Results: The proband’s baseline ECG displayed a QTc interval of 692 ms and abnormal broad T waves in nearly all leads. Direct sequencing of her DNA revealed a heterozygous mutation in the transmembrane pore region of KCNH2 consisting of a G-to-A transition at nucleotide 1825 (c.1825G>A), predicting a substitution of an asparagine for aspartate at highly-conserved residue 609 (P.Asp609Asn, D609N), which was also present in her son with a QTc interval of 465 ms and absent in non-affected family members and 150 healthy controls. This mutation is predicted to be possibly damaging with a score of 0.688 by PolyPhen-2, and to affect protein function with a score of 0.03 by SIFT. Oral administration of verapamil (240 mg daily) shortened QTc to 514 ms, converted T wave morphology from bifid to biphasic and abolished TdP without ICD shock delivery in the proband over a 3-year follow-up period. In vitro studies, verapamil dose-dependently prolonged QT interval, decreased transmural dispersion of repolarization, and suppressed TdP in the LQT2 model. Concordant but stronger effects of verapamil on the morphological properties of the LQT2 model were noticed when nifedipine was perfused.

Conclusions: These results indicate a possible therapeutic role of verapamil in management of LQT2 patients.

GW25-e3149
Preexcitation syndrome: experimental study on the electrocardiogram of antegradeley conducting accessory pathway
Xu Zhongling, Chang Qinghua, Liu Renguang
The Cardiovascular Institute of the First Affiliated Hospital of Liaoning Medical University

Objectives: In preexcitation syndrome, initial vector change (delta wave) is highlighted. However, there has been little information concerning terminal QRS vector change. In our study, preexcitation was simulated in the rabbit model by applying epicardial electrophysiological technique. Then we further explored the effect of antegradeley conducting accessory pathway (AP) on ECG characteristics. 

Methods: Ten healthy rabbits were selected. Sensing electrode and stimulating electrode were placed to high right atrium and epicardial surface of atrioventricular groove of left ventricular anterior wall, respectively. Programmed prematurity stimulation S2 synchronized P wave positively swept ventricle (step length was 5 ms). We made a comparison of sinus PR interval (ventricular activation time via normal pathway), sinus QRS complex (ventricular activation via normal pathway) and cardiacventricular pacing QRS complex (ventricular activation via AP) to observe the initial, maximal and terminal QRS vector of R2 in the process of PS2 (ventricular activation time via AP) positive sweep. We also observed the relationships between the difference of PS2 and PR interval and R2 morphology change.

Results: Preexcitation was successfully simulated in the rabbit model including complete preexcitation, incomplete (typical) preexcitation, incomplete latent pre- excitation and complete latent preexcitation. PS2 interval<PR interval: when the difference was >47.00:6:7.53 ms, R2 was complete preexcitation, inversely, R2 was incomplete preexcitation. PS2 interval>PR interval: when the difference was <13.00:3:50 ms, R2 was incomplete latent preexcitation, inversely, R2 was complete latent preexcitation.

Conclusions: The ECG characteristics of antegrade conduction of AP depends on the time difference of conduction through AP and normal pathway. According to the difference between the PR interval and PS2, we can identify the preexcitation pattern. The presence of a delta wave indicated that AP conduction was faster than AV node conduction. The terminal QRS vector change represented the ventricles were preexcited through an AP. The change of terminal QRS vector was helpful for identifying the preexcitation without evident delta wave and incomplete latent preexcitation.

GW25-e3427
Pure fascicle capture pace mapping can help to identify the target for ablation of left upper septal fascicular ventricular tachycardia
Xiao-Gang Guo, Sha Zhang, Jian Ma
Arrhythmia Center, Fawai Hospital, National Center for Cardiovascular Diseases, Chinese Academy of Medical Sciences and Peking Union Medical College

Objectives: Left upper septal fascicular ventricular tachycardia (VT) was rare. Its mechanism was deemed as triggered activity or microreentry in the fascicular system. Radiofrequency (RF) ablation can successfully eliminate the site of origin (SOO) by destroying the reentry circuit or creating an alternative macroreentry circuit. However, identifying the SOO of left upper septal fascicular VT after accidental mechanical termination, frequently made the procedure troublesome. 

Methods: We included two patients (both men, aged 22 yrs and 45 yrs) with left upper septal fascicular VT. The VT QRS was relatively narrow with an incomplete right bundle branch block morphology and inferior frontal axis. Transhoracoh electrocardiography confirmed normal left ventricular systolic function and the absence of structural heart diseases. Mapping catheters were introduced via venous access to the coronary sinus. AP configuration to maximally reduce myocardial dyssynchrony and improve cardiac hemodynamics/output remains a challenge. We investigated a variety of echocardiographic parameters, and defined their roles in improving the accuracy and efficacy of current on-line and off-line optimization protocols for CRT with quadripolar lead.

Results: The major parameters improved after echo optimization were left ventricular diastolic function (E/A fraction (24.2±10.3% vs. 32.8±5.4%, P=0.019), mean NYHA class (3.2±0.5 vs 2.2±0.6, P=0.000), and QRS duration (162±25.9 ms vs 139.±14.0 ms, P=0.013). Radial strain analysis with 4D protocol demonstrated reproducible results during optimization analysis. Among 4D strain analysis, longitudinal and circumferential strain abnormalities always preceded the radial strain abnormalities. The area strain (combined the effect of both longitudinal and circumferential strain) correlated well with the results from radial strain analysis. 4D strain protocol measures all of the 3 strain components in all LV segments from a single acquisition, to decide the best pacing configuration out of 10, which made the optimization of CRT with quadripolar lead more quickly and accurately than TDI or 2D strain protocols. 4D strain analysis was also affected by the change in volume status/cardiac preload and heart rate.

Conclusions: Area strain measurement in 4D strain protocol increases the diagnostic value to detect regional myocardial mechanical dysynchrony during the echocardiographic optimization. The full-volume data sets by 3D reconstruction acquires data more efficiently, and helps 4D strain analysis to become a bedside valuable tool for optimization of CRT with quadripolar lead.

GW25-e2176
Developing Integrated Echocardiographic Protocol to Optimize Cardiac Resynchronization Therapy with Quadripolar Lead
Lei Juan1,2, Jing-Feng Wang1,2, Robert Voelker3, Natalia Hernandez3, Kan Liu1
1Department of Cardiology, Sun Yat-Sen Memorial Hospital, Sun Yat-Sen University, Guangzhou 510120, China, 2Guangdong Province Key Laboratory of Arrhythmia and Electrophysiology, Guangzhou 510120, China, 3Division of Cardiology, Heart and Vascular Center, Department of Medicine, State University of New York, Upstate Medical University Hospital, Syracuse

Objectives: Inappropriate lead position is one of major reasons for nonresponse to cardiac resynchronization therapy (CRT). CRT with quadripolar lead offer programing flexibility with 4 electrodes and up to 10 pacing configurations, which result in greater CRT efficiency. However, how to choose and validate the suitable configuration to maximally reduce myocardial dysynchrony and improve cardiac hemodynamics/output remains a challenge. We investigated a variety of echocardiographic parameters, and define their roles in improving the accuracy and efficacy of current on-line and off-line optimization protocols for CRT with quadripolar lead.

Methods: We studied 22 patients (65±16.5 years old) who were implanted CRT in the Upstate Medical University Hospital of State University of New York.. Nine of them had CRT with quadripolar lead, and 13 of them with conventional bipolar leads. All patients were assessed by tissue Doppler (TDI) based tissue synchronization imaging, two dimensional (2D) and four dimensional (4D) strain analysis immediately after implantation. In patients receiving CRT with quadripolar lead, we tested pacing thresholds of each configuration. The speckle tracking analysis was performed with both 2D and 4D strain protocols. We used 4D strain to track regional myocardial mechanical dyssynchrony from frame to frame in three dimensional (3D) over time, obtained the real-time strain patterns during both diastolic and systolic cycle, and established the “real” myocardial deformation curves through the entire cardiac cycle. 

Results: The major parameters improved after echo optimization were left ventricular diastolic function (E/A fraction (24.2±10.3% vs. 32.8±5.4%, P=0.019), mean NYHA class (3.2±0.5 vs 2.2±0.6, P=0.000), and QRS duration (162±25.9 ms vs 139.±14.0 ms, P=0.013). Radial strain analysis with 4D protocol demonstrated reproducible results during optimization analysis. Among 4D strain analysis, longitudinal and circumferential strain abnormalities always preceded the radial strain abnormalities. The area strain (combined the effect of both longitudinal and circumferential strain) correlated well with the results from radial strain analysis. 4D strain protocol measures all of the 3 strain components in all LV segments from a single acquisition, to decide the best pacing configuration out of 10, which made the optimization of CRT with quadripolar lead more quickly and accurately than TDI or 2D strain protocols. 4D strain analysis was also affected by the change in volume status/cardiac preload and heart rate.

Conclusions: Area strain measurement in 4D strain protocol increases the diagnostic value to detect regional myocardial mechanical dysynchrony during the echocardiographic optimization. The full-volume data sets by 3D reconstruction acquires data more efficiently, and helps 4D strain analysis to become a bedside valuable tool for optimization of CRT with quadripolar lead.

GW25-e2218
Correlation Analysis of Echocardiographic Parameters and Atrial Fibrillation Thromboembolism Risk Scoring
Yu Hao, Chang Dong, Dong Yinqae, Cong Tao, Zhang Shalong
First affiliated hospital of Dalian Medical University

Objectives: Thromboembolism risk assessment system of Atrial fibrillation (AF) is all clinical indicators in clinical, and some indicators are subjective, this study assumes that echocardiography can identify the patients with atrial fibrillation at high-risk of
thromboembolism. By analyzing the correlation of transesophageal echocardiography parameters and atrial fibrillation thromboembolism risk assessment indicators (CHADS2, and CHA2DS2-VASc), a new prediction method of risk of stroke in patients with atrial fibrillation.

Methods: 304 patients that diagnosed with atrial fibrillation in our hospital from October 2010 to October 2012, and score to each patient according to standard of CHADS2, and CHA2DS2-VASc. Patients were divided into low, medium, and high-risk groups. After admission, each patient underwent transesophageal ultrasound echocardiography, internal diameter of right ventricle, interventricular septum thickness, left ventricular internal diameter, left ventricular posterior wall, right ventricular outflow tract, aortic root diameter, pulmonary artery diameter, left atrial diameter, pulmonary artery diameter, left atrial diameter, right ventricular cavity diameter, pulmonary artery systolic pressure, deceleration time of E wave, speed of aortic valve flow and the pulmonary valve orifice flow, left ventricular ejection fraction (LVEF). We analysis correlation of ultrasound heartbeat graph parameters and thromboembolism risk scoring by using Spearman rank.

Results: (1) The ultrasound indicators that has a significant correlation with CHADS2, score are: interventricular septal thickness, left ventricular posterior wall thickness, left atrial diameter, pulmonary artery diameter, right ventricular diameter, the inner diameter of the aortic root, LVEF. (2) The ultrasound indicators that has a significant correlation with CHADS2, score are: Interventricular septal thickness, left ventricular posterior wall thickness, left atrial diameter, pulmonary artery diameter, aortic valve flow velocity, LVEF. (3) Ultrasound echocardiography and to compare these two risk stratification indicators.

Conclusions: The CHADS2, score and CHA2DS2-VASc score increased, cardiac ultrasound showed the enlargement of left atrium, left ventricular hypertrophy, pulmonary artery diameter widened and LVEF decreased. In addition, the internal diameter of right ventricle, aortic root diameter is associated with CHADS2, score; aortic valve flow velocity is associated with CHA2DS2-VASc score. The CHADS2, score was strongly correlated with the echocardiographic index such as thickness of interventricular septum, posterior wall, left atrial diameter, diameter of pulmonary artery, aortic valve flow rate and LVEF value may be the identification index of thromboembolism risk in non-valvular atrial fibrillation patients.

GW25-e2219
Evaluation of the embolism risk score systems in patients with atrial fibrillation
Jiang Shasha, Cong Tao, Chang Dong, Dong Yinxue, Zhang Shulong
First affiliated hospital of Dalian Medical University

Objectives: Atrial fibrillation (AF) is associated with a significantly high risk of stroke and systemic embolisms, several scoring system are currently used to stratify thromboembolic risk for each patient. We evaluate the predictive power of different scoring system to identify the suitable scoring system for Chinese atrial fibrillation patients.

Methods: 425 consecutive patients treated in our hospital with paroxysmal or persistent atrial fibrillation are selected. The clinical data, such as gender, age, blood pressure (BP), blood lipids, LVEF, history of smoking, embolism, heart failure (HF), diabetes mellitus (DM), coronary heart disease (CHD), hyperthyroidism, valvular heart disease (VHD), myocardial infarction (MI), peripheral arterial disease (PAD), large aortic plaque, are collected for each patient. Telephone follow-up are done for each patient, the patients with definitive stroke are defined as stroke positive group. AF-related stroke system (CHADS2, score) is calculated. A therapy (drugs or ablation) was instituted for 49/291 patients (17%) in the active group vs 43/304 patients (14%) in the control group (P = 0.06). The frequency of AF-related stroke was 3.4% in the active group and 2.3% in the control group (P = 0.58). The six scoring system: modified CHADS2, score, Framingham score, Rietbrock modified score, CHA2DS2-VASc score, 2006 Nice score, ACC/AHA/ESC score, Eighth Edition ACCP) are used to stratify thromboembolic risk for each patient.

Results: (1) 325 patients (76.8% male, 17.8% female) with mean age 75.0±11.8 years; 32% female; 1750 paroxysmal AF) with nonvalvular atrial fibrillation were included. The primary criteria was the comparison of the time from enrollment to the first AF-related stroke system (CHADS2, score). A therapy (drugs or ablation) was instituted for 49/291 patients (17%) in the active group vs 43/304 patients (14%) in the control group (P = 0.58). (2) Anticoagulation was initiated in 80% of patients and antiarrhythmic drugs in 55%. In the active group, 93% of the notifications transmitted by HM were appropriate for SVA detection. The remaining 7% were inappropriate for SVA (over-sensing, noise or non-sustained VT).

Conclusions: The SETAM study demonstrated that HM allows earlier detection and treatment of SVA in patients implanted with pacemakers. It suggests that HM could be expanded to a maximum of patients in daily clinical practice in order to optimize their SVA management. The next step is to report how early detection of SVA with HM can possibly improve the patients clinical outcome.