83.41 ± 1.47 , AHBP - 97.10 ± 1.66 . The level of resistin (ng/ml) in the 1st group of patients was 13.96 ± 0.73 , and in the 2nd group - 11.24 ± 0.46 . A significant relationship was found between AHBP and resistin level ($p < 0.05$) in the 1st group of patients ($R = 0.34$), while in the 2nd group such relationship was also present, but insignificant ($R = 0.22$, $p > 0.05$).

Conclusions: Patients with type 2 diabetes and arterial hypertension have higher level of resistin than patients with type 2 diabetes without hypertension and also a significant relationship was found between the level of average hemodynamic blood pressure and resistin in the main group. We believe that resistin, along with other factors, is involved in the development of cardiovascular pathology in patients with diabetic cardiomyopathy, and this contribution is more significant in patients with hypertension.

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Hypertension as an Intensification Factor of Metabolic and Inflammatory Deviations in Patients With Non-alcoholic Fatty Liver Disease

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Background: Arterial hypertension (HT) is of the main cardiometabolic pathologies, affecting about 30% of the population, and about 50% of patients with HT have non-alcoholic fatty liver disease (NAFLD). Convincing evidence suggests a bidirectional effects of pathologies.

Objective: to study the effect of HT on the course of NAFLD in patients with comorbidity of pathologies.

Methods: We examined 63 patients with HT I-II grade in combination with NAFLD in non-alcoholic steatohepatitis (NASH) stage and 52 patients with isolated NASH. The control group consisted of 20 relatively healthy volunteers. Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were determined by spectrophotometric method. The C-reactive protein (CRP) levels were evaluated using a highly sensitive method (hs-CRP ELISA) (Biomerica, USA). HOMA-IR was calculated according to the generally accepted formula. Statistical analysis was performed according to standart methods.

Results: There were significantly more cases of moderate (41.27%) and severe (7.94%) steatohepatitis in HT and NAFLD group, while in the group with isolated NASH moderate NASH was only in 7.69% of patients ($df=1$, $c2=16.657$, $p < 0.001$), and no cases of severe pathology were determined ($df=1$, $c2=4.315$, $p=0.038$). CRP level averaged 7.90 mg/l (SD 1.57) in patients with HT and NAFLD versus 6.55 (SD 1.61) in patients

with isolated NAFLD and 2.07 mg/l (SD 0.33) in control values ($p < 0.001$). Liver enzymes were also significantly increased in patients with HT and NAFLD. ALT in comorbid patients averaged 79.00 IU/l (SD 13.86), that was higher, than in NAFLD group (69.00 IU/l (SD 9.88), $p < 0.001$) and in control group (20.00 IU/l (SD 5.50), $p < 0.001$) in 1,14 and 3,95 times, respectively. AST level was 75.05 IU/l (SD 14.60) in patients with HT and NAFLD versus 54.00 IU/l (SD 6.88) in isolated NAFLD patients and 16.50 IU/l (SD 5.00) in control results ($p < 0.001$).

The HOMA-IR in HT and NAFLD patients was 4.67 mmol/L \times mOD/ml (SD 0.66) versus 3.40 (SD 0.47) in group with isolated NAFLD and 2.28 (SD 0.26) in control group ($p < 0.001$).

Conclusion: NAFLD is much more severe in patients with HT, and its course is associated with a more pronounced inflammatory response and more striking liver enzymes changes, that may be a consequence of increased insulin resistance. These data allow us to draw conclusions about the serious negative impact of HT on course of NAFLD in patients with this comorbidity.

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Clinical Significance of the AST to Platelet Ratio Index in Patients With Non-alcoholic Fatty Liver Disease and Hypertension

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Background: Hypertension is considered as one of the etiological factors of metabolic disorders in liver. NAFLD is the most common cause of chronic liver disease with a prevalence of 20.0-50.0%. Liver tests might not always reliably reflect the degree of liver damage in NAFLD with pre-existing hypertension, while APRI is an indicator of long-term fatty degeneration of liver tissue and more accurately reflects the actual degree of damage to the liver parenchyma.

Aim: To determine the role of hypertension in the progression of liver damage in patients with NAFLD.

Methods: Main group: 26 patients with hypertension (grade 1-2 and stage 1-2) in combination with NAFLD; comparison group - 23 patients with an isolated NAFLD. Control group - 22 relatively healthy individuals. Patients underwent an examination according to Healthcare Protocols, including liver tests and assessment of hepatic steatosis. The APRI index was calculated as the ratio of ACT to its upper limit value and to platelet level. Logistic regression was used to assess the association between parameters.

Results: Among patients with comorbid NAFLD and hypertension, 40.9% of steatosis and 59.1% of steatohepatitis were detected. In comparison group corresponding indicators were 73.7% and 26.3% ($p = 0.035$). In main group SBP and DBP were 149.9 \pm 7.4 mmHg and 87.4 \pm 7.6 mmHg and significantly ($p < 0.001$) exceeded values in comparison group (123.5 \pm 9.7 mmHg and 76.9 \pm 10.7 mmHg).

Mean ALT and AST in controls were 25.1 \pm 9.4 U/l and 22.3 \pm 8.9 U/l. In patients with isolated NAFLD -35.7 \pm 10.3 U/l and 33.3 \pm 18.7U/l; and in main group -47.9 \pm 8.4 U/l and 41.6 \pm 6.7U/l. Parameters were significantly higher in patients of main than of comparison group ($p < 0.001$ and $p = 0.004$). Despite significant difference, no significant association was found between hypertension, ALT, and AST levels.

APRI in controls was 0.3 \pm 0.1; in main group -0.7 \pm 0.2, which significantly ($p = 0.001$) exceeded the value in comparison group (0.4 \pm 0.1). Significant association between APRI and concomitant hypertension in patients with NAFLD was found: OR=0.001 [95.0%CI 0.000-0.079], $p = 0.003$.

Steatohepatitis was significantly associated with concomitant hypertension (OR=0.247 [95.0%CI 0.065-0.934], $p = 0.039$). Analysis showed association of steatohepatitis with 2nd stage hypertension (OR=7,000 [95.0%CI 1,014-48,312], $p = 0.048$). SBP was associated with

steatohepatitis in patients with NAFLD: OR=1.075 [95,0%CI 1.007-1.147], $p = 0.030$.

Conclusions: Hypertension in NAFLD-patients is associated with progression of liver damage, which manifests by increase in liver enzymatic activity. The use of APRI can be an informative non-invasive indicator of the liver damage degree in patients with NAFLD and hypertension, and more clearly reflect the condition of liver parenchyma than levels of liver enzymes.

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The Determinant of Traditional Risk Factors for Cardiovascular Disease Event Recurrence in the Atherosclerotic Disease: A Multivariate Analysis Study

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Background: Recognizing traditional risk factors is important to secondary prevention for cardiovascular diseases (CVD) event recurrence. The aim of this study was to investigate the effect of traditional risk factors with CVD event recurrence by using the data from the Bethesda Stroke Registry in Indonesia.

Methods: This cross-sectional study was based on a stroke registry, data were collected using electronic medical records in the Bethesda Hospital Yogyakarta Indonesia. All patients ³18 years of age, who developed ischemic stroke between January 1, 2011, and December 31, 2018, were included in this study. Traditional risk factors included genre, age, hypertension, type 2 diabetes-mellitus(T2DM), atrial fibrillation (AF), and hyperlipidemia. The statistical measures calculated were chi-square- test and logistic regression.

Results: Among the 8248 patients involved in this study, there were 4937 (59.9%) men patients and 3311(40.1%) women patients. Of these patients, aged ³50 years old of stroke was 6979(84.6%). Multivariate analysis showed men ($p < 0.001$, RR:1.186, 95%CI:1.068-1.317), older age ($p < 0.001$, RR:1.363, 95% CI:1.205-1.542), T2DM ($p < 0.001$, RR:1.363, 95 %CI:1.205-1.542) and hypertension ($p = 0.002$, RR:1.174, 95 %CI:1.060-1.300) was significantly associated with recurrence CVD event.

Conclusions: Older age, men, hypertension, and T2DM were independent predictors of recurrent CVD events. Recurrent CVD event patients were more likely to had older age, men, hypertension, and T2DM.

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Strategies to Bridge Therapeutic Gap in Low-density-lipoprotein Cholesterol Lowering Among 90,818 Chinese With Atherosclerotic Cardiovascular Diseases

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Background: Current guideline recommends addition of proprotein convertase subtilisin kexin type 9 inhibitors (PCSK9i) to achieve low-density-lipoprotein cholesterol (LDL-C) lowering by ³50% to target LDL-C <1.4 mmol/L for patients with atherosclerotic cardiovascular disease (ASCVD) already on maximum tolerated dose of statin. We aimed to evaluate the residual distance to target LDL-C in ASCVD patients on statin monotherapy and the projected improvement by up-titration to high potency statin, addition of ezetimibe and PCSK9i.

Methods: We retrospectively analyzed 90,818 patients with ASCVD on stable statin monotherapy prior to lipid profile assessment from 43 public hospitals in Hong Kong between Aug 2016 and Jul 2020. Patients were divided into (i) high potency statin (HP-S; rosuvastatin ³20 mg,

atorvastatin 340 mg or simvastatin 380 mg) and (ii) non-high potency statin (NHP-S; other statin doses) statin users. We calculated the mean percentage LDL-C reduction required to reach the target of LDL-C lowered by $\geq 50\%$ and < 1.4 mmol/L. We assumed up-titration from NHP-S to HP-S would further reduce LDL-C by approximately 10%; addition of ezetimibe 20% and PCSK9i 60%.

Results: Of 90,818 patients (63.2% male, mean age 66.9 ± 11.3), 80.3% had coronary artery, 1.7% had peripheral artery and 21.1% had cerebrovascular disease; 18.7% were on HP-S and 81.3% on NHP-S. LDL-C target was not achieved in 96.9% ($n=71,545/73,865$) patients on NHP-S and 93.9% ($n=15,911/16,953$) patients on HP-S. In these patients, mean LDL-C was 1.8 ± 0.6 and 1.9 ± 0.6 mmol/L and mean percentage LDL-C reduction required to reach LDL-C target was $40.6 \pm 15.3\%$ and $36.5 \pm 26.2\%$, respectively. The proportion of patients who required 5-10%, 10-30%, 30-50% and $\geq 50\%$ further reduction to reach target LDL-C were 1.3%, 22.6%, 44.1%, 31.2% on NHP-S, and 7.6%, 23%, 28.9%, 32.8% on HP-S, respectively. Proportion of NHP-S patients projected to reach LDL-C goal by up-titrating to HP-S is 2.2% ($n=1,561/71,545$). Addition of ezetimibe is projected to achieve LDL-C target in 21.9% ($n=18,787/85,895$) patients on HP-S who are not at goal. Overall, 76.7% ($n=67,108/87,456$) of patients on HP-S and ezetimibe were expected to need PCSK9i and is projected to achieve LDL-C target in 96.4% of cases ($n=64,671/67,108$).

Conclusions: Our 'real-world' study showed the use of HP-S in ASCVD patients was low and $> 90\%$ did not reach LDL-C target. High potency statin plus ezetimibe was projected to bridge more than one fifth of these patients to target LDL-C. PCSK9i is likely required in significant number of patients despite HP-S plus ezetimibe.

ABSTRACTS: PERCUTANEOUS CORONARY INTERVENTION

1 The Optimal Percutaneous Coronary Intervention Strategy For Patients With ST-segment Elevation Myocardial Infarction and Multivessel Coronary Artery Disease: A Pairwise and Network Meta-analysis

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Background: The option of percutaneous coronary intervention (PCI) strategy is still at dilemma in patients with ST-segment elevation myocardial infarction (STEMI) and multivessel coronary artery disease. **Methods:** Trials that randomized patients with STEMI and multivessel coronary artery disease to immediate multivessel PCI, staged multivessel PCI, or culprit-only PCI and prospective observational studies that investigated all-cause death were included. Random effect risk ratio (RR) and 95% confidence interval (CI) were conducted.

Results: A total of 13 randomized trials with 7,627 patients and 21 prospective observational studies with 60,311 patients were included. In the pairwise and network meta-analysis based on randomized trials, multivessel PCI (immediate or staged) was associated with a lower risk of long-term major adverse cardiac events (MACE; RR: 0.58; 95% CI: 0.45 to 0.74) compared with culprit-only PCI, which was mainly due to lower risks of myocardial infarction (RR: 0.67; 95% CI: 0.51 to 0.88) and revascularization (RR: 0.38; 95% CI: 0.28 to 0.51), without any significant difference in all-cause death. However, results from real-world prospective observational studies suggested that staged multivessel PCI reduced all-cause death, whereas immediate MV-PCI increased short-term all-cause death relative to culprit-only PCI.

Conclusions: For low-risk patients, MV-PCI at an immediate or staged procedure was preferred due to improvements in long-term outcomes, whereas in high-risk patients, staged MV-PCI was preferred yet immediate MV-PCI may increase short-term all-cause death, which should be evaluated in future randomized trials.

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Proton Pump Inhibitor and Infection in Patients With ST-Elevation Myocardial Infarction

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Background: Infectious complications are prevalent in patients with acute myocardial infarction (AMI), which worsens their outcomes. Proton pump inhibitor (PPI) usage potentially increases infection in several cohorts. However, whether PPI therapy affecting the development of infection in AMI patient is poorly understood.

Methods: In this prospective study, we consecutively enrolled ST-elevation myocardial infarction (STEMI) patients undergoing percutaneous coronary intervention (PCI) from January 2010 to June 2018. The patients were then divided into a PPI group and a non-PPI group, according to whether a PPI was given after admission. The primary endpoint was infection during hospitalization.

Results: A total of 3027 patients were enrolled, and 310 (10.2%) patients developed infection during hospitalization. Higher incidence of infection was observed in the PPI users when compared to non-PPI users (11.5% versus 7.0%, $P < 0.001$). Multivariate logistic regression analysis showed that PPI use was positively associated with infection (OR=1.78, 95% CI=1.22-2.59, $P=0.003$), in-hospital all-cause mortality (OR=2.13, 95% CI=1.14-3.99, $P=0.018$), and major adverse clinical events (MACE) (OR=2.42, 95% CI=1.44-4.09, $P=0.001$). The propensity score analyses further verified these findings.

Conclusions: PPI usage was associated with higher incidence of infection during hospitalization, in-hospital all-cause mortality, and MACE in STEMI patients.

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Retrospective Study on Primary Percutaneous Coronary Intervention Versus Thrombolytic Therapy Outside Office Hours Under the New Cluster-based 24-hour Primary PCI Program

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Introduction: Acute STEMI represents a unique patient population carrying high morbidity and mortality. Timely effective coronary reperfusion is the major determinant of patient outcome. In Hong Kong, thrombolytic therapy remains the mainstay of reperfusion strategy in STEMI patients presenting outside office hours. A 24-hour PCI program was launched in October 2018 based on Kowloon Central Cluster.

Objective: To compare 30-day mortality and major bleeding event in patients receiving historical thrombolytic therapy and primary PCI as the reperfusion strategy for patients with acute STEMI presenting outside office hours.

Method: A single center retrospective study was conducted in Queen Elizabeth Hospital on consecutive STEMI patients presented outside office hours, who received urgent thrombolytic therapy between January 2016 and September 2018 and primary PCI between October 2018 and December 2019. The primary endpoints measured were 30-day mortality and major bleeding event, defined as BARC type 3 or type 5. The secondary endpoints measured were thrombolytic failure rate, unplanned revascularization and hospital length of stay.

Results: 188 patients in thrombolytic group and 143 patients in primary PCI group were analyzed. 30-day mortality occurred in 11.7% and 4.2% of patients in thrombolytic therapy group and primary PCI group respectively ($P=0.02$). Major bleeding events occurred in 8% and 2.1% in thrombolytic and primary PCI group respectively ($P=0.02$). Among the subset of patients who presented early (≤ 3 hours from symptoms onset),

there was a trend towards lower mortality rate (4.9% vs 6.8%, $P=0.58$) and fewer major bleeding events (3.7% vs 6%, $P=0.47$) in primary PCI group. Among the subset of elderly population (age ≥ 75), primary PCI group has a significantly lower composite outcome (17.6% vs 41.9%, $P=0.03$) and fewer major bleeding events (8.8% vs 29%, $P=0.04$). Regarding 30-day mortality in this subset, primary PCI group also had lower 30-day mortality rate (17.6% vs 38.7%, $P=0.06$), though this did not reach statistical significance. Thrombolytic failure occurred in 31.4% of patients and unplanned revascularization in 25.5% of patients receiving thrombolytic therapy. The median length of stay was not different between the two groups (5 [IQR 4-7] days vs 4 [IQR 3-7] days, $P=0.29$). **Conclusion:** Compared with thrombolytic therapy, primary PCI in patients with acute STEMI presenting outside office hours is associated with lower risks of 30-day mortality and major bleeding event. The superiority of mechanical reperfusion strategy was consistent across the different age categories.

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Long-term Prognostic Implications of Percutaneous Coronary Intervention in Acute Coronary Syndrome Patients With Intermediate Lesions That are Non-ischemic on the Basis of Computational Pressure-flow Dynamics Derived Fractional Flow Reserve

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Background: A substantial proportion of patients with acute coronary syndrome (ACS) may have intermediate lesion(s) that are non-ischemic during emergency coronary angiography. The long-term prognosis of such patients, compared to stable ischemic heart disease (SIHD), is uncertain. The role of PCI in such ACS patients remains underexplored. Computational pressure-flow dynamics derived fractional flow reserve (caFFR) has been developed to assess myocardial ischemia without invasive pressure wire and hyperemic stimulus. Our aim is first to assess the prognostic differences between ACS and SIHD with non-ischemia intermediate lesions. Second, we ascertain whether PCI in these ACS patients provides survival benefit.

Methods: We studied 551 patients (mean age 64.4 years; male 59.9%) with absence of myocardial ischemia, defined as caFFR=0.80 in all vessels. Patients were stratified into those with ACS ($n=132$) and those with SIHD ($n=491$). Among the ACS cohort, patients were divided into those with PCI ($n=83$) and with medical therapy (MT) ($n=49$). The SIHD cohort, all treated with MT, was considered as the referent group. The primary endpoint was major adverse cardiovascular events (MACE) at 3 years, defined as a composite of all-cause mortality, myocardial infarction (MI), and any revascularization.

Results: During a follow-up of 36 months, 54 MACE occurred, including 38 all-cause mortality, 5 MI, and 14 revascularization. Compared to SIHD, ACS was independently associated with MACE even in the absence of myocardial ischemia (adjusted HR=2.531; 95% CI=1.397-4.586; $P=0.002$). The 3-year incidence rate of MACE was the highest in ACS patients with MT, followed by ACS patients with PCI; SIHD patients had the lowest incidence rates (30.6% vs 12.0% vs 5.9%, $P<0.001$). Similar findings were observed for hospitalization for heart failure (14.3% vs 6.0% vs 3.1%, $P=0.031$) and cardiovascular death (8.2% vs 4.8% vs 0.4%, $P<0.001$) at 3 years.

Conclusion: In patients with intermediate lesion(s) without myocardial ischemia, those presented with ACS had a higher risk of MACE at 3 years compared to SIHD. In patients with ACS, our finding suggests

that PCI should be advocated to intermediate lesions even without myocardial ischemia.

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LGE-cMRI Assessment of Volume Controlled Reperfusion Method in Primary Percutaneous Coronary Intervention in Patients With ST Elevated Myocardial Infarction

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Objectives: We create a procedure based on postconditioning and gradual reperfusion, "Volume Controlled Reperfusion Revascularization" method (VCR) in primary percutaneous coronary intervention. The aim of this experimental study is to assess feasibility and effect of VCR and if this method will attenuate reperfusion injury in microvascular obstruction.

Methods: VCR method, Basically, contemporaneous forward blood flow balloon inflation blocking at the occlusion site and prolonged distal reperfusion via aspiration catheter. Active NC balloon inflation at occlusion site, while keeping NC balloon inflation, aspiration catheter was positioned 10-15 mm advanced of NC balloon, intra- aspiration catheter infusion of mixture solution (artery blood 10 ml+ heparin NS 10 ml), 20 ml/min for 10 mins, adjust volume and speed according to blood pressure and heart rate variation. Stent or DCB as usual. After several successful operation on RCA, 10 patients with acute ST-segment elevation myocardial infarction (STEMI) with angiography confirmed proximal complete occlusion on dominant blood vessel were non-randomly enrolled (symptom to angiography <12h). 5 cases in VCR group with volume- controlled reperfusion revascularization method, 5 cases in control group with conventional PCI method. Microvascular obstruction (MVO) has been calculated by late gadolinium-enhanced cardiovascular magnetic resonance (LGE-cMRI). Base line information, angiographic features before and after procedure, in-hospital status and MVO were compared.

Results: Successful PCI procedure, safe in-hospital treatment and LGE-cMRI assessment for MVO. Group difference were found in age group and PCI to MRI interval (53.8±7.6 vs 70.2±4.44, $P=0.0031$; 7.4±2.3 vs 10.4±1.67, $P=0.046$) between VCR and control group, respectively. There was no statistic difference in other base line information, peak myocardial enzyme, and BNP. MVO and MVO mass ratio was significantly lower in VCR group (0.78±0.96 vs 2.80±1.37, $P=0.0317$; 0.00585±0.00080 vs 0.02493±0.01501, $P=0.0372$). TIMI III blood flow found in VCR group. Re-myocardial infarction nor target vessel revascularization was documented in-hospital or 30-days follow up.

Conclusion: Among the selected small sample cases, volume-controlled reperfusion method procedure was clinical safe and feasible without additional side effect. TIMI III blood flow and less MVO were documented.

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Comparison of Acute Angiographic Result And 1-year Clinical Outcome of Intravascular Ultrasound Versus Angiography Guided Percutaneous Cardiac Intervention For Patients With Chronic Total Occlusion

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Background: The impact of intravascular ultrasound (IVUS) on long-term clinical outcome in patients undergoing percutaneous coronary

intervention (PCI) for chronic total occlusion (CTO) is not well established. This study aimed to evaluate IVUS guided compared to angiography-only guided CTO-PCI on acute angiographic result and 1-year clinical outcome.

Methods: We analysed 528 consecutive patients undergoing CTO-PCI at a University affiliated hospital in Hong Kong from February 2009 to December 2016. Baseline patient characteristics, procedural characteristics, and 1-year clinical outcomes including cardiac death, non-fatal myocardial infarction (MI), target lesion revascularization (TLR), and composite target lesion failure (TLF) were evaluated. The use of IVUS, and the choice of PCI devices including plain old balloon angioplasty (POBA), bare metal stent (BMS), and drug eluting stent (DES), were at the discretion of the operator. Propensity score matching (PSM) was performed to reduce treatment selection bias and potential confounding factors.

Results: 275 patients underwent 288 angiography-only guided and 253 patients underwent 268 IVUS-guided CTO-PCI. IVUS-guided CTO-PCI was associated with higher procedural success compared to angiography-only guided CTO-PCI (77.5% vs. 55.3%, $p<0.001$). The types of PCI devices used showed significant group differences ($p<0.001$) where DES were used more often in the IVUS-guided CTO-PCI group compared with angiography-only guided group (85.3% vs. 65.6%), while BMS were used less in IVUS-guided CTO-PCI group (9.3% vs. 26.1%). After PSM for successful CTO stented patients, angiography-IVUS guidance was associated with more post stent balloon dilatation (84.7% vs. 56.3%, $p<0.001$), less residual stenosis (2.2% vs. 10.8%, $p<0.001$), longer total stent length (44.16 ± 23.88 mm vs. 33.52 ± 18.90 mm, $p<0.001$), larger final angiographic stented diameter (3.12 ± 0.63 mm vs. 2.94 ± 0.48 mm, $p<0.001$), and larger ratio of final angiographic stented diameter to stent diameter (1.10 ± 0.14 vs. 1.05 ± 0.09 , $p<0.001$). IVUS guided CTO-PCI was associated with lower 1-year TLF rates compared to angiography-only guidance (3.0% vs. 10.0%, $p=0.012$).

Conclusion: The use of IVUS was associated with higher success rates, more aggressive post-dilatation and better 1-year clinical outcomes compared to angiography-only guided strategy in CTO-PCI.

71 Heart Failure Outcomes Following Percutaneous Coronary Intervention in ST-elevation Myocardial Infarction Patients Based on a Novel Index: Computational Pressure-flow Dynamics Derived Fractional Flow Reserve

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Background: Computational fluid dynamics derived fractional flow reserve (caFFR) is a novel index for evaluating the severity of myocardial ischemia in patients with coronary artery disease, eliminating the need of pressure wire and hyperaemic stimulus required in traditional fractional flow reserve (FFR) measurement. After percutaneous coronary intervention (PCI) in ST-elevation myocardial infarction (STEMI) patients, there may be varying degree of residual ischemia in the involved artery, affecting clinical outcomes. We aimed at evaluating the clinical significance of post-PCI caFFR on heart failure (HF) outcomes in patients who presented with STEMI.

Method: A total of 230 patients (mean age 63.1 ± 13.5 , male 80%) who presented with STEMI and subsequently received PCI were included in this study. The caFFR values of these patients were computed based post-PCI angiograms. The primary endpoint was defined as a composite of HF related mortality and HF related hospitalization.

Results: The mean post-PCI caFFR was 0.91 ± 0.04 and the interquartile range was 0.89-0.94. The post-PCI caFFR was obtained in left anterior descending artery in 138 (60%) patients, left circumflex artery in 20 (8.7%) patients, and right coronary artery in 72 (31.3%) patients. The primary endpoint events occurred in 21 (9.3%) patients at 3 years. With multivariable adjustment, per 0.01 increase in post-PCI caFFR was associated with a significantly lowered risk of primary endpoint events at 3 years (adjusted hazard ratio [HR]=0.905; 95% confidence interval [CI]=0.840-0.973; $P=0.007$). When the components of primary endpoint were analyzed individually, per 0.01 increase in post-PCI caFFR was associated with significantly lowered risk of HF related mortality (adjusted HR=0.778; 95% CI=0.622-0.973; $P=0.028$) but not HF related hospitalization at 3 years (adjusted HR=0.981; 95% CI=0.865-1.111; $P=0.758$).

Conclusion: In patients who presented with STEMI, higher post-PCI caFFR is associated with significantly lowered risk of HF related outcomes at 3 years, mainly driven by the lowered risk of HF related mortality.

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Revascularization Vs Optimal Medical Therapy for Coronary Stenosis With Grey-zone caFFR

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Background: The optimal cut-off value of fractional flow reserve (FFR) for revascularization is debated. Existing studies on clinical decision-making in coronary stenosis with grey-zone FFR (0.75-0.80) yielded inconsistent results. Computational pressure-flow fluid dynamics derived fractional flow reserve (caFFR) is a novel angiography-derived index that correlates closely with conventional FFR. We evaluated the prognosis for revascularization vs optimal medical therapy in coronary stenosis with caFFR values in the grey zone.

Methods: This study retrospectively included 329 coronary stenosis with grey-zone caFFR, defined as 0.75-0.80, in 329 patients. The patients were stratified into those treated with revascularization ($n=197$) or optimal medical therapy alone ($n=132$). The primary outcome was major adverse cardiovascular events (MACE, defined as a composite of all-cause mortality, non-fatal myocardial infarction, and unplanned revascularization) at 3 years, and secondary outcomes included cardiovascular death (CV), recurrent episode of angina, and hospitalization for heart failure (HHF) at 3 years.

Results: The 3-year incidence rate of MACE was significantly higher in patients treated with optimal medical therapy compared to those treated with revascularization (18.2% vs. 9.6%, $P=0.024$), which was mainly driven by the rate of all-cause death (10.6% vs. 4.1%, $P=0.020$). The incidences of CV death and HHF were also significantly higher in patients treated with optimal medical therapy (6.1% vs. 1.5%, $P=0.031$; 8.3% vs. 3.0%, $P=0.034$, respectively). Multivariate Cox regression analysis demonstrated that revascularization was associated with a lower 3-year risk of MACE (adjusted Hazard Ratio [HR]=0.498; 95% Confidence Interval [CI]=0.272-0.910; $P=0.023$), CV death (adjusted HR=0.247; 95% CI=0.065-0.936; $P=0.040$), and HHF (adjusted HR=0.327, 95% CI=0.120-0.894; $P=0.029$). The risk of recurrent angina was nonetheless similar between the two groups (adjusted HR=0.623, 95% CI=0.368-1.056; $P=0.079$).

Conclusion: For coronary stenosis with grey-zone caFFR, revascularization was associated with improved 3-year MACE outcome compared to optimal medical therapy alone.

ABSTRACTS: STRUCTURAL HEART INTERVENTION

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A Retrospective Case Control Study on Efficacy of Stroke Prevention and Bleeding Risk Between Atrial Fibrillation Patients Who Had Left Atrial Appendage Occlusion (LAAO) Performed Against Patients Put on Non-vitamin K Antagonist Oral Anticoagulants (NOAC)

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Background: Stroke is one of the most devastating complication of Atrial Fibrillation. Both LAAO and NOAC are effective means for stroke prevention but head-to-head trial result is not available.

Objective: Our study is to determine the efficacy of LAAO versus NOAC on stroke (overall, ischaemic, haemorrhagic) prevention and bleeding risk (overall, gastrointestinal and intracranial haemorrhage).

Method: A single centre retrospective case-control study, targeting patients suffering from AF indicated for anticoagulation. Consecutive patients with LAAO performed or NOAC newly started between 1st February 2013 till 1st November 2017 were recruited, with outcome analysed until 31 August 2018. LAAO (Index) and NOAC (Control) cases were matched in 1:3 ratio with 3 criterias: 1) best matched CHA2DS2-Vasc score 2) best matched HAS-BLED 3) best matched intervention-to-analysis period and duration; for most valid comparison. Risk-free survival analysis was performed with Kaplan-Meier method, with differences compared by log-rank test. Multivariate analysis was performed on bleeding risk to isolate independent variables.

Results: 400 cases were included (100 LAAO, 300 NOAC).

There was no significant difference in stroke ($p=0.98$), ischaemic stroke ($p=0.78$) and haemorrhagic stroke ($p=0.84$) risk between the LAAO/NOAC groups. There was significantly less gastrointestinal bleeding ($p<0.005$) and overall bleeding ($p=0.02$) in the LAAO group, with relative risk reduction of 81% in overall bleeding. The overall bleeding was clinically significant as the majority of which was classified as "requiring medical attention" based on the TIMI bleeding grade. However, there was no significant difference in risk of intracranial hemorrhage ($p=0.98$).

Conclusion: LAAO was as effective as NOAC in stroke prevention, with decreased risk of gastrointestinal and overall bleeding.

ABSTRACTS: VALVULAR HEART DISEASE

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Prognostic Implication of Insufficient Cardiac Unloading Following TAVR

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Background: Several risk factors associating with clinical outcomes following transcatheter aortic valve replacement (TAVR) are known, whereas the implication of insufficient cardiac unloading following TAVR remains unknown.

Objectives: We investigated the prognostic impact of insufficient cardiac unloading following TAVR.

Methods: We retrospectively included the patients with severe aortic stenosis who underwent hemodynamic assessments using right heart catheterization following TAVR. The impact of elevated pulmonary capillary wedge pressure (PCWP) on cardiovascular mortality or heart failure readmission was investigated.

Result: Eighty-two patients (median 86 years old, 57 women) were included. Median PCWP following TAVR was 9 (7, 13) mmHg. A

higher PCWP was associated with the primary endpoint with 1.18 of adjusted hazard ratio (95% confidence interval 0.99-1.41). A cutoff of PCWP >11 mmHg stratified the cumulative incidence of the primary endpoint (2-year incidence of 31% versus 8%). The up-titration of diuretics dose was associated with the event freedom among those with PCWP >11 mmHg.

Conclusions: Insufficient cardiac unloading following TAVR was associated with clinical outcomes. The implication of aggressive intervention to improve mild pulmonary congestion is the next concern.

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Epidemiology of Infective Endocarditis in Hong Kong, 2000-2019

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Background: Despite improvements in therapeutic strategies, the mortality and morbidity of infective endocarditis (IE) remain high. The incidence and outcomes of IE, particularly in an Asian population, are poorly understood and characterised, and the effect of antibiotic prophylaxis guidelines revision on the incidence of IE remains unexplored. We aim to describe temporal changes in the epidemiology and surgery for IE in Hong Kong in the past 2 decades.

Methods: From a territory-wide database in Hong Kong, all patients aged 20 or above diagnosed with incident IE from 2000-2019 were included. Temporal trends in the incidence of IE, surgical intervention, and Charlson Comorbidity Index (CCI) were characterised using Poisson regression, expressed in annual percentage change (APC [95% CI]). Interrupted time series was used to evaluate the change in incidence after antibiotic prophylaxis guidelines revision. Temporal trends in 1-year all-cause mortality were evaluated using multivariable Cox regression.

Results: A total of 5,657 patients (59.9 ± 18.3 years, 37.2% females) were included. The crude incidence remained stable from 2000-2019, and remained unchanged following the revision of antibiotic prophylaxis guidelines in 2009 (relative risk of change=0.90 [0.64 to 1.00], $P=0.065$). Concordant with an increase in the mean age of IE patients (APC 0.9% [0.8 to 1.1], $P<0.001$), the comorbidity burden grew substantially from 2000 (CCI 0.55 ± 1.2) to 2019 (CCI 1.09 ± 1.66). The rate of surgery significantly increased from 5.3% in 2000 to 17.8% in 2019 (APC 2.7% [1.1 to 4.3], $P=0.004$), and surgery at 1 year was associated with a 45% risk reduction in 1-year all-cause mortality (Hazard Ratio 0.55 [0.46 to 0.65], $P<0.001$). Nevertheless, the crude all-cause mortality rate at 1 year increased from 27.4% in 2000 to 31.5% in 2019 (adjusted APC -0.7% [-1.6 to 0.1], $P=0.087$).

Conclusions: The incidence of IE did not change following the antibiotic prophylaxis guidelines revision. Patients with IE have evolved to be older and more comorbid. Despite an increasing rate of surgery, the mortality of IE remained irresistibly high.

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Microbiology of Infective Endocarditis in Hong Kong from 2000 - 2019: a 20-year Analysis

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Background: Infective endocarditis (IE) is associated with high mortality and complex microbiological profile. The antibiotic prophylaxis

guidelines underwent a major revision in 2009 to reduce unnecessary antibiotic exposure. The understanding on the microbiology in an Asian population is lacking. We aim to describe the trends in the microbiology of IE in Hong Kong in the past 2 decades.

Methods: All patients aged 20 or above diagnosed with incident IE with blood culture results from 2000-2019 were included from a territory-wide database in Hong Kong. Association between microbiology and 1-year all-cause death was evaluated using a multivariable Cox proportional-hazards model was used, adjusted with demographics and comorbidities. Temporal trends in the proportion of each organism were characterised using Poisson regression. Interrupted time series was used to evaluate the change in the organism-specific incidence after the revision of guidelines.

Results: In a total of 5,657 patients (age 59.9±18.3 years, 37.2% females), there were 2,185 (38.6%) patients with culture-negative endocarditis. *Staphylococcus aureus* (22.4%) was the most common organism identified. There was a significant reduction in the proportion of culture-negative endocarditis, and a significant increase in the proportion of endocarditis due to *Staphylococcus aureus* and Streptococci. After guidelines revision in 2009, there was no significant change in organism-specific incidence. Compared to patients with culture-negative endocarditis, those infected with *Staphylococcus aureus*, other Staphylococci, and Enterococci had a higher risk of 1-year all-cause death. There was a significant increase in the proportion of methicillin-resistant *Staphylococcus aureus* (MRSA) endocarditis (annual percentage change 4.1% [1.9 to 6.3], $P<0.001$), with no significant interval change after 2009. Patients infected with MRSA had a higher all-cause death (Hazard Ratio 2.00 [1.70-2.36], $P<0.001$).

Conclusions: Over time, there were fewer cases of culture-negative endocarditis, and the revision of antibiotic prophylaxis guidelines did not result in a significant change in the microbiological profile. There was an increasing trend for MRSA endocarditis, which was associated with a higher risk of death.

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Survival Benefits and Optimal Timing for Surgical Intervention for Infective Endocarditis

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Background: Albeit often indicated in infective endocarditis (IE), the benefits and optimal timing of surgery have not been validated in large-scale studies. We aim to address these knowledge gaps for patients with IE in Hong Kong.

Methods: From a territory-wide database in Hong Kong, patients aged 20 or above diagnosed with incident IE from 2000-2019 were included. Patients were divided into those who received surgical intervention within 1 year of IE (surgical cohort) and those who did not (control cohort). The two cohorts were then compared using inverse probability weighting of the covariate balancing propensity score. Multivariate Cox regression was used to evaluate the association between surgical intervention and death, with "doubly-robust estimation" used to minimise confounding. For complications, a Fine-Gray model was used to account for competing risk.

The surgical cohort was subdivided into early (≤7 days of hospitalisation) or late surgical intervention; a similar propensity score analytic approach was used to evaluate the effects of early vs. late intervention. **Results:** A total of 5,657 patients (age 59.9±18.3 years, 37.2% females) were included, of which 930 (16.4%) received surgical intervention in 1 year. The surgical cohort had a 45% risk reduction in all-cause death (hazard ratio [HR] 0.55, 95% CI [0.46-0.65], $P<0.001$), and the association remained consistent in subgroup analysis stratified by age, sex, and microorganisms.

The surgical cohort also had a lower risk of complications, including acute kidney injury (HR 0.61, [0.43-0.87], $P=0.006$), systemic embolism (HR 0.35 [0.23-0.55], $P<0.001$), ischaemic stroke (HR 0.37 [0.24-0.55], $P<0.001$), cardiac dysrhythmia (HR 0.79 [0.66-0.95], $P=0.011$), and pneumonia (HR 0.36 [0.26-0.49], $P<0.001$).

In the surgical cohort, compared to those who had early surgery (N=181), those with delayed surgery had a lower risk of all-cause death (HR 0.58 [0.34- 0.99], $P=0.045$) and complications at 1 year.

Conclusions: Surgical intervention significantly reduced the risk of death and complications in patients with infective endocarditis. Delayed surgical intervention appeared to be more protective.

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Prognostic Value of Combined Hepatorenal Dysfunction and Malnutrition in Patients Undergoing Valvular Heart Surgery

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Background: The discriminatory accuracy of valvular surgery risk-scoring systems is modest despite an increasing volume and complexity of valvular heart disease (VHD) patients. Hepatorenal dysfunction and malnutrition, as frequent extra-cardiac manifestations of VHD, may provide combined value for risk-stratification in valvular surgery. As such, we sought to evaluate the prevalence, temporal changes, and prognostic implications of concomitant hepatorenal dysfunction and malnutrition before and after valvular surgery.

Methods: Baseline and temporal changes in hepatorenal function (assessed by the modified model for end-stage liver disease [MELD-XI] score) and nutritional status (assessed by Controlling Nutritional Status [CONUT] score) were correlated with adverse events (composite of all-cause mortality and hospitalization for heart failure) using Cox proportional hazards analyses, adjusted with clinical and echocardiographic characteristics, medications, type of valvular intervention, and cardiac surgery risk-stratification models (EuroSCORE II and STS score).

Results: Overall, 909 patients undergoing valvular surgery were included in our study, of which 216 (24%) and 554 (61%) had hepatorenal dysfunction (MELD-XI >12.43) and malnutrition (CONUT³2), respectively. MELD-XI scores were modestly correlated with CONUT scores ($R=0.36$, $p<0.001$), with concomitant hepatorenal dysfunction and malnutrition present in 177 (19%) patients.

Over a median follow-up of 4.1 years, 101 (11%) patients died and 119 (13%) were hospitalized for heart failure. There was a stepwise increase in mortality ($c2$ 89.1, $p<0.001$) and adverse events ($c2$ 92.9, $p<0.001$) from patients with normal hepatorenal function and nutrition to concomitant hepatorenal dysfunction and malnutrition. This association remained consistent in fully adjusted models. MELD-XI and CONUT scores significantly improved the discriminatory accuracy of EuroSCORE II (area under the curve [AUC]: 0.80 vs 0.73, $p<0.001$) and STS score (AUC: 0.79 vs 0.72, $p=0.004$) for all-cause mortality.

In patients with MELD-XI and CONUT scores 1 year after surgery ($n=707$), DMELD-XI (follow-up MELD-XI minus baseline MELD-XI score) and DCONUT scores were significantly associated with adverse events (Hazard Ratio [HR] 1.08, 95% Confidence Interval [CI] 1.03- 1.14, $p=0.001$ for DMELD-XI; HR 1.18, 95% CI 1.02-1.35, $p=0.02$ for DCONUT). Patients with persistent hepatorenal dysfunction and malnutrition experienced worse survival (log-rank $c2$ 65.2, $p<0.001$) and adverse events (log-rank $c2$ 90.4, $p<0.001$).

Conclusions: Concomitant hepatorenal dysfunction and malnutrition is prevalent in patients undergoing valvular surgery. Their status at baseline and temporal changes after surgery are strongly associated with increased mortality and adverse events. These findings highlight

the prognostic importance of pre- and post-operative hepatorenal and nutritional assessment in valvular surgery.

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Contemporary Trends and Outcomes of Valvular Interventions in Hong Kong, 2001-2019

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Introduction: Valvular heart disease is a major health burden that carries a survival penalty only attenuated by surgical correction. Aging populations and transcatheter therapies have influenced the volume and risk profiles of patients undergoing valvular interventions, yet this paradigm shift has not been explored in an Asian population. Our study aims to describe the temporal trends in the incidence, patient profiles, and outcomes of valvular interventions in Hong Kong.

Methods: Using a well-validated territory-wide database, we identified patients aged ≥ 20 years who underwent valvular interventions between 2001 and 2019 in Hong Kong. Temporal trends in incidence and patient characteristics (age and mean Charlson Comorbidity Index [CCI]) were evaluated using Poisson regression analysis and expressed as annual percentage change (APC [95% CI]). Outcomes of interest include all-cause mortality and complications (infective endocarditis and new-onset atrial fibrillation), adjusted for baseline demographics and comorbidities.

Results: Overall, 11277 patients (age 58.8 ± 13.5 years, 51.9% male) were included in the study. The annual number of valvular interventions increased from 297 in 2001 to 860 in 2019 (APC 1.1% [0.8% to 1.5%], $P < 0.001$), which was the most prominent among patients ≥ 60 years of age. Concordant with an increase in mean age (APC 0.9% [0.9% to 1.0%], $P < 0.001$), patients' comorbidity burden grew substantially over time (APC 2.7% [2.3% to 3.1%], $P < 0.001$).

The total volume and proportion of aortic valve procedures grew significantly from 108 in 2001 to 462 in 2019 (APC 1.0% [0.4% to 1.5%], $P < 0.001$), which was contributed in part by an increase in transcatheter aortic volume implantation from 2011 to 2019 (APC 9.6% [5.2% to 14.4%], $P < 0.001$). Despite an increase in the volume of mitral valve procedures, their proportion has declined substantially (APC -2.0% [-2.5% to -1.6%], $P < 0.001$), whereby mitral valve repair (APC 3.4% [2.6% to 4.3%], $P < 0.001$) is increasingly performed compared to mitral valve replacement (APC -4.5% [-5% to -3.9%], $P < 0.001$).

The adjusted rates of 1-year mortality decreased from 12% in 2001 to 9% in 2019 (APC -2.1% [-3.2% to -0.9%], $P < 0.001$). Alarming, the rates of infective endocarditis (APC 2.3% [1.0% to 3.5%], $P < 0.001$) and new-onset atrial fibrillation (APC 2.5% [1.3% to 3.6%], $P < 0.001$) at 1-year after intervention increased significantly.

Conclusions: The burden of valvular interventions has grown substantially, with patients becoming older and more comorbid. Despite continuous improvements in short-term mortality, complications such as infective endocarditis and new-onset atrial fibrillation continue to climb, which calls for potential strategies for their reduction.

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Swan-Ganz Catheter Assessment of Aortic Stenosis: Comparison With Echocardiography

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Background: Hemodynamic assessment of aortic stenosis in the catheterization laboratory accurate determined by the transvalvular gradient. The most widely used invasive technique for more than a

decade has been performed with a Langston® Dual Lumen Catheter (Teleflex – Morrisville, NC), which has a 6Fr outer catheter and a 4Fr inner lumen enabling simultaneous measurement of left ventricular (LV) and aortic (AO) pressures. The catheter was recalled in March 2020 due to several instances of separation of the inner catheter during power injection. This leaves cardiologists without a straightforward technique for simultaneously measuring LV and AO pressures in the cath lab. A commercially available Swan-Ganz thermodilution pulmonary artery catheter can be used to obtain this gradient via a single arterial puncture. The catheter has similar advantages like Langston® Dual Lumen Catheter over other methods used to measure the gradient in aortic stenosis, but without safety concerns. However, it has not been critically evaluated.

Method: In order to assess the performance and accuracy of this catheter compared to the standard echocardiography pressure gradient, we studied 20 patients with aortic stenosis using Swan-Ganz thermodilution pulmonary artery catheter systems and standard transthoracic echocardiography.

Result: Calculated aortic valve areas in these groups of patients ranged from 0.23 cm² to approximately 1.65 cm². Correlation between gradients obtained by the two methods was strong as evaluated by regression analysis with an r value of 0.79 ($r^2 = 0.637$). No complications were encountered while using the Swan-Ganz catheter system.

Conclusion: We conclude that the Swan-Ganz thermodilution pulmonary artery catheter provides accurate data in the hemodynamic evaluation of aortic stenosis.

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Predictors and Prognostic Implications of Residual Tricuspid Regurgitation After Tricuspid Annuloplasty

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Background: Management of tricuspid regurgitation (TR) has evolved from conservative approaches to direct surgical correction of the tricuspid valve. The durability of tricuspid annuloplasty is, however, limited and recurrent TR occurs frequently. Nonetheless, risk factors and the prognostic impact of repair failure remain underexplored. The purpose of this study was to describe the prevalence, predictors, and prognostic implications of residual TR after tricuspid annuloplasty.

Methods: Between 2012 and 2019, 290 consecutive patients (age 63 ± 9 years, 63% female) underwent transthoracic echocardiography pre-operatively, early post-operatively (8 days, interquartile range [IQR] 6 to 8 days), and > 1 year (584 days, IQR 450 to 829 days) after tricuspid annuloplasty. Echocardiographic determinants of residual TR (defined as moderate or greater severity by echocardiography) were identified using logistic regression, and residual TR was correlated with adverse events (composite of all-cause mortality and heart failure hospitalization) using Cox proportional hazards analysis.

Results: At 1 week and > 1 year after tricuspid annuloplasty, residual TR was present in 44 (15%) and 47 (16%) patients respectively. During this period, 19 (7%) patients experienced TR progression by ≥ 1 grade. Independent risk factors for residual TR were pre-operative right atrial pressure (Odds Ratio [OR] 1.08, 95% Confidence Interval [CI] 1.01-1.14; $p = 0.02$), tricuspid annulus diameter (OR 1.08, 95% CI 1.03- 1.14; $p < 0.01$), and right ventricular end-diastolic and end-systolic areas (OR 1.08, 95% CI 1.03-1.13; $p < 0.01$ for both). TR progression was predicted by pre-operative tricuspid valve regurgitant volume (OR 1.01, 95% CI 1.00-1.02; $p < 0.01$) and right ventricular diastolic area (OR 1.07, 95% CI 1.01-1.14; $p = 0.02$).

Over a median follow-up of 4.4 years (IQR: 2.7 to 6.3 years), 63 adverse events (40 heart failure hospitalization and 23 deaths) occurred. Compared to patients without residual TR, those with residual TR 1

week or >1 year after tricuspid annuloplasty incurred an excess risk of adverse outcomes (Hazard Ratio [HR] 1.98, 95% CI 1.07-3.67 and HR 1.86, 95% CI 1.05-3.29 respectively; $p=0.03$ for both). Nonetheless, TR progression was not significantly associated with adverse events at long-term follow-up ($p=0.391$).

Conclusions: TR persists in a significant proportion of patients after tricuspid annuloplasty. Right atrial pressures and right ventricular dimensions identify patients at high risk of residual TR which confers a heightened risk of adverse outcomes following surgery.

ABSTRACTS: OTHERS

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EGCG Prevents Pressure Overload-induced Myocardial Remodeling Through Downregulating HDAC5 Overexpression in Mice

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We investigated whether epigallocatechin gallate (EGCG) could prevent myocardial remodeling by regulating histone acetylation and explored the mechanisms underlying this effect in the hearts of a mouse model of transverse aortic constriction (TAC). A TAC mouse model was created by partial thoracic aortic banding (TAB). Subsequently, TAC mice were injected with EGCG at a dose of 50 mg kg⁻¹day⁻¹ for 12 weeks. In TAC mice of 4 weeks, 8 weeks and 12 weeks, acetylation level of histone acetylated lysine 27 on histone H3 (H3K27ac) first increases and then decreases, and the expression levels of genes related to pathological myocardial remodeling, Atrial natriuretic peptide (ANP) and Brain natriuretic peptide (BNP), also increase first and then decrease. The expression of histone deacetylase 5 (HDAC5) gradually increased in TAC mice. More importantly, this study showed that EGCG increased acetylation of H3K27ac by inhibiting HDAC5 in TAC mice. Meanwhile, EGCG normalized the transcriptional activity of heart nuclear transcription factor MEF2A in TAC mice. The low expression of myocardial remodeling-related genes (ANP and BNP) was reversed through EGCG treatment in TAC mice. In addition, we found that EGCG can reverse cardiac enlargement, and improve cardiac function and survival rate in TAC mice. HDAC5-mediated histone H3K27ac imbalance plays a critical role in pathological myocardial remodeling, and EGCG can prevent and postpone myocardial remodeling through inhibiting HDAC5 in TAC mice.

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Renal Outcomes of Novel Oral Anticoagulants Among Patients With Atrial Fibrillation

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Background: Chronic oral anticoagulation is needed for thromboembolic stroke prophylaxis for patients with atrial fibrillation. Evidence showed novel oral anticoagulants (NOACs) have better renal outcome compared to warfarin. It is not known if this is a class effect or if intra-class differences exist.

Methods: Using a database of Hospital Authority of Hong Kong, 1164 patients with nonvalvular atrial fibrillation taking either one of the NOACs (dabigatran, rivaroxaban and apixaban) before 31st December, 2017 were identified. Inverse probability of treatment weighting was used to balance the baseline characteristics. Combined primary endpoint included renal outcomes, including thirty percent decline in

estimated glomerular filtration rate, acute kidney injury, doubling of serum creatinine and renal failure. Cox proportional hazard regression was performed to compare the three drugs.

Results: Rivaroxaban was associated with increased risk of combined primary endpoint compared to dabigatran (Hazard ratio 1.401, 95% confidence interval 1.17 to 1.67, p -value <0.001). There were no statistically significant differences between rivaroxaban and apixaban, as well as between dabigatran and apixaban.

Conclusion: Renal function decline is common among patients taking NOACs for stroke prophylaxis. Intra-novel oral anticoagulant differences exist in terms of adverse renal outcomes.

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Cardiovascular Safety of Novel Oral Anticoagulants Among Patients With Atrial Fibrillation

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Background: Novel oral anticoagulants (NOACs) are effective in reducing risk of thromboembolic stroke among high risk patients with atrial fibrillation. Evidence showed that NOACs, especially dabigatran, might be associated with higher risk of myocardial infarction. It is not known whether the available NOACs are different in terms of cardiovascular safety profile.

Methods: Using a database of Hospital Authority of Hong Kong, 1161 patients with nonvalvular atrial fibrillation taking either one of the NOACs (dabigatran, rivaroxaban and apixaban) before 31st December, 2017 were identified. Inverse probability of treatment weighting was used to balance the baseline characteristics. Combined primary endpoint included risk of myocardial infarction and sudden cardiac death. Secondary endpoints included the risk of major adverse cardiovascular outcomes, myocardial infarction, cardiovascular death, hospitalization for heart failure, stroke and fatal bleeding. Cox proportional hazard regression analyses were performed to compare the three NOACs and direct thrombin inhibitor versus factor Xa inhibitors collectively.

Results: Rivaroxaban, apixaban and factor Xa inhibitors were associated with trend of lower incidence of combined primary endpoint of myocardial infarction plus sudden death compared to dabigatran (HR 0.72, 0.58 and 0.67, p -value 0.195, 0.242 and 0.082 respectively). There were no statistically significant differences between rivaroxaban and apixaban.

Conclusion: Intra-NOACs differences could exist in terms of cardiovascular safety profile among patients with atrial fibrillation.

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The Impact of Hyperhomocysteinemia, MTHFR Genotype and Air Pollution (PM2.5) on Atherogenesis in Modernizing China

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Background: Atherosclerosis is one of the most important global health hazards in 21st century, in modernizing China in particular, and air pollution (AP) has been implicated. Hyperhomocysteinemia (HC) and MTHFR CT polymorphism have been recognized in many parts of China.

Methods: To evaluate the prevalence of HC (fasting HC >14 mmol/l) and impact on atherogenic process, 756 asymptomatic subjects (mean age 45.3±11.7 years, male 54%) in Southern China (Hong Kong,

Macau, Pan Yu) and Northern China (Yu County of Shanxi, and 3 Gorges Territories) were studied in 1998-2007. Blood were taken for fasting HC (immunoassay), folate and vitamin B12, and MTHFR CT genotyping. PM2.5 exposure (satellite remote sensor and modeling) and metabolic syndrome (IFD criteria) were noted. Brachial flow-mediated dilation (FMD) and carotid intima-media thickness (IMT), both predictive atherosclerotic surrogates, were evaluated by ultrasound.

Results: Overall homocysteine level was 17.2 16.5 mol/l, lower tertile 7.4 1.2 mol/l and top tertile 32.6 21.3 mol/l, being higher (24.5 20.3 mol/l) in northern Chinese than southern Chinese (9.6 4.3 mol/l, $p < 0.0015$). The northern Chinese were characterized by lower folate and vitamin B12 levels, higher MTHFR TT genotype, higher PM2.5 exposure, higher metabolic syndrome (MS), lower FMD but higher carotid IMT ($p < 0.01$).

On multivariate regression, HC was related to MTHFR ($\beta = 0.370$, $p < 0.0001$), folate ($\beta = -0.117$, $p = 0.018$) and Vitamin B12 ($\beta = -0.093$, $p = 0.048$), but not to PM2.5 levels. Brachial FMD was related to PM2.5 ($\beta = -1.0$, $p = 0.028$), but not to HC or MTHFR independent of age and gender, while carotid IMT was related to HC ($\beta = 0.125$, $p = 0.004$), PM2.5 ($\beta = 0.389$, $p < 0.0001$) but not to MTHFR, independent of age, gender, MS, LDL-cholesterol and location.

Conclusions: Hyperhomocysteinemia and MTHFR-TT are more common in Northern China, associated with lower blood folate and vitamin B12, but higher PM2.5 levels. Hyperhomocysteinemia and PM2.5 but not MTHFR genotype are related to carotid IMT, independent of other traditional risk factors, with implications in dietary and AP strategies for atherosclerosis prevention.

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Genetic Analysis of the ISL1 Gene Promoter in Isolated And Sporadic Congenital Ventricular Septal Defects

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Purpose: Ventricular septal defect (VSD) is the most common congenital heart defect, resulting from interaction and correlation between genetic and environmental factors. Previous studies have reported ISL1 gene is highly associated with cardiac malformation, but the impact of the ISL1 gene promoter mutation on VSD patients has not yet been explored.

Methods: A total of 400 subjects (VSD patients: healthy controls=200:200) were recruited. The mutation of ISL1 gene promoter and related cellular functional experiments were investigated. Electrophoretic mobility shift assay (EMSA) experiments were performed to confirm the impact on gene expression

Results: There were 8 significant mutations identified by Sanger sequencing in the ISL1 gene promoter region. Using dual-luciferase reporter assay, three of the 8 mutations significantly decreased the transcriptional activity of the ISL1 gene promoter in HEK-293 cells ($P < 0.05$). EMSA revealed that these three significant mutations affected the binding affinity of transcription factors. Further, bioinformatic analysis with the JASPAR databases showed that a cluster of putative binding sites for transcription factors was disrupted by these mutations. Subsequently, this likely causes low expression of ISL1 protein and development of VSD.

Conclusions: Our study for the first time demonstrates genetic mutations in the ISL1 gene promoter in the Han Chinese population and the role of these mutations in the development of VSD, providing new insights into the etiology of congenital heart defect.

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The Correlations Between Biomarkers of Cardiometabolic Diseases in Hong Kong Chinese

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Background: Besides adiponectin, novel biomarkers of cardiometabolic syndrome now include growth differentiation factor-15 (GDF-15) and galectin-3. We investigated their relationship with obesity, C-reactive protein (CRP) and beta-2 microglobulin (B2M).

Methods: 25 healthy subjects (12 male, 13 female; 20.4 ± 1.29 years) were recruited. Anthropometric measurements including body weight and waist circumference were made. Serum samples were collected and serum biomarker levels were measured by enzyme-linked immunoassay (Antibody and Immunoassay Services, The University of Hong Kong). Pearson's correlation coefficients were determined, after logarithmic transformation where appropriate.

Results: Mean serum levels of GDF-15, adiponectin, galectin-3, B2M and CRP were 107.7 ± 63.7 ng/mL, 17567 ± 8327.8 ng/mL, 30.5 ± 18.0 ng/mL, 1277.8 ± 301.8 ng/mL and 753.6 ± 1190.1 ng/mL respectively. Serum B2M correlated significantly with CRP ($r^2 = 0.61$, $p = 0.001$). Serum GDF-15 correlated significantly with waist circumference ($r^2 = 0.49$, $p = 0.013$). In men, serum adiponectin (mean = 16564.3 ± 7043.1 ng/mL) correlated inversely with weight (mean = 66.4 ± 8.02 kg) ($r^2 = -0.70$, $p = 0.012$). In women, serum galectin-3 (mean = 31.5 ± 21.1 ng/mL) correlated inversely with weight (mean = 50.7 ± 2.90 kg) ($r^2 = -0.71$, $p = 0.007$).

Conclusions: Our preliminary findings suggest that GDF-15 and galectin-3, like adiponectin, are also biomarkers related to obesity. There appears to be some sex differences that warrant further investigation. Besides being biomarkers, they may also be potential therapeutic targets for cardiometabolic diseases.

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Outcomes of Percutaneous VA-ECMO Decannulation Using ProGlide and Manta Devices in Queen Elizabeth Hospital

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Background: When veno-arterial extracorporeal membrane oxygenation (VA-ECMO) support can be terminated, arteriotomy wounds closure by percutaneous devices was shown to have comparable outcomes to traditional surgical open repair. Moreover, transport of the critically-ill, man-power and timeslots of operating theaters could be saved if percutaneous decannulation is performed at bedside.

Methods: In the Intensive Care Unit of Queen Elizabeth Hospital, bedside decannulation was the default VA-ECMO decannulation method since November 2018. Ultrasound guided ProGlide post-close technique was first employed with the ECMO arterial wound closed by 2 to 3 ProGlide stitches applied at different angles. Since March 2010, Manta, a collagen-based closure device was also employed. The success rate, procedural details and the immediate complications were

compared between the 2 techniques.

Results: Between November 2018 and March 2021, Eighty-two patients received VA-ECMO and 48 survived to decannulation. All were decannulated percutaneously by bedside. Forty were decannulated using ProGlide and 8 were by Manta. Overall, forty-three (89.6%) had successful bedside decannulation, with success rate of 87.5% with ProGlide and 100% for Manta respectively. For the ProGlide group, the arteriotomy wounds were of 19Fr for 1; 17Fr for 21 and 15Fr for 18 patients. For the Manta group, one patient had 17Fr catheter and the rest were of 15Fr. In the ProGlide group, two ProGlide devices were used in 22 (55%) patients, three were used in 17 (42.5%) patients and 4 were used in one patient, while one Manta was used in each patient in the Manta group. There was no statistically significant difference in clinical outcomes including mortality, ventilator days and length of stay. The procedure time (49 (15-67) min vs 40 (26-52) min) and the blood loss (150 (122-320) mL vs 40 (20-200) mL) were similar between the ProGlide group and the Manta group. Minor complications were found in 4 (19.1%) patients in the ProGlide group, including two arterial clot formation, one pseudoaneurysm and one wound infection. There were no other major complications.

Conclusions: The 2 bedside percutaneous techniques resulted in similar clinical outcomes and complications rate. Larger studies can further investigate the difference between the 2 techniques. Other factors which could affect the choice of devices include cost, learning curve, case load of the center, the vascular conditions, presence of septicemia, ultrasound image quality and possibility of rewiring in case of failed hemostasis. Plan B and standby support by vascular surgeon were paramount.

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Genetic Analysis of the MEF2C Gene Promoter in Isolated Congenital Ventricular Septal Defects

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Purpose: Ventricular septal defect (VSD) is the most common congenital heart defect. Previous studies have reported genetic variations in the encoding region of MEF2C highly associated with cardiac malformation but the role of MEF2C gene promoter variations in VSD patients has not been genetically analyzed. We investigated the role of variations of MEF2C gene promoter in pediatric VSD patients.

Methods: This study enrolled 400 Han Chinese subjects (200 VSD patients and 200 healthy controls). The promoter region of the human MEF2C gene was generated by PCR and sequenced. The firefly luciferase reporter gene plasmid (pGL3-basic) expression vectors including variations was constructed and then transfected into HEK-293 cells. Dual-luciferase reporter assay system measured the luciferase activities. A bioinformatic analysis with the JASPAR databases was also performed.

Result: A total of six variations were identified by Sanger sequencing in the MEF2C gene promoter region. Using dual-luciferase reporter assay, two of the 6 variations identified significantly decreased and other two variations significantly increased the transcriptional activity of the MEF2C gene promoter in HEK-293 cells ($P < 0.05$). Further, bioinformatic analysis with the JASPAR databases showed that a cluster of putative binding sites for transcription factors was disrupted

by these mutations, likely causing low or over expression of MEF2C protein and development of VSD.

Conclusion: Our study for the first time demonstrates genetic variations in the MEF2C gene promoter in the Han Chinese population and the role of these variations in the development of VSD. Further studies are warranted to reveal the exact role of these findings in the development of congenital VSD.

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Simple Lifestyle Indicator Questionnaire for Cardiovascular Risk Among Medical Students in Malaysia

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Background: Cardiovascular disease (CVD) is the leading cause of premature death and inflicted huge financial burden for non-communicable diseases (NCDs). Five cardiovascular risk factors involving lifestyle have been identified as physical activity, diet, smoking, alcohol consumption and stress. Identifying the underlying risk of disease is important to manage CVD, subsequently reducing the burden in the developing countries. This study evaluated the impact on various lifestyle factors determining CVD risk among the medical students.

Methods: We conducted a cross-sectional study among medical students in a public university in Malaysia. Simple Lifestyle Indicator Questionnaire (SLIQ) was administered to all students and their anthropometric measurements were collected by using calibrated standardized digital weighing scales. Basic demographic data were also collected, and all data were analyzed by using the Statistical Package for Social Sciences (SPSS) version 16.0 with statistical significant set at $p < 0.05$.

Results: A total 319 medical students participated with majority of female students (74.6%) and mean age of 21 years (standard deviation, $SD = 1.58$). None of them have any predisposing chronic medical illness associated with CVD risk. We found out that almost a quarter of them with high body mass index (BMI) with overweight and obese reported to be 17.9% and 4.7% respectively. From our analysis of SLIQ scoring, 55.8% were classified as intermediate risk for CVD (mean score = 6.33, $SD = 0.76$) and the remaining students with healthy scoring (mean score = 8.33, $SD = 0.54$), with $p < 0.001$. Majority consumed moderate healthy diet (55.2%), engaged in vigorous physical activities (57.1%), had intermediate stress level (70.5%) and did not consume alcohol (mean = 0.07, $SD = 0.46$) or smoke (96.9%). From our analysis by using Logistic regression, the odds ratio (OR) for overweight group showed 4.3 times healthier lifestyle compared with obese group ($p = 0.04$).

Conclusion: SLIQ correlates with healthy lifestyle and can be used as screening tool for CVD risk assessment. The majority of medical students from our study had moderate risk for CVD based on SLIQ

scoring and thus, it is important to look into the lifestyle factors that could possibly contributed to the risk. Primary prevention of CVD should be carried out by obesity intervention and lifestyle modification in accordance to global target for better control of NCDs.

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Angiotensin-converting Enzyme Gene Polymorphism in the Prognosis of Cardiovascular Disorders in Patients with Asthma

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Damage to the cardiovascular system in the form of dysmetabolic cardiomyopathy, myocardiosclerosis or pulmonary heart disease is one of the serious complications of asthma. It was found that the predictor of such changes is endothelial dysfunction. Polymorphism of the angiotensin converting enzyme (ACE) gene can be considered as one of the markers of endothelial dysfunction.

Aim of the study: to assess the diagnostic and prognostic value of insertion-deletion polymorphism of the ACE gene in the implementation of cardiovascular events in patients with asthma.

Methods: ACE gene polymorphism was studied using the "SNP-express" diagnostic test system ACE Alu Ins/Del I>D. Analysis of polymorphic DNA loci was carried out by the method of polymerase chain reaction of DNA synthesis followed by electrophoretic detection.

Results: In 60 patients with asthma the genotypic ratios of the ACE gene were presented as follows: I/I genotype was registered in 11.7% of cases, I/D - in 35% and unfavorable mutant D/D genotype - in 53.3% of patients. Comparison of genotypes with clinical manifestations of the asthma showed that the fourth stage of the disease was registered in 30 out of 32 patients with the D/D genotype, and in two cases the third. It was found that in patients with a pathological mutation, the exacerbation of the disease in 90.6% of cases was accompanied by a moderate increase in blood pressure (systolic up to 155.2±3.4 mm Hg and 87.3±3.2 mm Hg), rhythm disturbances (extrasystole in 59.4% of patients and paroxysmal tachycardia in 28.1%) and conduction (12.5%). Changes in blood pressure in patients with I/D genotype were recorded in 33.3%, rhythm disturbances in 19% and 14.3%, respectively, and conduction disturbances in 9.5%; patients with normal I/I genotype had an increase in blood pressure in 14.3% cases, extrasystole - in 14.4%, conduction disturbances were not recorded.

Conclusions: The presence of the mutant genotype D/D of the ACE gene in patients with asthma makes it possible to predict a severe course of the disease with frequent exacerbation of bronchopulmonary pathology and hemodynamic disorders. The determination of the genotypic structure of the ACE gene can be used to predict cardiovascular disorders in patients with asthma and, therefore, to develop issues of prevention and treatment of such patients.

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Large Gaps in Awareness of Peripheral Arterial Disease in Hong Kong: A Cross Sectional Study

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Background: Peripheral arterial disease (PAD) is prevalent and associated with significant cardiovascular (CV) mortality and morbidity. However, PAD awareness is low and there is paucity of published literature on public awareness of PAD in Asian countries.

Purpose: We aimed to assess awareness of PAD among adults in Hong Kong. The survey is designed to measure knowledge of risk factors for PAD and consequences of having PAD. Insights into public awareness

of PAD will help develop strategies for behavioral change communication and health promotion.

Methods: We conducted a cross-sectional study to assess awareness of PAD in 1,008 adults (mean age 64.0±11, 53.2% male) attending outpatient clinics at the Prince of Wales Hospital. Participants' awareness was classified as (i) not heard about the disease; (ii) heard but could not describe the disease; and (iii) heard about and could describe the disease. Bivariate analysis for awareness of PAD by selected participant characteristics was performed, and differences between groups were analyzed with Pearson's chi-square tests. Multivariate logistic regression analysis was used to assess independent predictors of awareness of PAD.

Results: Awareness of PAD was low (63%) compared with other CVD and CV risk factors such as hypertension (99.5%), diabetes (98.6%), hyperlipidemia (99.5%), coronary artery disease (CAD 93.5%) and cerebrovascular disease (CVD 97.8%, p<0.01). Awareness of risk factors for PAD, CAD and CVD was high (70-93%) in both the PAD aware and unaware populations (p=NS). This suggested a generally high awareness of CV diseases and risk factors but specifically for PAD. Among patients who were aware of PAD, most associated the disease with walking difficulties (90%) and blood clots (76%) but much fewer were aware of more serious CV complications of PAD including death, heart attack, stroke and limb loss (57-66%).

Conclusion: Overall awareness of CV diseases and risk factors was high. However, awareness of PAD was significantly lower compared to other CV diseases and risk factors. Education needs to focus on raising awareness of the seriousness and potential CV complications of PAD which are comparable to that of CAD and CVD.

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Effect of Sodium-glucose Co-transporter 2 Inhibitors On Cardiovascular Outcomes in Patients With Chronic Kidney Disease: Hong Kong-wide, Observational, Propensity Score Matched Analysis

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Purpose: Sodium-glucose cotransporter 2 inhibitors (SGLT2i) are associated with lower risk of cardiovascular death (CV death) in patients with chronic kidney disease (CKD). We aimed to compare CV death between new users of SGLT2i versus non-users in patients with CKD.

Methods: All patients with chronic kidney disease who were prescribed SGLT2i between August 2015 and August 2020 in 16 public hospitals in Hong Kong were identified. Patients with baseline estimated glomerular filtration rate (eGFR) =30 ml per minute per 1.73 m² were included in analysis. Propensity-matched cohorts of SGLT2i users and non-users (n=4,632 per group) were generated on the basis of baseline eGFR, etiology of CKD (i.e., diabetic or non-diabetic), gender and age. Time to CV death was analyzed using COX proportional hazards model. Subgroup analysis was performed to detect any heterogeneity of effect across stages of CKD.

Results: SGLT2i users and non-users groups were well balanced at baseline (mean age 65.0±12.5, female 38.1%), with a median follow-up of 3.7 (IQR: 1.6- 5.2) years (32,523.5 person-years). Overall, utilization of SGLT2i was associated with reduced risk of CV death (Hazards Ratio (HR) 0.60 (95% CI 0.44 to 0.82), compared with non-users. Subgroup analysis detected heterogeneity of effect, with a numerically lower risk with SGLT2i users in G3a group and statistically marked lower risk in G3b group. The effect was not significant across other earlier CKD stages (P for interaction<0.001).

Conclusion: Utilization of SGLT2i was associated with decreased risk of CV death compared with non-users in a real-world setting and a population with stage G3b CKD. Our findings indicated SGLT2i might improve CV outcomes among patients with moderate to severe CKD.

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The First Systematic Athlete Pre-participation Screening Program in Hong Kong

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Background: Sudden cardiac death is the leading medical cause of mortality in young athletes. However, international consensus on the roles of routine pre-participation electrocardiography (PP-ECG) screening for athletes is lacking. We aim to study the efficacy of PP-ECG in professional athletes.

Method: We performed routine PP-ECG for all professional athletes in Hong Kong Sports Institute (HKSI). Standardized electrocardiograms (ECGs) interpretation was performed by 3 independent physicians according to the 2017 International Criteria for Electrocardiographic Interpretation Consensus.

Result: Between Dec 2020 and April 2021, 848 athletes received PP-ECG (mean age 22.8±8.3 years, 485 males). Abnormal ECGs were identified in 28 athletes (3.3%), among whom only 23 (2.7%) (mean age 21±5.6 years, 11 males) fulfilled the consensus criteria. The ECGs abnormalities included pre-excitation (N=7), QTc prolongation (N=7), T wave inversion (TWI) (N=3), frequent ventricular ectopics (VE) (N=3), right bundle branch block (BBB) with left axis deviation (LAD) (N=1), left BBB (N=1) and left atrial enlargement (LAE) with LAD (N=1). Among the 7 athletes with pre-excitation, 1 received catheter ablation. One had incomplete suppression of pre-excitation during treadmill and would require cardiac electrophysiology study. Four had complete suppression of pre-excitation during treadmill and were allowed to resume competitive sports. One was pending treadmill. Among the 7 athletes with QTc prolongation, one had clinical diagnosis of congenital long QT syndrome and was disqualified from competitive sports participation. Rest of the 6 athletes had normal QTc upon reassessment resting or post-stress ECG. Among the 3 athletes with frequent VE, 1 received catheter ablation and 2 were managed conservatively. One athlete with LAE and LAD had atrial septal defect (ASD) requiring closure. One athlete with abnormal TWI had mitral valve prolapse. Rest of the athletes with BBB and TWI had unremarkable follow-up investigations.

The remaining 5 athletes (mean age 24.6±8 years, 3 males) (0.6%) were regarded as having abnormal ECG basing on clinical assessment, new onset interval ECG changes or discordance between exercise training intensity and ECG abnormalities. All had unremarkable follow-up investigations.

Conclusion: We conducted the first systematic PP-ECG screening program for professional athletes in Hong Kong. The screening program yielded an abnormal ECG rate of 2.7%. Cardiac interventional procedures were indicated in 3 out of the 23 athletes. One athlete was disqualified from competitive sports participation. PP-ECG is helpful in identifying asymptomatic serious cardiac pathologies that might increase the risk of exercise-related sudden cardiac death in athletes.

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A Community-based, Cross-sectional Study on Knowledge, Attitude, And Awareness of Cardiovascular Diseases

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Background: To study the level of awareness about cardiovascular diseases among the general population and provide an awareness

lecture that included information about the risk factors, major symptoms, and prevention of cardiovascular diseases.

Methods: All residents who live in the western region of Saudi Arabia aged 18 years and above will be invited to participate voluntarily. A pre-structured questionnaire was designed to collect data on age, gender, marital status, education level, occupation, lifestyle habits, and history of heart diseases, with cardiac symptoms, and risk factors sections. Educational material was provided at the end of the questionnaire.

Results: The majority of respondents were females (74.8%). Lack of exercise, stress, and obesity were the most identified risk factors. Chest pain recognized as the major Cardiovascular disease symptom (87.6%). Other symptoms include dyspnea, syncope, and excessive sweating. The knowledge about cardiovascular disease risk factors was poor. Only (18.5%) showed excellent responses regarding risk factors awareness. 60% were successful in identifying preventable factors for Cardiovascular diseases: smoking cessation (92.2%), cholesterol level (88.6%), and blood pressure (78.7%) 83.7% of the participants have attended the awareness lecture in whom 99% of the attendees reported that the lecture increased their knowledge about cardiovascular disease.

Conclusion: A lack of knowledge about cardiovascular symptoms and risk factors is alarming in our population. A call of action is highly needed. A simple educational material in a basic language is a useful tool.

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Add-on Therapy With Sodium-glucose Co-transporter 2 Inhibitors to ACEI/ARB Reduced Cardiovascular Mortality Across the Spectrum of Chronic Kidney Disease Stage

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Purpose: Sodium-glucose co-transporter 2 inhibitors (SGLT2i) reduced risk of cardiovascular death (CV death) in patients with chronic kidney disease (CKD) in randomized controlled trials. Whether add-on therapy with SGLT2i further lowers residual CV risk in patients already on ACEI/ARB is unknown. We aimed to compare CV death between ACEI/ARB alone versus combination of SGLT2i and ACEI/ARB in patients across spectrum of CKD.

Methods: Patients with stage 1-3b CKD (defined as baseline estimated glomerular filtration rate (eGFR) ³30 ml per minute per 1.73 m²) on ACEI/ARB between August 2010 and August 2015 in 16 public hospitals in Hong Kong were identified from electronic medical records. Time to CV death was analyzed using COX proportional hazards model, adjusted for baseline eGFR, gender and age. Add-on therapy with SGLT2i was handled as time-varying variable. Patients initiating SGLT2i contributed follow-up time to the ACEI/ARB single regimen group until SGLT2i initiation and then to the combination treatment group thereafter. Subgroup analysis was performed to detect effect heterogeneity between stages of CKD.

Results: Of 16,678 patients, 8.8% (n=1,467/16,678) were in stage G1, 30.3% (n=5,056/16,678) stage G2, 32.5% (n=5,413/16,678) stage G3a and 28.4% (n=4,742/16,678) stage G3b. SGLT2i was prescribed in 29.4% (n=4,901/16,678) of CKD patients on ACEI/ARB (mean age 68.3±12.8, female 39.4%), with a median follow-up period of 1.5 (IQR: 0.9-2.9) years. Compared to ACEI/ARB therapy alone, add-on SGLT2i was associated with reduced risk of CV death in patients with Stage 2 (Hazards Ratio (HR): 0.56, 95%CI: 0.31-1.02), 3a (HR: 0.47, 95%CI: 0.25-0.87) and 3b (HR: 0.33, 95%CI: 0.14-0.74) but not in Stage 1 CKD patients.

Conclusion: SGLT2i added to ACEI/ARB was associated with decreased risk of CV mortality in patient with Stage 2 to 3b CKD irrespective of diabetic status is a real-world setting.