H-S01 Left Ventricular Measurement by Fully Automated Three-Dimensional Echocardiography Software

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The application of fully automated software for three-dimensional echocardiography (3DE) was investigated for precise left ventricular (LV) volume and ejection fraction (EF) measurements, with a focus on comparison with cardiac magnetic resonance (CMR) techniques. In an original investigation study, we aimed to establish the optimal threshold setting for this software. A total of 65 patients who underwent both 3DE and CMR exams were analyzed. By adjusting the LV global border threshold, LV end-diastolic volume (LVEDV) and LV end-systolic volume (LVESV) were measured and contrasted with CMR using disk-area summation and feature tracking methods. Setting the threshold around 80-90 enabled reliable LV volumes and EF approximation of CMR-derived measurements.

In a systematic review and meta-analysis study, encompassed 12 relevant studies involving 616 subjects. The fully automated 3DE software was compared against CMR, and results indicated mean differences of approximately -20 mL for LV end-diastolic volume, -11 mL for LV end-systolic volume, and minimal variation (0.4%) for EF. Strong correlations (0.85-0.91) between the two methods supported the software's potential for reliable clinical practice. While 3DE slightly underestimated LV volumes, EF measurements aligned well with CMR. In summary, fully automated 3DE software offered feasible and accurate measurements of LV volumes and EF. These findings underscored the software's potential as a valuable tool for non-invasive cardiac assessment, with promising implications for routine clinical use.

H-S02 Echocardiographic Assessment of Prosthetic Valve Dysfunction

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Surgical or transcatheter valvular replacement is the main method to treat cardiac valve dysfunction. Numbers of patients with prosthetic cardiac valves are growing worldwide, and we are also encountering more prosthetic valve dysfunction than the past. Echocardiography is the method of choice to be used to evaluate prothetic valves. However, because of the unique physical features between prothetic and native valves, the classification of their dysfunction is quite different. Leaflet thrombosis, patient-prosthetic mismatch, local high gradient, and paravalvular regurgitation are some of the main problems of prosthetic valves. To accurately identify the problems, the importance of a comprehensive guideline-based echocardiographic exam could not be emphasized more. In this talk, we will focus on the essentials of echocardiographic evaluation of prosthetic cardiac valves.

H-S03

The Role of Echocardiography in Cancer Therapy - Related Cardiac Dysfunction

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Cancer therapy, while lifesaving, often poses a significant risk of developing cardiac dysfunction as a side effect, which can lead to potentially serious complications. As advancements in cancer treatment have improved patient outcomes, the incidence of cancer therapy-related cardiac dysfunction (CTRCD) has become more prevalent. Identifying this

complication early and accurately is crucial for effective management and improved patient care.

Echocardiography has emerged as a cornerstone tool in monitoring and assessing cancer patients for potential cardiac damage during and after cancer treatment. This abstract explores the pivotal role of echocardiography in the detection, monitoring, and management of CTRCD.

The primary advantage of echocardiography lies in its non-invasive nature, enabling clinicians to regularly evaluate cardiac function with minimal risk to the patient. Transthoracic echocardiography (TTE) is the most common modality used, providing valuable information on cardiac structure and function, including left ventricular ejection fraction (LVEF) and myocardial strain imaging. Early detection of changes in LVEF or subtle alterations in myocardial mechanics through echocardiography allows for prompt intervention, potentially preventing the progression to heart failure or irreversible cardiac damage.

Moreover, recent advances in echocardiographic techniques, such as three-dimensional echocardiography and speckle tracking echocardiography, offer enhanced sensitivity and accuracy in detecting early signs of cardiotoxicity. These modalities enable the assessment of myocardial deformation and contractility, providing valuable insights into subtle myocardial changes that may precede overt cardiac dysfunction.

Additionally, serial echocardiographic monitoring allows for a longitudinal assessment of cardiac function throughout cancer therapy, enabling oncologists and cardiologists to tailor treatment regimens based on the individual's cardiac reserve and susceptibility to cardiotoxicity.

In conclusion, echocardiography plays a pivotal role in the comprehensive assessment of cardiac function in cancer patients undergoing therapy. Early detection of CTRCD using echocardiography enables timely intervention, potentially mitigating adverse outcomes and improving overall patient care. Furthermore, ongoing research and technological advancements in echocardiography continue to enhance its sensitivity and specificity, empowering clinicians to optimize cancer treatment strategies while safeguarding patients against cardiac complications. Integrating echocardiography into routine cancer care protocols is vital to ensuring the successful management of CTRCD and improving long-term cardiovascular outcomes for cancer survivors.

H-S04

New Era of Ultrasound: Application of Palm-held, Isolated Echo Probe Wirelessly Connected to Carriable Electronic Devices

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Ultrasound was introduced into clinical medicine in the 1950s. For more than half a century, due to its non-invasive, non-radioactive, convenience, and easy-to-operate advantages, ultrasound has been widely used in various clinical departments. widely used. In addition, ultrasound is not only used in the examination room. Due to the advancement of technology, ultrasound has advanced from fixed large-scale instruments to mobile instruments. Nowadays, the advancement of integrated circuits has led to the shrinking of ultrasound types. The latest models for clinical use have reached the point where the probe can be separated from the ultrasound instrument itself. The wireless probe can be controlled by the palm of the hand, and then the signal can be transmitted wirelessly to a portable device. Even in the cloud!

This type of ultrasound has been miniaturized to the point where it can be mastered and operated, which undoubtedly elevates the role of ultrasound to a new level! In the past, ultrasound was usually considered only one of a variety of clinical examination items! However, with the application of ultrasound for decades, in many clinical situations, ultrasound has been able to replace computer

tomography or magnetic resonance imaging examination, reaching the final examination in imaging! In addition, in the first-line clinical field, ultrasound has become the third eye of clinicians, and it is almost an indispensable tool for clinicians to quickly make differential diagnosis at the patient's bedside! The miniaturization, separation, and wirelessization of ultrasonic probes are indispensable steps to maximize the above-mentioned function. To sum up, in the clinical situation of the 2030s, the application of small handheld wireless independent ultrasound probes is an inevitable trend in the future!

H-S05

Intra-Coronary Imaging in Total Occlusion Intervention

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Coronary artery disease remains a significant global health concern, often necessitating interventions to restore blood flow to the heart muscle. In cases of total occlusion, where a coronary artery is completely blocked. successful revascularization becomes paramount. Intra-coronary imaging techniques, such as Intravascular Ultrasound (IVUS) and Optical Coherence Tomography (OCT), have emerged as indispensable tools in guiding total occlusion interventions, significantly enhancing precision and optimizing clinical outcomes.

IVUS, employing high-frequency sound waves, provides real-time, cross-sectional images of the arterial wall and lumen. This technique aids interventional cardiologists in accurately assessing the nature of the occlusion, plaque morphology, and vessel dimensions. By offering insights into the underlying pathology, IVUS aids in the selection of appropriate strategies, including stent sizing and deployment, thereby minimizing the risk of complications and optimizing long-term patency. Complementing IVUS, OCT employs light waves to achieve micron-level resolution, enabling detailed visualization of plaque composition and stent apposition. The ability to discern fine structures within the vessel wall enhances decision-making during total occlusion interventions. OCT's precision is particularly valuable in evaluating stent deployment, ensuring optimal expansion, and minimizing malapposition, a condition associated with adverse events.

Intra-coronary imaging not only facilitates procedural guidance but also offers a unique opportunity for immediate assessment of outcomes. Real-time visualization of the treated segment permits on-the-spot adjustments, potentially reducing the need for repeat procedures. Moreover, these imaging modalities contribute to advancing our understanding of coronary physiology, leading to the development of more targeted and effective interventions.

In conclusion, intra-coronary imaging, through IVUS and OCT, represents a remarkable advancement in the field of total occlusion intervention. By providing a clear view of the coronary anatomy, plaque characteristics, and stent deployment, these techniques empower interventional cardiologists to make informed decisions, optimize procedural success, and ultimately enhance patient well-being. As technology continues to evolve, the integration of intra-coronary imaging into routine practice holds the promise of further elevating the standards of coronary care.

H-S06 Echo-guided Vascular Puncture

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Vascular punctures are often necessary in daily clinical practice. They are secure, but not free of complications. Ultrasonography enhances safety of

the procedure by decreasing puncture attempts, complications and costs. Ultrasound-guided vascular puncture technique is now widely used. This technique is not only limited to catheter implantation, but also in variety of endovascular procedure. Vessels must be evaluated using ultrasonography before the gowning of professional for the procedure. It enables the understanding of their anatomy, identifies possible anatomical variations of the position, observes the depth of vessel, recognizes obstacles of a successful procedure, such as thrombosis or stenosis. In this will introduce the topic, we basics of ultrasound-guided vascular puncture, including the tips and tricks. Current application and novel technique of ultrasound-guided endovascular procedure well also be demonstrated.

H-O01

Prognostic Value of Fully Automated Left Atrial Strain in Patients with Asymptomatic Chronic Severe Aortic Regurgitation

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Objective: To examine whether fully automated left atrial (LA) strain predicted all-cause death (ACD) in patients with asymptomatic hemodynamically-significant chronic aortic regurgitation (AR).

Methods: Consecutive asymptomatic patients with isolated ≥moderate-severe AR undergoing echocardiograms were retrospectively identified from 2008 through 2022 from a tertiary referral center. LA strain, including reservoir strain(LASr), contractile strain(LAScd), and conduit strain(LASct) were measured using vendor-independent analytical software (Auto Strain LA Analysis, LOT 31.0; Tom Tec Imaging Systems, Unterschleissheim, Germany) from apical 4 chamber view. Endpoint was ACD at medical follow-up.

Results: Of the enrolled 359 patients (mean age 59±17 years; 19% female), mean left ventricular ejection fraction (LVEF) was 60±8%, Charlson score 0.93±1.49, LV end-systolic dimension index (LVESDi) 21.9±3.9mm/m2, LV end-systolic volume index (LVESVi) 40±18 ml/m2 and LASr 36.2%. In 7% cases, tracking border was partially corrected. Median follow-up under medical treatment was 3.6(IQR:0.86-7.37) years; during which 57 patients died. Multivariate analysis showed that older age, higher Charlson score, larger LVESDi (hazard ratio [HR] per 1mm/m2: 1.07), larger LVESVi (HR per 1ml/m2: 1.02) and lower LASr (HR per 1% increase: 0.97) were independently associated with ACD (all $P \le 0.036$); LV longitudinal strain (LVLS), LAScd, and LASct were not. Lower LASr was also independently associated with aortic valve surgery(HR per 1% increase: 0.97) after adjusting for age, sex, Chalrson score, LVESDi and LVLS. When we classified patients according to median LASr (36.2%), Kaplan-Meier curves showed that patients having LASr<36.2% had worse survival (P<0.0001) as compared to those having LASr \geq 36.2%.

Conclusions: Fully-automated LASr was a clinically feasible tool for predicting poor outcomes in patients with asymptomatic hemodynamically-significant chronic AR. It provides incremental prognostic value in addition to traditional factors and guideline-recommended LV parameters. Therefore, LASr may be incorporated into clinical decision making process to identify asymptomatic AR patients at high risks of death.

H-002

Sex-differences in Outcomes of Chronic Aortic Regurgitation in Asians: A Multicenter Study

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Objective: To examine clinical-differences between Asian men and women with hemodynamically-significant chronic aortic regurgitation (AR) and compare findings from westerners.

Methods: Consecutive patients with \geq moderate-severe AR (n=1305) undergoing echocardiograms were retrospectively identified from 2008 through 2022 from 3 tertiary referral centers. Endpoints included aortic valve surgery (AVS), all-cause death (ACD) and cardiovascular death (CVD).

Results: At baseline, compared to men (63 ± 17) years; n=968), women (69±16 years; n=337) were older, more symptomatic, had more comorbidity, larger indexed aorta size, and larger left ventricular end-systolic dimension index (LVESDi) (all<.001). LVESDi>20mm/m2 was noted in 90% asymptomatic women versus 71% asymptomatic men (P<.001). The correlation of symptomatic status and degree of LV remodeling was better in men. Median follow-up was 3.9 (IQR:1.3-7.1) years. Women were independently associated with less AVS (P≤.0001); overall 10-year survival for ACD and CVD was better in men than women ($P \le .002$). However, 10-year post-AVS survival was similar between sexes (P=0.9). AR-progression related LV remodeling was similar between sexes (P=0.86). Multivariable independent determinants of ACD and CVD were age, symptoms, indexed aorta size, LV parameters, and Taiwanese (all P≤.04) but not female-sex; AVS was protective. Adjusted mortality cutoffs for LV ejection fraction, LVESDi, LV end-systolic volume index (LVESVi) and indexed aorta size in women are 53%, 26mm/m2, 44ml/m2

and 25mm/m2, respectively; the corresponding cutoffs in men are 53%, 23.5mm/m2, 50ml/m2 and 23mm/m2, respectively.

Conclusions: Sex-differences in Asian AR patients did exist and the survival condition was similar to western cohort. Women had survival penalty due to disadvantages they carried, including older age, advanced symptoms, more comorbidity, and less AVS, but not due to sex per se. It was encouraging that women had similar post-AVS survival versus men, suggesting that to close survival-gap in female patients, taking abovementioned sex-specific mortality-cutoffs into account for early surgical referral is important.

H-O03

Comparing Early versus Late Initiation of Sacubitril/Valsartan for Reverse Remodeling in Patients with Diagnosed Heart Failure and Reduced Ejection Fraction

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Background: It is still unclear whether initiating sacubitril/valsartan earlier in patients with newly-diagnosed heart failure and reduced ejection fraction (HFrEF) leads to improved left ventricular reverse remodeling.

Methods: Patients with newly-diagnosed HFrEF were identified from Chang Gung Research Database from 2016 to 2020. Individuals without echocardiographic reports or those with severe valvular heart diseases were excluded from the study. Among patients prescribed sacubitril/valsartan, those who started treatment within 6 months of HFrEF diagnosis were categorized as early users, while those who began after 6 months were considered late.

Interval change of echocardiographic findings from baseline to the end of follow-up were compared after the inverse probability of treatment weighting. **Results:** Between 2016 and 2020, a total of 410 patients with newly-diagnosed HFrEF and prescribed sacubitril/valsartan were identified. Within this cohort, 188 patients initiated treatment early, while 222 patients began treatment later. When compared to the late initiators, the early initiators were characterized by a younger age (58 vs. 61 years old), higher blood pressure levels, and a lower left ventricular ejection fraction (LVEF) (27.8% vs. 29.6%). Late initiators had a higher prevalence of hypertension, diabetes, and chronic kidney disease. The two groups exhibited similar demographic profiles and comorbidity patterns following inverse propensity score weighting.

After a median follow-up period of 2.1 years, both groups displayed reverse remodeling. Among the early users, the left ventricular ejection fraction (LVEF) increased from 28.7% to 45.3% (+16.6%), while in the late users, LVEF improved from 28.9% to 40.1% (+11.2%). Moreover, both groups exhibited decreases in left ventricular end-diastolic and end-systolic diameters. Nevertheless, the enhancement in LVEF was notably more significant in the early users (p<0.0001)."

Conclusion: After the diagnosis of HFrEF, initiating sacubitril/valsartan within 6 months was associated with a more pronounced left ventricular reverse remodeling.

H-004

Relationship Between Chronic Inflammation, Coronary Flow Velocity Reserve and Myocardial Remodeling in Patients with Pre-dialysis Chronic Kidney Disease

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Background: To determine the relationships between inflammation, echocardiographic coronary microvascular function and myocardial function in patients with predialysis chronic kidney disease (CKD).

Materials and Methods: The CKD patients come from the cardiologist's and nephrologists' outpatient clinic. Using 2-dimensional echocardiography, we evaluated left ventricular systolic function, diastolic function, and coronary flow velocity reserve. To evaluate coronary flow velocity reserve (CFVR) of left anterior descending coronary artery (LAD), a sample volume (1.5 or 2.0 mm wide) positioned on the color signal in the LAD, Doppler spectral tracings of flow velocity in the LAD were recorded. We first recorded baseline spectral Doppler signals in the distal portion of LAD. Intravenous adenosine (140 µg/kg/min) for 2 minutes continuously to record Doppler signals during hyperemic conditions. Peak diastolic velocity was measured at baseline and peak hyperemic conditions. CFVR was defined as the ratio of hyperemic to basal peak diastolic coronary flow velocity. In addition, we measured plasma inflammatory markers and plasma galactin-3 just before each echocardiography examination.

Results: We enrolled 38 patients with different stages of CKD during 12 months. We found that CFVR is significantly lower in patients with advanced CKD. The left ventricular ejection fraction and left ventricular mass index were not different between early and advanced CKD. Abnormal (CFVR<2) and Normal CFVR (CFVR>3) are shown in figures 2 & 3, respectively. There was no significant difference between 2 groups in terms of plasma inflammatory markers and galactin-3.

Conclusion: CFVR was impaired in patients with advanced CKD, indicating that coronary microvascular vasodilation function is more impaired in advanced CKD status.

H-O05

Radiation Free, Echocardiographic Precision Guidance for Catheter Ablation of Atrial Fibrillation/Atrial Flutter

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Background: Efforts to minimize radiation exposure in cardiac interventions benefit patients significantly. and physicians Combining transesophageal echocardiography (TEE) and 3D facilitated electro-anatomical mapping has non-fluoroscopic catheter ablation. However, the utilization of TEE in AF/AFL ablation was scanty. This study investigates the potential of trans-esophageal echocardiography (TEE) as an alternative for guiding non-fluoroscopic AF/AFL ablation.

Methods: Between August 2019 and February 2023, we included 46 patients undergoing TEE-guided minimal or non-fluoroscopic atrial fibrillation catheter ablation and structural intervention. TEE was performed under general anesthesia to assess catheter position, trans-septal puncture guidance, and pre-ablation left atrial appendage thrombus. A tailored TEE acquisition protocol was developed. Recorded complications included pericardial effusion, inter-atrial septum dissection, aortic puncture, and left atrial posterior wall puncture.

Results: 46 patients were enrolled, categorized into 6 congenital structural defect cases (CASH), ten minimal fluoroscopy (Mini-F), and 30 non-fluoroscopic (Non-F) AF/AFL ablation cases. In the CASH group, 100% achieved thriving region of interest TEE monitoring. In Mini-F and Non-F groups, left atrial appendage thrombus detection correlated well with CT angiography. Visualization success rates were

90% for the left upper pulmonary vein,

75% for the right upper pulmonary vein,

75% for the right lower pulmonary vein, and

60% for the left lower pulmonary vein.

Coumadin ridge localization and cavotricuspid isthmus pre-stem pop monitoring was successful in all subjects. Trans-septal puncture success rate was 75%, with no recorded complications.

Conclusion: TEE-guided non-fluoroscopic catheter ablation offers a safe and consistent approach for routine AF/AFL ablation practice. This technique presents a radiation-free alternative that

significantly benefits patients and physicians. TEE has better visualization than fluoroscopy concerning cardiac structure localization, enabling potentially better outcomes.

H-006

Left Ventricular Hypertrophy and Clinical Outcomes in Fabry Disease: A Longitudinal Cohort Study in Taiwan

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Background: The effect of different grades of left ventricular hypertrophy (LVH) on the clinical outcomes of patients with Fabry disease is unclear. This study aimed to evaluate the association between the severity of LVH and clinical outcomes in Fabry disease.

Methods: We conducted a retrospective cohort study from a large registry of adult patients with Fabry disease. Left ventricular mass index (LVMI) was measured by echocardiography. The severity of LVH was categorized according to LVMI using sex-specific cutoff values. The primary outcome was a major adverse cardiovascular event (MACE), including a composite of hospitalization for heart failure, ventricular tachycardia, acute ischemic stroke, and all-cause mortality.

Results: The study included a total of 268 patients (age 50.4 ± 15.4 years, men 46.6%) with Fabry disease (83.2% IVS4+919G>A mutation) and 106 patients (39.6%) with LVH. Among them, patients with mild, moderate, or severe LVH had 5-year MACE rates of 7.4%, 10%, and 30.5%, respectively (P< 0.001). After adjusting for age, sex, hypertension, hyperlipidemia, atrial fibrillation, renal function, left ventricular diastolic function, late gadolinium enhancement, and enzyme replacement

therapy, patients with severe LVH remained to have an increased risk of MACE at 5 years (adjusted hazard ratio, 12.0; 95% confidence interval, 1.29-112.60; P= 0.03) compared with no LVH.

Conclusions: Severe LVH is independently associated with a higher risk of MACE in Fabry disease, suggesting poor clinical outcomes in advanced stages of cardiomyopathy. Sex-specific grading of LVH by LVMI can be applied to Fabry disease for a refined risk stratification upon the initial diagnosis.

Keywords: left ventricular hypertrophy; Fabry disease; major adverse cardiovascular events; enzyme replacement therapy

H-P01

Echocardiographic Features of a Patient with Alcoholic Cardiomyopathy

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Chronic and excessive consumption of alcohol could result in progressive cardiac dysfunction and heart failure (HF). Chronic exposure to alcohol results in reduced contractility of cardiomyocytes, ventricular dilation, fibrosis, and ultimately HF. We recently have a case who has history of chronic alcohol consumption for 16 years and developed mild degree heart failure. Due to cardiomegaly and markedly depressed left ventricular (LV) systolic function, the cardiomyopathy was impressed. We hereby report the history and echocardiographic features of this interesting case.

Patient was a 66 year old man. He was told that

regular drinking small amount of wine would be beneficial to his health, especially to cardiovascular system. Thus, he has drunk the Chinese sorghum wine (高粱酒) about 120 mL/day consecutively for 16 years. It was until 2 weeks ago. He developed mild dyspnea on exertion, so he called at a local clinic. The local clinic informed him that he had cardiomegaly and abnormal heart function. Then, he visited our Cardiovascular Outpatient Department (OPD) on July 18, 2023. At the OPD, physical examination revealed body height=173 cm, body weight=88 kg, BP=108/80 mmHg, heart beat=103 bpm, irregular. The chest film showed cardiomegaly. ECG showed atrial fibrillation, left ventricular hypertrophy by voltage and two ventricular premature contractions. The echocardiogram revealed: mildly dilated left atrium and LV, mild septal hypertrophy, markedly global LV hypokinesis with markedly depressed LV systolic performance, and estimated LV ejection fraction=30 % by modified Simpson's method. Since a pervious echocardiogram studied 6 years ago was normal including left atrium and LV dimension as well as LV ejection fraction. Thus, the findings of the present echocardiogram are consistent with alcoholic cardiomyopathy. Biochemistry data revealed abnormal cholesterol (232 mg/dL) and low density lipoprotein cholesterol (155 mg/dL). Besides the mediations of edoxaban, valsartan, rosuvastatin, and ivabradine, we also suggested him to quit wine drinking, decrease in body weight, and start vitamin B complex supplement in order to control of his disease promptly.

Keywords: alcoholics, cardiomyopathy, dyspnea, echocardiography, heart failure, hypercholesterolemia,