

P4-055

Atrial tachycardias utilizing the ligament of marshall region and pulmonary vein-left atrial appendage ridge following single ring pulmonary vein isolation for atrial fibrillation

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Background: Organized atrial tachycardias (OAT) after pulmonary vein isolation (PVI) procedure are common. Arrhythmia mechanisms include mitral annular, ring gap or roof dependent gap related flutters. In this series, we describe a mechanism of arrhythmia utilizing the ridge between left pulmonary vein (PV) and left atrial appendage (LAA) in the Ligament of Marshall (LOM) region.

Methods and Results: Seven tachycardias involving the LOM region were identified from 240 patients who underwent a single ring PVI procedure for symptomatic atrial fibrillation. The common characteristics of these tachycardias were the endocardial breakout over a broad area adjacent to the LOM region, presence of pre-systolic or mid-diastolic potentials and abolition by ablation of the pre-systolic or mid-diastolic potentials remote from the endocardial breakout site. In six cases, tachycardias were present after isolation of the veins and posterior left atria. All demonstrated characteristic areas of very slow conduction in the LOM region highlighted by presence of either low voltage, long duration fractionated potentials or mid-diastolic potentials with a fixed temporal relationship to the subsequent endocardial activation. The pattern of activation and termination of tachycardia during ablation were consistent with an arrhythmia utilizing an electrically insulated tract within LOM and the PV-LAA ridge region.

Conclusions: We identified a pattern of arrhythmias involving a concealed pre-systolic component and a broad endocardial breakout site related to the LOM region. Some of the characteristics of these atrial tachycardia suggest a re-entrant mechanism involving a critical isthmus between the PV-LAA ridge in the region of the LOM.

P4-056

Confined rapid pulmonary vein activities were revealed to be responsible for recurrent atrial tachyarrhythmias by adenosine triphosphate: a case report

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Background: Provocation and elimination of the pulmonary vein (PV) reconnection by adenosine triphosphate (ATP) has been widely performed to reduce the recurrence of atrial fibrillation (AF). However, it remains to be elucidated whether the radiofrequency (RF) application for the ATP-reconnection site actually eliminated the responsible tachyarrhythmias.

Methods: N/A

Results: A 56-year-old man with recurrent AF and atrial tachycardia (AT) undergoing PV antrum isolation previously was referred to our institute for repeated catheter ablation. Sinus rhythm was maintained, but left inferior PV (LIPV) was reconnected at baseline. Confined rapid PV activities inside left pulmonary vein ablation line were spontaneously initiated and sustained after disconnection of left atrium (LA)-LIPV recurrent conduction. Transient AF and AT with the same P-wave morphology as clinical AT were induced repeatedly by administration of intravenous ATP at 30mg during sustained confined rapid PV activities. These tachycardias were spontaneously initiated under isoproterenol infusion. AF and AT were terminated immediately after the first RF application for the gap where the complex fractionated atrial electrograms were recorded at the anterior aspect of LIPV. AF and AT could not be induced after the RF application.

Conclusions: Confined rapid PV activities were suggested to lead to clinical AF and AT through conduction gap exposed by ATP administration. Evaluation of ATP-provoked dormant LA-PV conduction was effective and feasible for identifying and eliminating the responsible atrial tachyarrhythmias in this case.

P4-057

Atrioventricular block triggered by REM sleep and mild desaturation in a patient with sleep apnea

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Introduction: We report a patient with high grade atrioventricular block from a combination of mild OSA and REM sleep.

Case report: A 57 year old male presented with a NSTEMI. Coronary angiography revealed a 95% stenosis of the OM1 and chronic total occlusion of the mRCA with good collaterals from the LCX. The atrioventricular nodal branch of the RCA had good flow. A bare metal stent was deployed to the OM1. On telemetry, he had transient asymptomatic episodes of high grade atrioventricular blocks during sleep, with ventricular standstill up to 5.18s. He had symptoms of OSA and polysomnography showed mild OSA(AHI 12.8). 2 episodes of atrioventricular blocks occurred during apnea with REM sleep, but the desaturations were mild (nadir SpO2 of 88%).

Discussion: Advanced atrioventricular block is associated with surges of parasympathetic tone in OSA. REM related bradyarrhythmias are associated with exaggerated vagal tone in the absence of normal compensatory sympathetic modulation. In our patient, episodes occurred during mild desaturations, not consistent with observations of bradyarrhythmias related to the severity of desaturations and sleep apnea. There was no suggestion of ischemia to the atrioventricular node. We propose that REM sleep compounded by a mild apnoeic episode can be sufficient to cause transient atrioventricular block. Our patient was entirely asymptomatic and there was no indication for pacemaker insertion.

Conclusions: Our case suggests that sleep apnea and desaturations, though mild, coupled with REM sleep can result in significant nocturnal bradyarrhythmias.

P4-058

A holter based methodology for screening of sleep apnea syndrome may overestimate the degree of sleep apnea in patients with wenckebach atrioventricular block

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Introduction: A holter based method using heart rate variability (HRV) and ECG derived respiratory signal (EDR) has been proposed for sleep apnea screening.

Case report: A 31 year old male, with no significant past history, underwent nocturnal polysomnography with simultaneous holter recording. Using a sleep apnea software (Del Mar Reynolds Lifescreen Version3.14 Hertford, UK), an estimated apnea hypopnea index (AHI) was derived. He had persistent Wenckebach second degree atrioventricular block (unknown prior). The polysomnogram revealed mild sleep apnea (AHI of 7.6). The holter estimated AHI was 46.7.

Discussion: The holter based method consists of a 3 channel holter and subsequent analysis of HRV and the ECG derived respiratory signal. HRV indices include: mean RR-interval, standard deviation of the RR-interval, first five correlation coefficients of RR-intervals, NN50, NN50 measure, two pNN50 measures, RMSSD, Allan Factor, interval-based power spectral density(PSD) of RR-intervals. The EDR is a reflection of the respiratory cycle based on ECG amplitude changes from electrode motion and thoracic electrical impedance change. The mean amplitude of the EDR, standard deviation of the EDR and interval-based power spectral density of EDR signal were analyzed. There are no guideline reference ranges for the estimated AHI currently.

The presence of Wenckebach atrioventricular block would have led to increased HRV, and may have accounted for the elevated estimated AHI compared to the polysomnogram.

Conclusions: Despite combination of EDR to heart rate variability to improve performance, significant arrhythmias may lead to overestimation of holter derived estimated AHI in the screening of sleep apnea.

P4-059

A male adolescent with hypertrophic cardiomyopathy who showed a Brugada-like electrocardiogram at the first visit

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A school-based electrocardiographic screening program has been developed for 1st, 7th, and 10th graders in Japan. A 12-year old male athlete was screened as having a Brugada-like electrocardiogram (ECG) by the screening system and was referred to our hospital. His ECG showed a saddleback-type ST elevation ≥ 2 mm at lead V2, and normal ST segments and T waves in the left precordial leads. His ECG also had narrow Q waves at leads V1-3. His ultrasonic cardiogram (UCG) at the first visit showed normal left ventricular (LV) movement with an ejection fraction of 85% and interventricular septal thickness (IVSTh) and LV posterior wall thickness of 9 mm. A Holter ECG at a lead on the left third intercostal space showed an ST elevation of ≥ 3 mm. He was suspected as having Brugada syndrome and followed annually. Two years later, his ECG showed inverted T waves in leads II, III, aVF, and V5-6 and a flat and/or negative T wave in V4-6. His UCG showed an IVSTh of 12 mm and LV posterior wall thickness of 11 mm. Biopsy specimens performed from the LV wall showed hypertrophy of myocytes, and disarrangement and focal disarray of myocytes, indicating hypertrophic cardiomyopathy. Brugada-like ECG findings with or without other ECG findings should be followed up. School-based ECG screening programs may be useful for screening cardiovascular diseases at asymptomatic periods.

P4-060

A case of recurrent undifferentiated wide complex tachycardia on implantable loop recorder

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Background: A fit and well 16-year old male presented for investigation after a single episode of palpitations and presyncope. He had a normal transthoracic echocardiogram and mild biventricular dilatation on cardiac MRI. His family history was notable of sudden cardiac death in maternal uncle in the setting of acute myocarditis, thus concern was raised should the patient be offered an implantable cardioverter-defibrillator. An implantable loop recorder was utilised and multiple asymptomatic episodes of monomorphic wide complex tachycardia between 240-330bpm lasting 1.5-10min were captured.

Method: To further characterise the nature of the arrhythmia, patient underwent a diagnostic electrophysiology study.

Results: At electrophysiology study, no ventricular arrhythmia was induced, dual AV nodal physiology was evident. Tachycardia was induced with atrial burst pacing at 230ms, retrograde A was on time with His and proximal CS. Intermittent aberrancy with right bundle branch block was evident without altering the cycle length of tachycardia or retrograde atrial activation sequence. Simultaneous rhythm strip from loop recorder confirmed the tachycardia was the clinical tachycardia in question. Despite some variations in CS sequence, standard pacing manoeuvres suggested most likely atypical AV nodal re-entrant tachycardia. Based on the electrophysiology study findings, implantable cardioverter-defibrillator was not indicated. As patient was asymptomatic, patient was continued on surveillance and was able to return to elite sports training uneventfully.

Conclusions: This case highlights the diagnostic limitation of implantable loop recorder. Implantable cardioverter-defibrillator based solely on documented wide complex tachycardia on implantable loop recorder could be inappropriate and it is crucial to characterise the tachycardia.

P4-061

Catheter-induced mechanical conduction block of a fasciculoventricular bypass tract

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A 43-year-old man was referred to our institution for recurrent syncope because his occupation was a bus driver. The patient was previously diagnosed with Wolff-Parkinson-White syndrome on the basis of an electrocardiogram. The amplitude of the initial r wave in lead V1 increased without preexcitation after administration of a sodium channel blocker (pilsicainide, 0.3 mg/kg). The patient underwent a head-up-tilt test, which failed to induce syncope. We performed an electrophysiologic study (EPS) to estimate the accessory pathway. During sinus rhythm, the earliest ventricular activation was recorded at the His bundle area, with a His-ventricular interval of 20ms. Atrial pacing produced prolongation of the atrial-His interval due to an atrioventricular nodal delay without any change in the degree of preexcitation. His bundle stimulation resulted in a preexcited QRS. These findings were compatible with the fasciculoventricular bypass. Any sustained arrhythmia were induced during EPS. Preexcitation disappear because of catheter induced mechanical trauma at the end of EPS. His electrocardiogram did not show preexcitation a day after the EPS. We recommended him further study with an implantable loop recorder.

The incidence of mechanical conduction block of fasciculoventricular pathway was unknown, because this type of bypass tract is very rare. Although a fasciculoventricular bypass do not give rise to any reentrant tachycardia, it is important to distinguish a fasciculoventricular bypass from a superoparaseptal bypass. We should pay attention to mechanical conduction block of bypass tract during EPS.

P4-062

Clinical significance of atrial pacing in a patient with constrictive pericarditis

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Background: Constrictive pericarditis is characterized by refractory heart failure. It is hard to control by medical therapy especially in inoperable patients, however, alternative therapeutic option has not been reported.

Case presentation: We present a case of 62-year-old woman with a history of prior valve replacement due to rheumatic valvular heart disease who was repeatedly hospitalized due to heart failure (HF). She was diagnosed as post-operative constrictive pericarditis by cardiac MRI and right heart catheter examination. Continuous dobutamin injection therapy was needed since her condition was not improved with the use of diuretics. Based on her clinical data and general condition, the mortality rate of pericardiectomy was considered to be high. Since she also had a relative sinus bradycardia, atrial pacing study was done. The study showed that both gain of cardiac output and decrease of right atrial pressure were obtained by increasing of her heart rate. Then, permanent AAI pacemaker implantation was performed. Intravenous inotropic agents were gradually decreased and she could withdraw from inotropic support on the 14th day after the pacemaker implantation, and discharged on foot on the 21th day. She has not been hospitalized due to HF after the pacemaker implantation.

Conclusion: Atrial pacing for refractory inoperable patients with constrictive pericarditis could be an important therapeutic option.

P4-063

A catheter ablation case of atrial tachycardia initiated by non-pulmonary vein ectopy adjacent to Fossa Ovalis of the left atrium - do we always have to detect arrhythmogenic triggers after pulmonary vein isolation?

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A 67-old- female was emergently transferred to our department because of frequent chest discomfort episodes from 2013, despite after three times of catheter ablation(CA) of paroxysmal atrial fibrillation (AF). 12-lead- surface electrocardiogram(ECG) revealed non-sustained atrial tachycardia(AT) with the cycle length(CL) of 480-500ms, 1:1 (or 2:1) atrioventricular conduction, also with incessant tachycardia property. Electrophysiologic study before CA was performed, revealed all three pulmonary veins(PVs) except right inferior PV were electrically isolated. Initiation of AT using isoproterenol(ISP) infusion was performed after electric antral isolation of all PV potentials. During ISP infusion, non-sustained AT following repetitive atrial premature ectopy(PAC) with incessant tachycardia property was induced. Although the CL of AT was fluctuating(220-250ms), the earliest atrial activation was constantly documented at the site of His bundle electrogram(HBE) area, and no ectopic firing or tachycardia was documented from all PVs. Electroanatomical mapping was performed for detecting PAC origin, diagnosed as the main initiative site for AT, revealed a low-voltage/fragmented potential preceding 35ms from HBE adjacent to the site of Fossa Ovalis in the left atrium. Radiofrequency CA was performed at that site, and no PAC firing, AT, nor other atrial tachyarrhythmias became inducible under high-dose of ISP(up to 10ug/min.) administration.

P4-064

"LAST (local anesthetic systemic toxicity) but not least": systemic lidocaine toxicity during cardiac device implantation

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Background: Implantation of ICD using local anesthesia and conscious sedation has been widely practiced. LAST is very rarely occurred but may lead to high morbidity outcome.

Case Description: A 56-year-old African American female with long-standing idiopathic cardiomyopathy was referred for evaluation of ICD implantation. Physical examination showed elevated jugular venous pressure of 12 cm H₂O with hepatjugular venous reflex. Her lab revealed albumin of 1.9g/dl, and abnormal liver function. Echocardiogram showed ejection fraction of 10-15%. She was transferred to EP lab for single-chamber ICD with local anesthesia and conscious sedation. The initial incision was performed on left infraclavicular area after 30 ml of 2% lidocaine infiltration. However, contrast venogram revealed subclavian vein obstruction with multiple collaterals. The incision was switched to right side and additional of 30 ml 2% lidocaine was given. During closing the device pocket, the patient developed generalized tonic-clonic seizure. 1 mg of midazolam was given for seizure control. She eventually deteriorated and became pulseless electrical activities. Cardiopulmonary resuscitation was performed. Initial arterial blood gas showed mixed metabolic and respiratory acidosis. She regained her pulse and rapidly recovered, by weaned off vasopressor and extubated within 8 hours after the event. Lidocaine level was 8.7 mcg/ml. Patient was discharged with neither cardiac nor neurological sequelae.

Conclusion: Common findings in advanced heart failure patients including advanced age, cardiac cachexia, advanced left ventricular dysfunction, congestive liver disease, malnutrition and possible central sleep apnea are the susceptible factors for lidocaine toxicity. Individual dose adjustment of local anesthetic agents is crucial.

P4-065

Case report: intravenous amiodarone infusion as a risk factor for torsades de pointes

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Background & Objective: Amiodarone has been used safely in patients with history of drug-induced Torsades de Pointes (TdP). However, the present case illustrates the not so benign nature of amiodarone as it led to pronounced QTc prolongation (QTc – 672ms) within hours of starting an intravenous infusion.

Case Description: A 50 year old female patient was planned for rhythm control regimen with cardioversion and class III anti-arrhythmics for maintenance of sinus rhythm. A dual chamber ICD was planned for primary prevention of sudden cardiac death (Class I, LVEF ≤35%, NYHA Class III) & to prevent spurious shocks in patient with history of frequent atrial tachyarrhythmia. The acute increase in QTc (672 ms) was diagnosed to be a result of proarrhythmic effect of intravenous amiodarone infusion. Previously, patient had a stable QTc on oral amiodarone (QTc 480ms) at oral dose of 200mg bd administered for prior one week before ICD implant. This reflects variable response of QTc for oral vs. intravenous amiodarone therapy. No confounding drug therapy or electrolyte abnormality was found that could have led to the abnormal rise in QTc. Amiodarone infusion was stopped and pacing rate of ICD increased to 80 bpm. The immediate cessation of episodes of torsades with an increase in pacing base rate highlights the pause-dependent characteristic of these arrhythmias. Following these measures, no episode of VT/ VF recurred and patient stayed comfortable during the recovery period.

Conclusion: Amiodarone therapy can lead to abnormally prolonged QTc resulting in TdP. Careful monitoring of patients, especially females, is important during intravenous infusion to avoid unwarranted outcomes.

P4-066

A case of successful radiofrequency catheter ablation with multiple atrioventricular accessory pathways - is it "multiple" or "broad multi-fiber" pathway?

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A 65-year-old female was transferred to our department because of episodes of palpitation. 12-lead-ECG revealed wide QRS complex with pre-excitation(delta) wave, showing positive polarity in II/aVL/aVF/V4-6, negative polarity in aVR, isoelectric polarity in I/III, and R/S wave amplitude<1 in V1. Electrophysiological study and catheter ablation was performed, suspecting the atrioventricular accessory pathway (AP) located at the anterolateral area of tricuspid annulus (TA). The earliest ventricular activation was recorded in the 10-11 o'clock region, and radiofrequency (RF) energy was delivered at that site. Although delta wave did not disappear, the polarity of delta wave was slightly changed (i.e. negative in III). This findings suggested the existence of multiple AP, or so-called "multi-fiber" AP, characterized by the "broad-fiber attachment" at the ventricular site. Furthermore, nonsustained supraventricular tachycardia was spontaneously induced, with the earliest retrograde atrial activation in the 2-3 o'clock region of the mitral annulus, suggesting orthodromic atrioventricular reciprocating tachycardia via left anterolateral concealed AP. Additional mapping was consecutively performed, and the earliest ventricular activation was recorded in the 6-7 o'clock region of TA, significantly distant (>2cm) from first ablation site. RF energy was then delivered, resulting in elimination of delta wave. Regarding the left concealed AP, ablation catheter was inserted using retrograde aortic approach, and successfully eliminated during the constant ventricular pacing. We here reported a rare case with totally 3 multiple APs successfully eliminated by catheter ablation.

P4-067

Differential response of myocardium and thoracic lymph nodes in patients with isolated cardiac sarcoidosis

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Background & Objectives: Isolated cardiac sarcoid (CS) is diagnostic challenge and monitoring sarcoid activity in such patients is more difficult. Prognosis is poor if untreated or undertreated yet it is unclear how to assess treatment efficacy. An 18-Fluorodeoxyglucose Positron Emission scan-computed tomography (18FDG PET CT) is a sensitive tool in diagnosing this disease and thought to correlate very closely with the granulomatous inflammation. We used 18FDG PET CT scan as a tool to observe resolution of disease in CS treated with immunosuppressive therapy.

Methods: We identified 18 patients with CS based on histopathologic diagnosis who had a baseline and follow-up 18FDG PET CT after immunosuppressive therapy. We collected their clinical data, mean and maximum, myocardial and thoracic lymph nodes' standardized uptake values (SUV) retrospectively. Responders were defined as patients whose CHF or VT regressed with therapy. We used paired t-test and F-test for statistical analysis

Results: Eight out of 18 patients were female. Mean age was 42.6 ± 11.7 years. The follow-up PET was done 5.1 ± 2.7 months after initiation of therapy, all less than 1 year. The thoracic lymph nodes' SUVs decreased in both responders and non-responders to therapy without difference between the two groups. However, the myocardial SUVs decreased in responders and increased in non-responders.

Conclusions: In patients with CS treated with immunosuppressive therapy, fall in thoracic lymph nodes SUV does not correlate with myocardial SUV fall.

P4-068

Arrhythmia in the ICUs

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Background and objectives: Many patients with an advanced disease go into Intensive care unit. AMC has many miscellany of ICUs and the patients have several types of arrhythmia by de novo, drugs and kind of illness. In ICU patients were monitored on ECG, BP and saturation.

Methods: Especially ECG monitoring is seen one or two leads on monitor in real time. From July, 2012 to April, 2013, about 3120 patients entered in the ICU. Daily checked new patients in ICU, examining all recorded ECG data of each patient on rounding. And classified ECG as rate and pattern.

Results: The arrhythmia had observed about 43% in all of the patients entered into ICU. Its arrhythmia ranges from tachycardia about 81% to bradycardia about 19%. Types of tachycardia are supraventricular tachycardia about 7%, atrial flutter about 5%, atrial fibrillation 38%, ventricular tachycardia about 12% and ventricular fibrillation about 1.9% while patients were in the ICUs. All kinds of bradycardia in the ICUs are first degree AVB about 10%, Mobitz type I about 8%, Mobitz type II about 12% and advanced AVB and third degree AVB about 7%. The data was analyzed how this relates to department of ICU, treatment of choice and key step in the initial treatment by diagnostic accuracy and capability as the each ICU.

Conclusion: Most common tachycardia is atrial fibrillation. Monomorphic VT occurred in the patient has structural heart disease intermittently. Meanwhile polymorphic VT arised in the case of patients using various kinds of medicines. In particular treatment of TdP often gave to patient inaccurate at the initial step. The Education of treatment and diagnosis of TdP is needed for ICU workers.

P4-069

**Arrhythmias without arrhythmic ECG in recurrent syncope patient
Implantable loop recorder revealed paroxysmal AV block**

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Case presentation: 55 year-old male suffered from recurrent syncope one year ago since March 2012. He denied hypertension, diabetic mellitus or other cardiovascular disease. The syncope always attacked at dawn that around 4 A.M. to 6 A.M. Witness is patient's wife. Syncope occurred once to several times per month. The duration of syncope is around 30 seconds to 60 seconds. The conscious recovered completely. No prodromal symptoms and signs like seizure or tachycardia were noted. The only accompany symptoms is urinary incontinence always.

The electrocardiography is normal. Results of additional cardiac examination such as echocardiography, holter and treadmill test were negative. The patient also received electrophysiology study and coronary angiography but these tests indicated neither arrhythmias nor structural heart disease. He decided to have implantable loop recorder (ILR), REVEAL (Medtronic, Minnesota), to identify cause of syncope on March 4th 2013.

Syncope with urinary incontinence happened again one month on April 6th 2013. The REVEAL revealed bradyarrhythmias on 4:22 A.M. Bradyarrhythmias initiated by 2:1 atrioventricular block and average heart rate was 23 beats per minute. It persisted for one minute then rhythm progressed to junctional escape rhythm with sinus arrest. Rhythm recovered to normal sinus rhythm after 18 seconds junctional rhythm.

Pacemaker implantation was performed on April 23th 2013. The patient had no syncope anymore after device therapy.

Conclusion: Implantable loop recorder is only diagnosed solution for low-frequent, symptomatic, recurrent syncope.

P4-070

A young case of atypical type-B Wolff-Parkinson-White syndrome accompanied by left ventricular dysfunction

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A 15-year-old male patient indicated the presence of an electrocardiographic abnormality and left ventricular dysfunction (left ventricle ejection fraction 40%) with during an echocardiography performed 2 years previously. The LV dysfunction had not improved despite the patient undergoing optimal medical therapy for dilated cardiomyopathy (DCM). Therefore he was admitted to our hospital for further examination. Twelve-lead electrocardiography showed a normal PR interval (138ms) with a small delta-like wave in V2, but not typical diagnostic wave. Remarkable asynchronous septal motion, similar to that of DCM, was detected during transthoracic echocardiography. We subsequently performed an electrophysiological study to exclude the possibility of Wolff-Parkinson-White syndrome. An accessory pathway (AP) was revealed at the lateral wall in the right ventricle, and radiofrequency catheter ablation was successfully performed to disconnect the AP. Thereafter, the dyssynchrony disappeared, and LV function improved. The intrinsic atrioventricular node conduction was very slow (A-H 237ms). The results of electrocardiogram auto-analysis could not be used to confirm the diagnosis of Wolff-Parkinson-White syndrome because of the atypical delta wave and because the conduction via the right lateral AP was causing the electrical dyssynchrony in the LV. This case suggests that atypical delta waves in 12-lead electrocardiograms should be evaluated without depending on electrocardiogram auto-analysis in patients with LV dysfunction accompanied by asynchrony.

P4-071

Daily fluctuation of pharmacologic challenge test in a patient with Brugada syndrome

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A 32 year-old man came to our emergency room due to ventricular fibrillation (VF) at early morning. In ambulance, automatic external defibrillator detected VF and converted to the sinus rhythm in the patient. The patient suffered from stormy VF recurrences after admission and we introduced percutaneous cardiopulmonary support (PCPS) device to stabilize his unstable hemodynamics. The VF recurrence was abolished six hours later by adrenalin, and sinus rhythm was maintained. We could not detect BS-type ECG, prolonged QT interval and J wave. Coronary angiography was normal, and the patient did not have any organic heart disease. Electrophysiological study showed the patient had normal functions of sinus and atrioventricular nodes and programmed electrical stimulation failed to induce VF. We performed sodium channel blocker test (intravenous pilsicainide chloride, 1mg/kg over 6-min period) to exclude the possibility of the BS and pilsicainide failed to unmask the BS-type ECG. We diagnosed the patient having idiopathic VF and implanted an implantable cardioverter defibrillator (ICD) to this patient. Type 2 Brugada-like ECG (saddle-back type ST elevation) of the Consensus Reports transiently appeared five days after the pilsicainide test, then we performed drug challenge test again. The second pilsicainide test unmasked the typical type 1 BS-type ECG. During follow-up, we could not detect BS type ECG, and VF have not recurred.

P4-072

A case of ventricular tachycardia originated from right ventricular outflow tract during parasympathetic nervous activity dominance

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The case was 57-year-old female with pre-syncope. She had felt dizziness at rest from early fifties. She consulted several hospitals for this complaint. Cardiac examinations performed at these hospitals showed no abnormal findings. One day, she clashed a pole in her driving due to faintness. She admitted to our hospital and was revealed ventricular tachycardia (VT) by 24-hour electrocardiogram Holter monitoring. Majority of premature ventricular contractions (PVC) and VTs were recorded during night. In the frequency-domain analysis of heart rate variability (HRV) from her Holter recording, parasympathetic nerve activity increased just before VT. The morphology of PVCs and the first beat of VTs were same, inferior axis and left bundle block type. The catheter ablation was performed with 3D mapping system, targeting for PVCs originated from right ventricular outflow tract. The frequent-domain HRV analysis from Holter recordings was performed before and after the catheter ablation. Parasympathetic nerve activity decreased and a fractal dimension, which is a trend of distribution of HRV in log-log scales, decreased. For more than five years after the catheter ablation therapy, she has not experienced faintness any more.

P4-073

A case of sudden cardiac death confirmed with remote monitoring system

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A 47-year-old male with history of AMI (July, 2006) underwent cardiac resynchronization therapy due to ischemic cardiomyopathy (EF21%) on March 31, 2009. Prior to the implantation, he did not experience ventricular fibrillation or ventricular tachyarrhythmia but underwent CRT-D implantation due to highly reduced cardiac function. After implantation, EF improved to 37% and heart failure symptoms also ameliorated. The patient was monitored and periodically followed by the remote monitoring system, and no abnormalities were detected prior to July 30th, 2010. On August 9th, 2010, an e-mail notification for shock delivery due to VF was sent out. An electrical storm (ES) had occurred. The patient's boss was contacted and an emergency rescue team was sent to his house. He had lost consciousness at home, and by the time the rescue team found him, he had already passed away. Via remote monitoring system, the transmitted holter showed that VF and shock therapy repeated occurred. For the first time, we experienced a case where ES was the first attack. Even though a shock device was implanted and the patient was remotely monitored, his life could not be saved. When a patient experiences a storm outside of the hospital, there are times where the patient cannot be saved regardless of an implanted shock device.

P4-074

Bipolar radiofrequency catheter transmural ablation on refractory arrhythmia originating from deep myocardium

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Introduction: Conventional unipolar catheter ablation is insufficient to eliminate deep intramural arrhythmia circuit. These cases demonstrated bipolar radiofrequency catheter ablation(RFCA) can be an alternative to achieve transmural ablation.

Case 1: A 46 year-old man with atrial tachycardia (AT) underwent RFCA. While the earliest activation (EA) site was supposed to be at the CS ostium on Duodeca catheter, the potential of ablation catheter at CS ostium was not earlier than that of Duodeca catheter. Activation mapping didn't show the EA compared to that of Duodeca catheter. We concluded that the trigger was in the deep interatrial septum. So bipolar RFCA was attempted for transmural lesion. Irrigated ablation catheter was placed at the CS ostium and reference catheter at the Left atrial septum, the opposite side of ablation catheter. AT was terminated during ablation.

Case 2: We preformed RFCA to a 45 year-old man with premature ventricular contraction (PVC). The EA site was left ventricular (LV) summit in the great cardiac vein (GCV) and right ventricular outflow tract (RVOT) and epicardial mapping. But PVC was not terminated after several ablation. So we concluded that the origin was in the deep location around LV summit and attempted bipolar RFCA. We positioned the ablation catheter at GCV around LV summit and reference catheter at RVOT. While RF energy was delivered, PVC was terminated but recurred immediately. We finished procedure because further ablation could injure the coronary artery.

Conclusion: Bipolar RFCA can be an alternative to eliminate deep intramural origin arrhythmias.

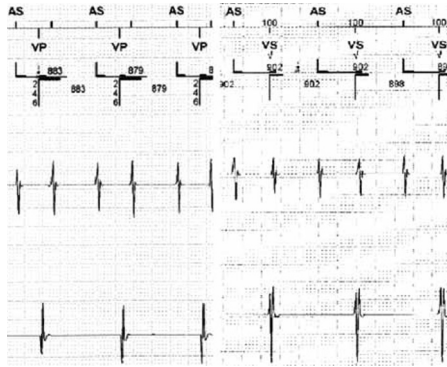
P4-075

2:1 rhythm - what is the mechanism?

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Background: A 66 year-old man with non-ischemic cardiomyopathy and a primary prevention implantable cardioverter-defibrillator (ICD) presented with fatigue and dyspnea.

Methods: ICD interrogation in DDD mode (left panel) and VVI mode (right panel) showed frequent episodes of the following:



The bigeminal Atrial (A) sensing had Ventricular (V) pacing with maximal atrio-ventricular (A-V) delay in DDD mode, and switched to V-sense with VVI mode.

EP study was done with high right atrial, His (H) and coronary sinus (CS) catheters.

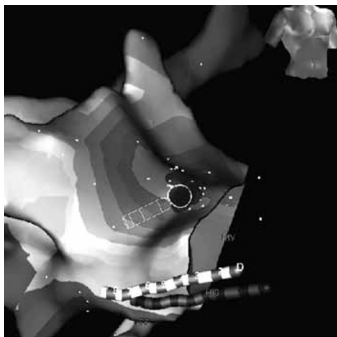


With the intracardiac electrogram and electrocardiogram "p" vector, we postulated that the atrial beats were from two mechanisms. Left atrial ectopic beats (simultaneous CS proximal and distal activations) conducted down a probable slow pathway (SP) with an atrial echo up the fast pathway (FP) along with H-V activation.

The retrograde FP blocked when the ectopic atrial rhythm cycle length prolonged with wobble. We postulated that the longer time allowed antegrade concealment into the FP causing retrograde block.

With retrograde FP block, sinus beats resumed. We postulated that the sinus rate was faster than the ectopic focus, but the ECHO beats were concealing the sinus node allowing the ectopic focus to be active. We also used atrial pacing maneuvers to confirm that the echo beats were not junctional ectopics.

Results: The left atrial focus was mapped using Ensite electro-anatomic mapping and ablated.



Sinus rhythm was restored with intermittent SP and FP conduction. The SP was ablated for A-V synchrony.

Conclusion: This case demonstrates a very interesting 2:1 arrhythmia with unique dual atrial mechanisms.

P4-076

Ablation guided by isolated late potentials for the treatment of ventricular tachycardia associated with dilated phase of hypertrophic cardiomyopathy

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Introduction: In this case report, we present a 57-year-old male patient who suffered from drug refractory ventricular tachycardia (VT) associated with dilated phase of hypertrophic cardiomyopathy (HCM) and the feasibility of endocardial ablation guided by isolated late potentials (ILPs) for the treatment of VT.

Clinical case: The patient had left ventricular aneurysm (LVA) in the apical region associated with dilated phase of HCM and suffered from drug refractory VT under ICD implantation. We performed endocardial activation mapping (CARTO) during atrial pacing. Electrograms with ILPs were recorded in LVA. Perfect pace mapping was obtained in posterior segment of left ventricle where an ILP was recorded. We performed radiofrequency applications each one targeting an ILP. Radiofrequency ablation suppressed clinical VT and decreased the need for ICD therapies in the patient.

Conclusions: Electrograms with ILPs were identified during atrial pacing in the LVA associated with dilated phase of HCM. Endocardial ablation guided by ILPs was effective in controlling drug-refractory VT in the reported case.

P4-077

An uncommon cause of ventricular tachycardia in patient of myotonia dystrophica and conduction system disease

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Background: Cardiac involvement frequently occurs in patients with neuromuscular diseases. Our present case illustrates the cardiac involvement in the form of conduction system disease and an uncommon mechanism of tachyarrhythmia in a patient with myotonic dystrophy.

Case report: 25 year-old lady was referred to us for the management of hemodynamically stable monomorphic ventricular tachycardia (VT) with right bundle branch block morphology with QRS axis of +135°. On evaluation, she was found to have features of myotonic dystrophy. Echocardiography and MRI were normal. Her mother had dilated cardiomyopathy with sudden cardiac death. Her baseline ECG showed Left bundle branch block (LBBB) morphology with first degree AV block. Electrophysiological study showed prolonged HV interval of 95ms. Programmed ventricular stimulation induced VT with LBBB morphology with QRS axis of -75°. Activation pattern and entrainment characteristics suggested counterclockwise bundle branch reentry. As the clinical VT had morphology different from the induced one, and high likelihood of development of complete heart block on RF ablation of bundle branch, an automatic implantable cardioverter defibrillator (AICD) was implanted. Subsequently, the patient was kept off antiarrhythmics. The patient had two appropriate shocks within 3 months of implantation. No further events occurred on amiodarone 100mg/d at 9 month of further follow up.

Conclusion: Conduction system involvement in patients with myotonic dystrophy can have varied manifestations like infranodal conduction delay and multiple forms of VT including bundle branch reentry. ICD implantation may be an early option in this high-risk patient population.

P4-078

Ablation of intraatrial reentrant circuits from within intracardiac lateral tunnel in a fontan circulation

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Background: Intraatrial reentrant tachycarrhythmias (IART) are common in patients with Fontan circulation. Catheter ablation is often limited by the need of baffle puncture to enter the native atrium in these patients with intra- or extracardiac lateral tunnel. We describe a case where the reentrant circuits could be successfully ablated from within the intracardiac lateral tunnel without entering into native ariia in a patient who had undergone Fontan palliation for single ventricle physiology with pulmonary stenosis.

Case Report: 24 year-old lady, who underwent total cavopulmonary connection surgery (intracardiac lateral tunnel) for double outlet right ventricle, inflow ventricular septal defect and severe pulmonary stenosis at the age of 11 years, presented with history recurrent episodes of palpitation. Her surface electrocardiography showed atrial flutter with 2:1 conduction. Electroanatomical mapping of the arrhythmia was done under EnSite velocity mapping system. Mapping revealed dense scar at both anterior and posterior aspect corresponding to the site of suturing of the medial aspect of the tunnel to the native atrium. Five different tachycardias were induced during the study, which showed earliest activation near both the end of the scars. Electrical isolation of both the scars resulted in termination of tachycardia. No tachycardia could be induced after the final ablation. As the circuits could be successfully ablated from within the tunnel, a baffle puncture could be obviated. After termination of tachycardia, she had slow junctional rhythm, which recovered to sinus rhythm within 24 hours.

Conclusion: IART in a patient with Fontan palliation could be ablated successfully from within the lateral tunnel in this case, and this suggests that the baffle puncture for entry into the native atrium could be avoided at least in a few similar cases.

P5-045

Case report: An 84-year-old man reported several episodes of palpitations over the previous 6 months

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Case report: An 84-year-old man reported several episodes of palpitations over the previous 6 months. He had previously suffered a non-Q-wave myocardial infarction (MI) in 2005. He was referred to our clinic 2 years later when he was diagnosed with sick sinus dysfunction while receiving treatment with a beta blocker (bisoprolol), aspirin, and an angiotensin-converting enzyme (ACE) inhibitor (perindopril). To treat his condition we implanted the patient with an ALTRUA dual-chamber pacemaker (DDDR). Analysis of the data in his pacemaker memory in December 2011 did not indicate any malfunctioning and verified approximately 8,000 premature ventricular beats (PVBs) daily and nonsustained ventricular tachycardia (NSVT).

The patient agreed to add omega-3 fatty acid ethyl ester supplementation (1 g/day) to his regimen. Pacemaker analyses 3 months later indicated no NSVT and only 215 PVBs daily. The patient has remained well and has had no further ventricular arrhythmias. Omega-3 fatty acid ethyl ester supplementation may be beneficial in post-MI patients with pacemakers who develop ventricular arrhythmias.

Conclusions: There was a clear positive association between cessation of palpitations and commencement of treatment with Omacor by this patient, although any link must be considered speculative. The observed dramatic benefit sustained over 6 months of follow-up, in the absence of beta blocker or ACE inhibitor therapies, suggests a genuine effect of Omacor. Thus, non-invasive omega-3 fatty acid ethyl ester supplementation with Omacor may be of benefit in post-MI patients with ICDs who develop ventricular arrhythmias.

P5-046

Two cases of right atrial thrombi complicated by tachycardia induced cardiomyopathy

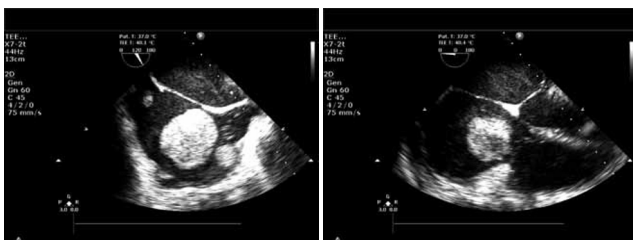
Haruka Fujimaki, Yoshiyuki Hama, Tai Sekine, Satoshi Tokimasa, Bi Katsu, Shuzo Tanaka, Norimasa Tomoike, Kyokushi Hou, Yuji Matsudo, Masashi Yamamoto, Toshiharu Himi
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Background: Atrial thrombi associated with atrial flutter or atrial fibrillation usually occur in the left atrium. We present two cases of right atrial thrombi complicated by tachycardia induced cardiomyopathy due to atrial flutter or atrial fibrillation.

Case 1: A 38-year-old man visited our hospital with palpitations lasting for 3 weeks and dyspnea on exertion for a few days. The electrocardiogram showed atrial flutter and transthoracic echocardiography revealed one huge and at least two small mobile masses in the right atrium. The huge mass was 50 mm in diameter. The left ventricle ejection fraction (LVEF) was 15%. Computed tomography revealed small pulmonary emboli. An emergent open heart surgery was performed and the histological findings confirmed the diagnosis of fresh thrombi. After the operation, a catheter ablation for atrial flutter was performed.

Case 2: A 49-year-old man with hypertension and atrial fibrillation visited our hospital with symptoms of heart failure. The electrocardiogram showed atrial fibrillation and transthoracic echocardiography revealed a very low cardiac function (LVEF 15%). Transesophageal echocardiography revealed thrombi in both the right and left atrial appendages. Warfarin and amiodarone were administered, and the thrombi disappeared within 3 months. Thereafter, a catheter ablation for atrial fibrillation was performed.

Conclusion: The thrombi were presumably caused by stasis due to decreased intracardial blood flow. A detailed evaluation of the right atrium is important for patients with a very low LVEF and tachycardia induced cardiomyopathy.



P5-047

Successful catheter ablation of junctional tachycardia in a heterotaxy patient with twin atrioventricular nodes

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Background & Objectives: Mechanism of supraventricular tachycardia (SVT) associated with heterotaxy is various. We report a very rare case of 10 year-old male with heterotaxia, single ventricle, exhibiting recurrent junctional tachycardia of the posterior-atrioventricular node (AVN).

Methods: N/A

Results: During baseline electrophysiological study, two distinctive His bundle electrograms were detected on the annulus of common-atrioventricular valve. The VA conduction was decremental, and the earliest atrial activation during retrograde conduction was at the anterior-AVN. The baseline cardiac rhythm was accelerated junctional rhythm (JR) and the earliest atrial activation was noted at the posterior-AVN. During transient sinus rhythm (SR) and atrial pacing, AV-conduction was through the anterior-AVN and the posterior-AVN producing different narrow QRS complexes. SVT was not induced by programmed stimulation and isoproterenol infusion. The QRS morphology of 12-lead ECG that had been recorded during clinical SVT was the same as the baseline-JR. From these observations, we diagnosed that the anterograde conduction was through anterior-AVN and posterior-AVN and the retrograde conduction was through anterior-AVN only and that clinical SVT was junctional tachycardia of the posterior-AVN. After ablating the posterior-AVN successfully, the accelerated JR was converted to SR with narrow QRS complex due to anterior-AVN conduction.

Conclusion: Successful catheter ablation of junctional tachycardia originating from the posterior-AVN in heterotaxia with twin atrioventricular nodes has not been reported. Since SVT can be a fatal complication in the Fontan patients, especially with heterotaxy syndrome, we should recognize such a rare situation other than twin atrioventricular nodal reentry.

P5-048

Extremely rapid electrical activity persisting in the isolated pulmonary vein in patients with paroxysmal atrial fibrillation: a case series

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Background: Although slower dissociated rhythms in the isolated pulmonary vein (PV) have been observed during atrial fibrillation (AF) ablation, extremely rapid electrical activities persisting in the disconnected PV have rarely been encountered.

Case1: A 46-year-old male with paroxysmal AF underwent AF ablation. Circumferential PV isolation was conducted under sinus rhythm. AF was induced following right PV isolation and transitioned into common atrial flutter. Completion of cavo-tricuspid isthmus linear ablation terminated atrial flutter and shifted it to another atrial tachycardia with an atrial cycle length (CL) of 270 ms originating from the left PV. Although sinus rhythm was restored just after achieving left PV isolation, rapid electrical activity with a CL of 110 ms continued in the left inferior PV. Radiofrequency application to the focus successfully eliminated the intra-PV firing.

Case2: A 62-year-old female with paroxysmal AF underwent catheter ablation. Circumferential PV isolation was started during AF. During left PV isolation following right PV isolation, AF was converted to focal right atrial tachycardia (CL 320 ms). Radiofrequency application to the focus promoted a shift from the existing tachycardia to a different tachycardia with an absolute irregular atrial rhythm (CL 350-600 ms) arising from the left PV. Both atria were restored to sinus rhythm just after complete left PV disconnection, although the rapid electrical activity (CL 90 ms) still continued within the isolated left PV. Following RF application to the focus, electrical excitation has never recurred.

Conclusion: We experienced rare two cases with rapid electrical excitations persisting in the isolated PV.

P5-049

Effectiveness of ASV and catheter ablation for the refractory electrical storm associated with SAS in patient with cardiac sarcoidosis

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A 70-year-old man diagnosed cardiac sarcoidosis was admitted to our hospital because of electrical storm (ES); frequent appropriate therapy with ICD for ventricular tachycardia (VT) and ventricular fibrillation (VF) triggered by monofocal premature ventricular contractions (PVC) despite of normal electrolyte level and optimized treatments (amiodarone, predonine, & beta-blocker, ACE-inhibitor, K sparing diuretic). The clinical PVC (superior axis and RBBB type) appeared during sleeping and induced VT/VF. ES was related to hypoxia due to obstructive sleep apnea syndrome (SAS) (RDI 31.7/hr, the minimum SpO2 50%). Adaptive Servo Ventilation (ASV) for SAS markedly decreased the frequency of the PVC, but PVC and ES were not suppressed completely. After changing the setting of ICD (lower rate 80 and short AV interval) for RV overdrive pacing under general anesthesia, PVC and ES were suppressed eventually. We attempted to radiofrequency (RF) catheter ablation for the triggering PVC and substrates associated with VT/VF. Left ventricular substrate mapping revealed the low voltage site and delayed potentials at the apical-septal and inferior anurysmal area. During catheter ablation of apical-septal area, PVC firing occurred. PVC configuration during ablation was the same as PVC related to VT/VF. After several RF applications to these area, delayed potential split two components and PVC firing disappeared. We could discontinue RV overdrive pacing and general anesthesia, but continued ASV for SAS and LV dysfunction. No sustained VT/VF recurred during six months after discharge. We present here the effectiveness of ASV and catheter ablation to the refractory ES associated with SAS in patient with cardiac sarcoidosis.

P5-050

Usefulness of ivabradine in treatment of atrial tachycardia and predictors of its response

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Background and Objective: Ivabradine is a novel antiarrhythmic which blocks the If channels. Our aim was to document usefulness of ivabradine in atrial tachycardia with possibly considering If channel in pathogenesis of atrial tachycardia and predict factors which may predict its efficacy.

Method: Patients referred with incessant atrial tachycardia were included in the study. 5 mg of Ivabradine, twice daily was added in addition to the medications. Response to ivabradine in form of termination of tachycardia or slowing of rate was evaluated at the end of 2 days. All patients were offered radiofrequency ablation after that. Analysis to evaluate the effect of ivabradine on atrial tachycardia and to evaluate the predictors of response to ivabradine was done.

Results: Of the 29 patients included in the study. 5 patients opted to undergo RF ablation before 2 days of starting the drug and hence were excluded. Analysis was done from the 24 patients. 6 of 24 patients responded to ivabradine. Predictors of response of atrial tachycardia to ivabradine were younger age group, atrial rate variation during tachycardia, origin of arrhythmia from either the atrial appendages on electrophysiology study / P wave morphology of sinus or atrial appendage origin during tachycardia (P value < 0.05). None of the patients reported any side effects to the drug.

Conclusion: If channel is also responsible in genesis of atrial tachycardia and Ivabradine can be used as an alternative treatment in some patients who may not respond to conventional drug management strategies.

P5-051

Takotsubo cardiomyopathy complicating permanent complete AV-block

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Takotsubo cardiomyopathy presents with reversible left ventricular wall motion abnormalities and arrhythmias, usually associated with a good prognosis. Here we report a rare case of takotsubo cardiomyopathy complicating permanent complete AV-block.

History and Admission: An 84-year old woman was admitted to our hospital with persisting dyspnea due to heart failure. She had had no history of heart disease.

Diagnostic Procedures: ECG showed sinus tachycardia, first degree AV-block, and significant ST-segment elevation in V2-V5. Echocardiography revealed ballooning and dyskinesia in LV apex. Coronary angiography showed no significant coronary artery stenosis.

Treatment and Course: Her heart failure improved with diuretics. Dyspnea disappeared and LV wall motion recovered a week later, which were compatible with takotsubo cardiomyopathy. Nonetheless, second and third degree AV-block occurred in spite of the improvement of left ventricular wall motion. A permanent pacemaker was implanted on the 23th hospital day due to the persistent third degree AV-block. She has completely depended on pacemaker for two years.

P5-052

Right ventricular papillary muscle tachycardia in a patient with ehlers-danos syndrome

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Background/Objectives:

Premature ventricular complexes (PVCs) and ventricular tachycardia (VT) originating in the papillary muscles (PM) of the left ventricle have been well described; however, arrhythmias arising from one of the right ventricular (RV) PM are less common. We describe a case of recurrent VT in a patient with Ehlers-Danos syndrome (EDS).

Methods: Case report

Results: A 21 year old woman with EDS presented with symptomatic palpitations. Her baseline ECG showed sinus rhythm with a right bundle branch block. A Holter monitor recorded a wide complex tachycardia with negative QRS in lead V1. Echocardiogram and cardiac MRI demonstrated a normal structural heart. During EP study there were inducible PVCs and sustained VT (LBBB morphology, left superior axis, late precordial transition, QRS notching) consistently triggered by overdrive pacing on Isoprenaline. Using the Carto 3 Mapping system an activation map of the RV during VT showed earliest ventricular activation in the posterior mid RV. Intracardiac echocardiography (ICE) confirmed the intra-cavitary origin of the VT to the posterior PM of the tricuspid valve. Radiofrequency ablation with a 4 mm irrigated catheter (35 Watts, 45 C) eliminated the arrhythmia.

Conclusion: VTs originating in the RV PMs are rare. These arrhythmias have characteristic ECG findings suggesting their site of origin. Their underlying mechanism is triggered activity. Ablation of these arrhythmias is feasible. ICE helps to assure adequate catheter to tissue contact in these complex anatomical structures. The association between EDS and RV PM arrhythmias has not been previously described.

P5-053

Extracardiac structures are frequently present within close proximity to the mitral annulus: relevance to catheter ablation for the left mitral isthmus in 28 cases

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Background: The left circumflex coronary artery (LCX) and the coronary sinus (CS) including the great cardiac vein (GCV) is an important anatomic structure that is considered a landmark for the mitral annulus (MA) and also close to a ablation site. This study evaluated influence of linear ablation for left mitral isthmus on LCX, CS and GCV by multi-detector computed tomography (MDCT).

Methods and Results: We performed two-time MDCT on 28 patients (22 males, age 59.4 ± 10.7 years), before and after linear ablation for left mitral isthmus (LMI). The LMI ablation was performed under the guidance of the CARTO system with 3D geometric reconstruction of the left atrium (LA) from MDCT images. RF energy was delivered with 20-35 W at the anterior wall with a saline irrigation speed of 17 or 30 mL/min. The rate of complete bidirectional LMI block was 78.6% (22/28), ablation from CS or GCV was needed in 50% (14/28) patients. The observational period from LMI ablation to follow-up MDCT was 12.4 ± 5.4 months on average. There was no stenosis or occlusion in LCX, CS, GCV.

Conclusions: In almost half of LMI ablations, ablation from CS or GCV was needed to achieve complete bidirectional LMI block. About 1 year follow-up observation, there was no remarkable change in LCX, CS and GCV between before and after MMDCT. Although LCX, CS and GCV present within close to the ablation site of LMI, it may be safe to undergo ablation for LMI with deliberate RF energy setting.

P5-054

Successful catheter ablation of para-hisian accessory pathway targeted the accessory pathway potential

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Radiofrequency catheter ablation of accessory pathway (AP) located in the proximity of His bundle has the potential to result in atrioventricular (AV) block. We present a case of successful catheter ablation of Para-Hisian AP targeted the AP potential.

A 59 years old male with Wolff-Parkinson-White syndrome and frequent attacks of paroxysmal supraventricular tachycardia (PSVT) had unsuccessful attempt at a catheter ablation for Para-Hisian AP ten years ago. The electrocardiogram showed QS pattern in lead V1 and positive delta waves in leads II, III and aVF. In the electrophysiological study, the earliest anterograde ventricular activation during sinus rhythm and the earliest retrograde atrial activation during ventricular pacing occurred at the right anterosseptal tricuspid annulus in the region of the His bundle recording, and retrograde conduction over an anterosseptal AP was determined by Para-Hisian pacing. During atrial extrastimulus, a small spiked AP potential was recorded with delta wave and disappeared on atrium-to-ventricle interval prolongation. The ablation target was the ventricular site of right anterosseptal that presented a distinct AP potential and a sharp QS deflection on the unipolar electrogram. Delta wave disappeared and clear His bundle potential appeared as soon as radiofrequency energy delivery at relatively low power (20W). Furthermore, retrograde conduction over AP disappeared and PSVT was never inducted. On the other hand, AP potential remained and the finding expressed elimination of AP connection site to ventricular.

Radiofrequency catheter ablation targeted the AP potential seem to support to successfully eliminate Para-Hisian AP without AV block.

P5-055

The combination of post coronary vasospasm QT prolongation and right ventricular premature contractions is at risk for lethal ventricular arrhythmia in the patient with vasospastic angina

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Background: Little is known about the arrhythmogenesis of lethal arrhythmia in the patients with vasospastic angina (VSA).

Case: A 51-year-old woman who had been diagnosed VSA, old anterior myocardial infarction, right ventricular outflow tract premature ventricular contractions (RVOT-PVC) with a history of syncope was admitted to Yokohama Medical Center to inspect a liver hemangioma. At first midnight of hospitalization, she had second syncope with incontinence and sursumvergence. 12-lead ECG showed ST segment elevation with negative T wave in leads V1-5 and tremendous QT prolongation with repetitive Torsade de Pointes (TdP) triggered by frequent RVOT-PVCs. Emergency coronary angiography revealed no organic stenosis in all three coronary vessels. Interestingly, spontaneous TdP and subsequent ventricular fibrillation (VF) was observed just during left coronary angiography demonstrating that severe ischemia was not involved in the genesis of lethal arrhythmia because of no stenosis at the outbreak of TdP and VF. VF was terminated by electrical defibrillation, and repetitive TdP was inhibited effectively by right ventricular (RV) pacing at 90ppm. Triggering RVOT-PVCs were successfully eradicated by focal catheter ablation at the site of anterosseptal RVOT. Dual-chamber ICD was implanted, and she remained free from ventricular arrhythmia or syncope for 3.5 years. Gene analysis revealed no mutation and three SNIPs on KCNH2 and SCN5A.

Discussion: This case clearly demonstrated that the combination of post VSA attack QT prolongation and RVOT-PVC caused lethal ventricular arrhythmia. RVOT-PVC ablation would be recommended for the patient with VSA especially who had a history of syncope.

P5-056

Ablation of right ventricular outflow tract VT/PVC from left ventricular side

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Two cases of right ventricular outflow tract (RVOT) - ventricular tachycardia (VT) and premature ventricular complex (PVC) were studied. The morphology of PVC in both cases was left bundle branch block (LBBB) and inferior axis which was consistent with possibility of the origin of PVC from RVOT. Conventional activation and paced mapped techniques were used during study. PVCs were recurred after radiofrequency ablation of postero-septal part of RVOT where paced mapped PVC was matched with the morphology of clinical PVC in both cases. Thus, the alternative mapping was performed at adjacent left ventricular outflow (LVO) side. Ablation was attempted at LVO side after identifying the left and right coronary ostia by coronary angiogram and it was successful in both cases. The morphology of PVC in the surface ECG was sharp R spikes at leads 2, 3, avf, rudimentary R at lead V1 in both cases and negative R at lead 1 in one case and positive R at lead 1 in another case. The transitional zone of R at V2 was identified in both cases.

In conclusion, ablation of RVOT- VT/PVC should be attempted from LVO side if the ablation at RVOT is not successful. In addition, special advanced mapping system is not essential in outflow tract VT/PVC ablation.

P5-057

Three cases of pacemaker implantation via persistent left superior vena cava

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Background: The persistent left superior vena cava (PLSVC) has been reported in 0.3%-0.4% of candidates for pacemaker or cardioverter-defibrillator implantation. There would be technical problems to reach a convenient pacing site and to ensure stable lead placement via PLSVC. We present three cases of pacemaker implantation via PLSVC.

Methods: By retrospective medical review, we found three patients who underwent pacemaker implantation via PLSVC.

Results:

Case 1. A 70-year-old woman with mitral valve repair presented with sinus node dysfunction. PLSVC was confirmed by venography. Even though there was patent right superior vena cava, we implanted dual chamber pacemaker using active fixation leads via PLSVC, because of her preference.

Case 2. A 20-year-old man with symptomatic sick sinus syndrome (SSS) was admitted for pacemaker implantation. PLSVC was found by venography. Based on preference, Dual chamber pacemaker was implanted via PLSVC.

Case 3. A 51-year-old man with double valve replacement and symptomatic SSS was admitted for pacemaker implantation. Though there were separately right and left superior vena cava, according to choice he received dual chamber pacemaker via PLSVC without complication.

Procedural data was summarized in table 1.

Conclusion: We report three patients who received pacemaker via PLSVC without complication. Majority of right-handed patients who are undergoing to implant cardiac rhythm device want implantation of contralateral site. Implantation of pacemaker via PLSVC was possible in an acceptable procedural and fluoroscopic duration with excellent patients' satisfaction and stability of lead function. Presence of PLSVC should not be a contraindication to implant through left side approach.

Table 1. Summary of procedural data

No.	Age/ Sex	Atrium			Ventricle			Fluoro time (min)	Procedure time (min)		
		Position	P wave (mV)	Capture Threshold (V)	Impedance	Position	R wave (mV)			Capture Threshold (V)	Impedance
1	70/F	RAA	2.5	0.4	495	RV apex	16	0.4	821	11	60
2	20/M	RAA	3.0	0.3	640	RV inflow	15.2	0.4	1100	7	60
3	51/M	RAA	1.8	1.3	698	RV outflow tract	13.6	0.7	798	20	120

RAA, right atrial appendage; RV, right ventricle

P5-058

Usefulness of surgical intervention for refractory ventricular tachycardia in patients with structural heart disease - lessons from two cases

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Background: The surgical treatment for ventricular tachycardia (VT) has been largely replaced by percutaneous catheter interventions. However, some VT foci still remain inaccessible even using the advanced catheter technology. We experienced two patients with drug resistant malignant VTs which were refractory to both endocardial and epicardial catheter ablation (C-ABL), but were successfully eliminated by the surgical procedures.

Methods and Results:

Case 1; 45 years old male with hypertrophic obstructive cardiomyopathy (HOCM) and non-sustained VT. Left ventriculogram before C-ABL demonstrated an apical aneurysm and mid-ventricular obstruction. Because endocardial RF delivery at the relatively early sites within the aneurysm was ineffective, we switched to the epicardial procedure using a puncture method. Although several RF applications at the earliest sites on the surface of aneurysm terminated VT, the efficacy was transient. Two days later, aneurysmectomy and cryoablation were performed.

Case 2; 68 years old male with old myocardial infarction (OM) and sustained VT. We firstly selected the epicardial approach because of a large fresh thrombus in the LV aneurysm. We focused on the aneurysm as the origin of VT, however, catheter advancement to the aneurysm was impossible due to significant adhesion of pericardium. Endocardial RF delivery very close to the thrombus was also ineffective. The next day, aneurysmectomy, thrombectomy and cryoablation were performed.

Conclusion: Several conditions (e.g. mid-layer origin, thrombus formation and adhesion of epicardium) make the percutaneous access impossible to reach the VT focus. These can be resolved by the surgical intervention guided by the preoperative electro-anatomical mapping.

P5-059

Successful catheter ablation for focal atrial tachycardia developed a macro-reentrant circuit around the mitral annulus in patient with dialysis: a case report

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A 65-year-old man with persistent atrial tachycardia (AT) was admitted and underwent maintenance dialysis. Cavotricuspid isthmus ablation was performed, but the AT did not terminate, and it did not reach the AT cycle length using electroanatomical mapping (CARTO) and instead a centrifugal pattern developed. Therefore the AT circuit was suspected to be from the left atrium (LA), but no Brockenbrough procedure was performed. Six months after the first ablation, he was readmitted with the same AT because dialysis was difficult to perform due to the tachycardia. Right-sided AT was ruled out by activation and entrainment mapping. The AT terminated during CARTO mapping near the earliest excitation site, but the same AT was easy to induce. Activation re-mapping of the LA during AT was performed and a macro-reentrant circuit was identified with a critical left isthmus located between the mitral annulus (MA) and left inferior pulmonary vein. The activation wavefront rotated counter-clockwise around the MA. Although left isthmus radiofrequency catheter ablation (RFCA) was performed, the AT did not terminate. However, the AT successfully terminated with RFCA at the contralateral MA from the left isthmus where the AT terminated before and no longer could be induced after the final ablation. After confirming the left isthmus line, left isthmus ablation could not achieve bi-directional conduction block. Slow conduction was observed at the successful site with a low atrial voltage. Finally, focal AT at the MA was diagnosed. After the AT ablation the patient was arrhythmia free after a follow-up of 3 months.

P5-060

Focal atrial tachycardia - demographics, characteristics and outcomes post ablation in a South Australian population

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Introduction: Focal atrial tachycardia (AT) is a common arrhythmia that can be treated with catheter ablation. It has been reported to have preferential sites with previous studies suggesting a slight predominance to the right atrium. However data are only available from a limited number of institutions and it is unclear whether these are applicable to other populations. We present the electrophysiological characteristics and outcomes of focal AT treated with catheter ablation at our institution.

Methods: Retrospective analysis of demographic and electrophysiological characteristics of patients who underwent focal AT ablation over a five year period.

Results: 63 patients underwent catheter ablation for AT with a mean follow up of 28 months (range 5-66). 76% females, mean age 59 (22-85). 11 had more than one arrhythmia induced - AVNRT (n=6), atrial flutter (n=4) and RVOT-VT (n=1). 9 patients had more than one focus with 72 sites in 63 patients ablated. 59/72 were right sided (82%). Most common sites were Crista Terminalis (n=35), Tricuspid Annulus (n=8), CS os (n=8), RAA (n=5), AMC (n=4), Pulmonary veins (n=4), perinodal (n=3), left septum (n=3), CS body (n=1), LAA(n=1). A total of 73 procedures were performed in 63 patients, with 84% success after first procedure rising to 97% with a mean of 1.13 procedures/patient.

Conclusion: In contrast to previously reported series, we report a marked preponderance of right-sided foci, with Crista Terminalis accounting for almost 50%. Multiple foci and other arrhythmias appear common. Catheter ablation is associated with high success rate at medium term follow up.

P5-061

Focal atrial tachycardia arising from crista terminalis – clinical and electrophysiological characteristics and ablation outcomes

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Introduction: Focal atrial tachycardia (AT) arising from Crista Terminalis (CT) has been well reported. The anatomy, heterogeneity of conduction, and embryology of the CT may be important factors in the development of AT from this site which may translate into different characteristics. We compared clinical and electrophysiological characteristics of AT arising from this site to other ATs (non-CT).

Methods: Retrospective analysis of demographics and electrophysiological characteristics of patients who presented with focal AT for ablation over the last five years.

Results: A total of 63 patients who presented with AT for ablation were identified. 11 had more than one focus and were excluded. 29/52 had CT and 23/52 had non CT. Mean follow up of 26 months (range 5-65).

	CT	Non-CT	P
Mean age	52.1(22-85)	63.5(26-82)	0.013
Age<40	9/29	1/23	0.005
M/F ratio	11/18	7/16	0.022
Mean CL	453 (240-610)	376 (250-500)	0.012
Success	82.8	82.6	NS

Conclusion: AT arising from CT is common (>50%). It appears to be associated with a younger age, with 31% presenting before the age of 40 years. It is more predominant in males, and is characterized by longer cycle length. There is no difference in catheter ablation success rate after one procedure between CT and non-CT sites.

P5-062

Paroxysmal supraventricular tachycardia with relative slow heart rate — a case report

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Background and Methods: Male patient aged 58, complained palpitation for more than ten years. The patient's symptom, without obvious incentives and other simultaneous phenomenon, lasted for about ten minutes of each episode and could relieve itself. The history of the patient was normal and the patient's physical examination was normal, besides his heart rate fluctuated between 60bpm and 150bpm. The patient's ECG showed I degree atrioventricular block. Then the patient received intracardiac electrophysiological study.

Results: The results showed, during the ventricular S1 stimulation, until the cycle length of 320ms, the fast pathway still can retrograde. During the ventricular S1S2 stimulation, until the S2 cycle length of 300ms, the fast pathway still can retrograde. Then at the S2 cycle length of 240ms, 220ms and 200ms, the slow pathway could retrograde. The S2V-A length of fast pathway was 126ms and the S2V-A length of slow pathway was 180ms.

Conclusion and Discussion: The patient had dual atrioventricular node pathway. The fast pathway expressed poor forward conduction function. So the patient was advised to receive PACE maker implantation before receiving radio frequency catheter ablation. Most of clinical cases showed patients had fast heart rates when then accompanied paroxysmal supraventricular tachycardia, but the patient displayed a relative slow heart beat because of the poor forward conduction function of fast pathway. The case showed us the slow heart rate patients still have the possibility of receiving paroxysmal supraventricular tachycardia.

P5-063

PVCs and LV false tendons

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Background: Left ventricular false tendons(LVFT) are discrete fibro-muscular structures that traverse the left ventricular (LV) cavity and are distinct from the mitral valve apparatus. They have been reported to be associated with precordial murmurs, repolarisation abnormalities, preexcitation, ventricular arrhythmias, mitral regurgitation and dilated LV.

Case Details and Results: Mr X a 55 year old asymptomatic male previously diagnosed as "Benign PVCs ". He has no addictions and comorbidities. Clinical examination revealed 5-6 PVC's/ minute. ECG showed PVC'S of RBBB morphology. PVC'S were suppressed by exercise on Stress test. Holter monitoring showed multiple unifocal PVC's and no sustained ventricular arrhythmia. CT Coronary Angiography was normal. 2DEcho showed an LVFT traversing the LV cavity from septum to papillary muscle. He has been advised Beta blockers and close follow up.

Conclusion: Incidence of LVFT is 0.4 - 3% in the general population. In patients with PVC's the incidence is as high as 56%, suggesting that LVFT is a rare structural abnormality which may be an etiological factor in the development of PVC's especially the rate dependant and medically uncontrolled PVC's seen in apparently healthy individuals. Hence an LVFT should be specifically looked for by transthoracic or transesophageal echo before labeling the PVC as "benign" PVCs , especially in patients whose PVC's are suppressed by exercise and refractory to medical treatment. Asymptomatic patients without sustained ventricular arrhythmia should be followed up closely bearing in mind the potential problems known to be associated with LVFT.

P5-064

Effect of routine bilateral circumferential pulmonary vein isolation for atrial fibrillation in patient with ebstein's anomaly

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Background: Although catheter ablation is established therapy for atrial fibrillation (AF), it has not been reported about the effect of circumferential pulmonary vein isolation for AF in patient with Ebstein's anomaly.

Case: A 66-year-old female with Ebstein's anomaly was referred to our hospital because of congestive heart failure due to new onset of AF, and we performed catheter ablation for AF. Preprocedural transthoracic echocardiogram showed displaced tricuspid septal reaflet towards the right ventricular apex, and severe dilated right atrium. Although firing phenomenon from bilateral pulmonary veins was recorded, any other arrhythmogenicity including dilated right atrium could not be observed during ablation procedure, and routine bilateral circumferential pulmonary vein isolation was conducted. There was no recurrence of AF during 6 months follow up after ablation procedure and congestive heart failure was improved.

Conclusion: Routine bilateral circumferential pulmonary vein isolation may have adequate effect for AF in patient with Ebstein's anomaly.

P5-065

Failure of mode switch in 2:1 atrial flutter

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A 60-year old male with a history of paroxysmal atrial flutter underwent implantation of a Medtronic SED01 dual-chamber pacemaker because of sick sinus syndrome. Two months later, he presented with a rapid ventricular rate of 138bpm. ECG was atrial flutter with 2:1 atrioventricular conduction. Interrogation of pacemaker revealed sinus tachycardia on marker channel. By checking A EGM channel, atrial flutter was suggested (cycle length 220ms). The second flutter wave was not sensed as it was within the post-ventricular atrial blanking period (Figure 1). In order to unmask 2:1 atrial flutter, an algorithm named blanked flutter search (BFS) is designed. If eight consecutive sensed atrial cycle length is less than: (1) twice the total atrial blanking period (TABP= SAV+PVAB); and (2) twice the mode switch detection interval (MSDI), PVARP will be extended to 400ms to uncover any blanked AS events. If an atrial cycle length shorter than the detection interval is detected, mode switch will be activated. In this case, SAV=120ms, PVAB (black box) =130ms, MSDI=343ms, those criteria were met and should initiate BFS. PVARP (transparent box) was extended for one cycle and the formerly sensed atrial event fell into PVARP and conducted. Thus a new PVAB was initiated and the next atrial flutter wave (arrow) couldn't be revealed. Although failure of atrial flutter detection didn't affect ventricular rate in this case, it would interfere with recordings of atrial tachyarrhythmias. Further improvement in detection algorithms of atrial tachyarrhythmias is needed.



Figure 1

P5-066

Successful ablation of epicardial VT cases from great cardiac vein and endocardium

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Case1: A 50-year-old man with dilated cardiomyopathy was referred to our hospital due to severe heart failure and electrical storm of incessant monomorphic ventricular tachycardia (VT) with inferior axis. Right ventricular endocardium and aortic cusp activation mapping were performed. But radiofrequency energy application at the earliest endocardial activation site could not eliminate the VT. Radiofrequency energy application at the earliest endocardial activation site could not terminate the VT. Left ventricular assist device (LVAD) was implanted and carvedilol, amiodarone, mexiletine and enalapril were administered. Nine months later, after LVAD was explanted, the VT recurred. A pre potential preceding the onset of the QRS complex by 74ms was recorded at the distal great cardiac vein (GCV). Pace mapping provided an identical (12/12) match with the clinical VT morphology at the site. Radiofrequency ablation at this site terminated the VT and rendered the VT noninducible. Three months later, he remained free of arrhythmia.

Case2: A 23-year-old man without any structural cardiac disease was referred to our hospital because of incessant VT with inferior axis. At the distal GCV, QS pattern potential preceding the onset of the QRS complex by 28ms was found. But the impedance at that site was so high that radiofrequency ablation could not be applied. The opposite endocardial site was targeted, where rS potential preceded the QRS complex by 20ms. Radiofrequency ablation with a high output could eliminate VT successfully. Three months later, he remained free of arrhythmia.

We experienced two epicardial VT cases, which were treated by different ways of ablation

P5-067

A delayed complication of simple and superficial pacemaker pocket infection*Weng-Chio Tam, Ho-Shun Cheng, Shao-Jung Li, Ming-Hsiung Hsieh**Division of Cardiovascular Medicine and Surgery, Wan-Fang Hospital, Taipei Medical University, Taipei, Taiwan*

This 65-year old male had a medical history of tachycardia (paroxysmal atrial fibrillation)-bradycardia syndrome status post permanent pacemaker implantation (DDD mode) in September 2007. In December 2011, he presented to our emergency department due to superficial pacemaker pocket infection. No evidence of vegetation or thrombus formation was shown by trans-thoracic or trans-esophageal echocardiography. Wound culture yielded methicillin resistant *Staphylococcus lugdunensis* but no bacteria growth on three sets of blood cultures. Debridement of left pocket was done, and only the generator but not two pacemaker leads was removed at that time due to previous use of tined leads and no evidence of bacteremia. About 4 weeks' antibiotics treatment after surgery, a new pacemaker system was implanted at right subclavicular region. The patient remained no symptoms until nine months later. He was hospitalized due to frequent palpitation (paroxysmal atrial fibrillation) attacks. Fever and chilliness was noted one day after hospitalization. Four sets of blood cultures yielded methicillin resistant *Staphylococcus lugdunensis* (the same pathogen as previous pocket infection about nine months ago). Trans-thoracic echocardiography and Trans-esophageal echocardiography showed an 1.8 cm x 1.4 cm vegetation on pacemaker leads. The patient underwent extraction of all pacemaker devices. During the surgery, one yellowish vegetation was excised along two old residual leads, but not new leads. After the surgical procedure, intravenous antibiotics were given for almost four weeks. Patient was eventually discharged and remained asymptomatic for several months. We concluded that a delayed complication (infective endocarditis) may happen when superficial and simple pacemaker pocket infection. Therefore, removal of all pacemaker devices is strongly recommended.

P5-068

An unusual presentation of ICD lead perforation*Weng-Chio Tam, Ho-Shun Cheng, Shao-Jung Li, Ming-Hsiung Hsieh**Division of Cardiovascular Medicine and Surgery, Wan-Fang Hospital, Taipei Medical University, Taipei, Taiwan*

A 78 year-old woman had a past medical history of hypertension and coronary artery disease status post stenting. She was admitted to our hospital for sudden loss of consciousness for five minutes. Her 24-hour Holter ECG showed episodes of ventricular fibrillation. Therefore, she underwent an implantable cardioverter defibrillator (ICD) implantation. The ICD active fixation lead was put on right ventricular low septum. The patient tolerated the procedure well. In a few hours, the patient complained of palpitation. Her blood pressure was 109/60 mmHg, and heart rate 78 bpm. The ECG revealed sinus rhythm with narrow QRS beats and ventricular spikes without captures. The physical examination displayed abnormal pulsation on the abdomen. The transthoracic echocardiographic study demonstrated small amount of pericardial effusion without cardiac tamponade and the tip of ICD lead had perforated the right ventricle into the pericardial space. The patient was taken to the catheterization room for re-implantation of the ICD lead to right ventricular apex. The patient did not have the "palpitation" symptom after the procedure. The following echocardiographic study showed no increasing of pericardial effusion. She was discharged smoothly. We reported the unusual presentation "palpitation" of ICD lead perforation instead of cardiac tamponade. The perforated lead stimulated the pericardium to result in "palpitation" symptom.

P5-069

Renal infarction due to atrial fibrillation after ICD implantation*Huang Yingshuo¹, Wu Yongquan²**¹Health Care Center, Beijing Friendship Hospital, Capital Medical University, China**²Cardiovascular Center, Beijing Friendship Hospital, Capital Medical University, China*

A 75-year-old woman with paroxysmal atrial fibrillation and coronary atherosclerotic heart disease who received a DDD pacemaker because of long RR interval (4510ms) 7 years ago complained with dyspnea for 1 month and exacerbation for 3 days. When emergency ambulance arrived, her electrocardiogram showed ventricular tachycardia, after synchronized electrical cardioversion, the rhythm converted into atrial fibrillation.

After admission, the patient received an implantable cardioverter defibrillator implantation surgery. During perioperation period, anticoagulation therapy was discontinued due to preventing haemorrhage. On the 7th day after surgery, the patient presented abdominal pain with diarrhea, vomit and fever (38.7°C), blood routine revealed white blood cell count is $18.1 \times 10^9/L$ and neutrophilic granulocyte percentage is 89.9%, after antiinflammation therapy with Cefoperazone sodium and Sulbactam sodium, the patient showed paroxysm abdominal pain yet. On the 9th after surgery, the enhanced CT scan of abdomen showed no contrast agent in mid-distal of right renal artery and a cuniform low density region in right renal. The patient received anticoagulation immediately due to renal infarction with enoxaparin 40mgQ12h and warfarin for 2.5mgQd after 3 days of enoxaparin. On the 14th after surgery, the abdominal pain disappeared and temperature dropped to normal, blood routine revealed white blood cell count is $8.7 \times 10^9/L$ and neutrophilic granulocyte percentage is 67.4%.

After 3-year follow up, the right renal size reduced from 9.6x4.5cm before ICD surgery to 4.8x2.2cm at present and serum creatinine increased from 1.13mg/dl to 2.38mg/dl with international normalized ratio maintained between 1.8 and 2.2.

P5-070

The cases of the complication with complete atrioventricular block and right bundle-branch block due to catheterization in right ventricular*Masayuki Ishimura, Marehiko Ueda, Masaru Miyazawa, Takatsugu Kajiyama, Naoki**Hashiguchi, Tomonobu Kanaeda, Yusuke Kondo, Yoshio Kobayashi**Chiba-University Hospital, Japan*

Background & Objectives: The insertion of Swan-Ganz catheter in patients with pre-existing left bundle-branch block (LBBB) is controversial because new right bundle-branch block (RBBB) in the catheterization in right ventricular is not so rare. We here report two complication cases of complete atrioventricular block (CAVB) and RBBB due to insertion of Swan-Ganz catheter.

Methods: Case report

Results:

1. The 75-year old man complained of dyspnea of effort. The chest X-ray and the blood gas measurement showed congestion heart failure because of pulmonary vascular congestion and hypoxia. The electrocardiogram (ECG) revealed LBBB. The insertion of Swan-Ganz catheter was performed to estimate hemodynamics accurately. Immediately after the insertion of catheter, the LBBB developed CAVB and shock caused by cardiac arrest. The patient was dead in spite of immediately cardiac pulmonary resuscitation.
2. The 21-year old woman complained palpitation. The holter-ECG observed frequent and monomorphic premature ventricular contraction of right ventricular outflow tract origin. We performed the radio frequency catheter ablation (RFCA) for PVC by using Swan-Ganz catheter and EnSite Array™ Catheter. After the procedure, the ECG developed RBBB.

Conclusion: Sprung et al reported that 3% patients undergoing pulmonary artery catheterizations were associated with the development of a new RBBB. In addition to, Ian R et al experienced three complication of the procedure in Swan-Ganz catheter insertion in cardiac operation. (The two of them were RBBB and other was CAVB) The use of standby external pacemakers and equipment for transvenous pacemaker insertion is recommend in particularly LBBB patients. (237words)

P5-071

Temporary pacemaker lead perforation into pericardium: potential risk after Bentall's surgery

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Background & Objectives: The major perforation sites of cardiac perforation after transvenous temporary pacing (TPM) were right atrium and right ventricle. We reported 2 patients who have received Bentall's operation and TPM suffered from great vein perforation.

Results:

Case 1: A 76 year-old male received Bentall's operation for Stanford type A aortic dissection. Trans-venous TPM was inserted via the left internal jugular vein for high degree AV block. However, chest X-ray (Fig.1a) and echocardiogram (Fig.1b) showed that the electrode lead tip was located in the pericardium. Lead perforation through brachiocephalic vein into the pericardium was diagnosed by the angiography (Fig.1c and 1d). Under the consideration of relative low risk of cardiac tamponade due to post-operative pericardium adhesion, the lead was removed directly.

Case 2: A 52 year-old female received Bentall's operation for residual type A aortic dissection. Trans-venous TPM was inserted via left internal jugular vein for atrial fibrillation with 8.4 seconds pauses. Chest X-ray (Fig.2a) showed misplacement of the electrode lead, and angiography (Fig.2b & c) proved that the lead was perforating through left brachiocephalic vein into the pericardium. We removed the electrode lead, and re-inserted a new one into the right ventricle without angiographic extravasation into the pericardium.

Conclusion: Insertion of TPM in patients who have received the cardiovascular surgery should be performed cautiously to prevent the serious complication, lead perforation. Besides, the approach through the left internal jugular vein when inserting the pacing lead was associated with a higher risk than that of right side.

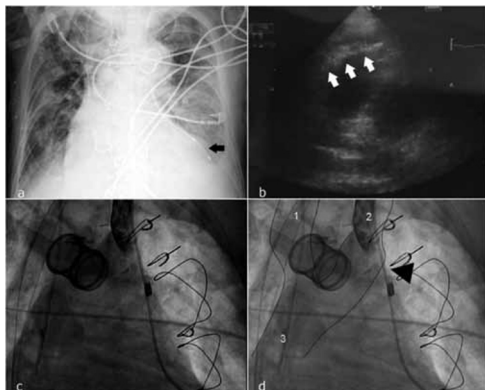


Fig. 1a

Fig. 1b

Fig. 1c

Fig. 1d

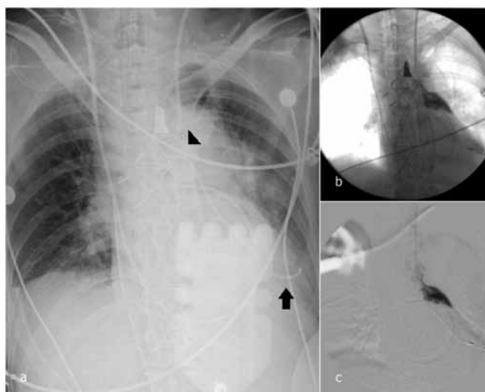


Fig. 2a

Fig. 2c

P5-072

Sawtooth electrocardiographic pattern with blocked cavotricuspid isthmus - what is the mechanism?

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Background and Objectives: A male patient had received cavotricuspid isthmus (CTI) ablation for typical atrial flutter in two years ago. This time, he presented with palpitation. The electrocardiography (ECG) revealed regular narrow QRS complex tachycardia with sawtooth pattern (Figure 1A). The intracardiac electrocardiograms resembled typical counterclockwise atrial flutter (Figure 1B). However, bidirectional block of the cavotricuspid isthmus was confirmed by differential pacing. What is the mechanism of this tachycardia and ECG pattern?

Methods: N/A

Results: In typical counterclockwise atrial flutter, the impulse ascends through the septum and descends along the free wall. In coronary sinus (CS), it travels from the opening to the distal part (upper panel of figure 2A). Typical atrial flutter is impossible with a blocked CTI.

In this case, entrainment pacing terminated the tachycardia. We then constructed right atrial 3D electroanatomical activation map. In the left anterior oblique view (Figure 2B), the earliest activation site was noted at the CS ostium, while in the modified antero-posterior view (Figure 2C), it resembled a counterclockwise activation. With radiofrequency ablation at the CS ostium, the tachycardia was terminated. Atrial tachycardia from the CS ostium was the final diagnosis.

The impulse from the CS ostium could not travel through the blocked CTI; therefore, the free wall could only be activated descendingly. The impulse also made the CS activation pattern the same as typical atrial flutter (lower panel of figure 2A). Atrial tachycardia of this case mimicked typical counterclockwise atrial flutter.

Conclusion: When interpreting electrophysiological tracings, previous procedures and subsequent electrophysiological changes should always be kept in mind.

Figure 1

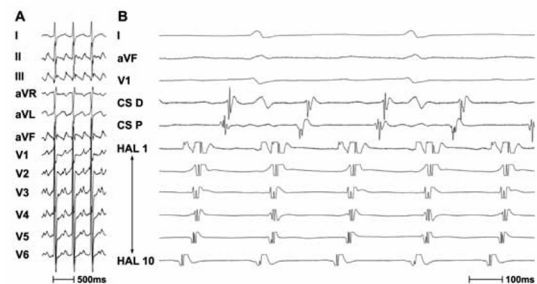
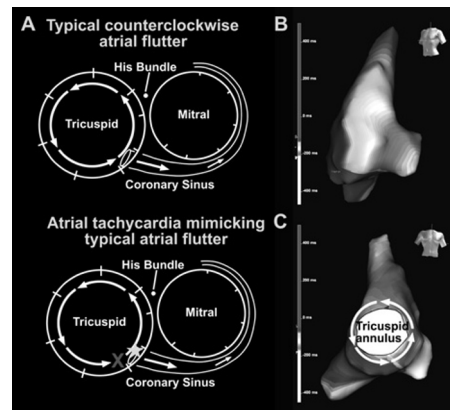


Figure 2



P5-073

Late positive flecainide test for brugada syndrome

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Introduction: Administration of sodium channel blockers may unmask diagnostic Type 1 ECG changes in patients with suspected Brugada Syndrome (BrS). ECG monitoring is usually performed for 30 minutes after drug administration when the test is negative. We report a case where drug-induced type 1 ECG changes occurred 100 minutes after cessation of flecainide.

Case Report: A 23 year old female presented with a 5 year history of recurrent palpitations and syncope. Initial investigations were normal, including 12-lead ECG, echocardiogram and holter monitor. She had undergone prior ablation for AVNRT. She re-presented with syncope with ECG showing type 2 Brugada pattern and underwent sodium channel blocker challenge. Intravenous flecainide was administered at 2mg/kg over 10 minutes, receiving a total dose of 150mg. Continuous ECG monitoring was performed for 30 minutes with leads placed in the high precordial position. Serial ECGs were thereafter performed every 10 minutes for 60 minutes and remained negative for type 1 Brugada pattern. (Figure 1A)

Approximately 100 minutes after cessation of the flecainide infusion, the patient complained of dizziness and palpitations. Repeat ECG showed Type 1 Brugada pattern (Figure 1B). These changes completely reversed with administration of intravenous isoprenaline, and recurred when isoprenaline was ceased. The ECG normalised 5 hours post infusion.

Conclusions: In this patient, diagnostic Type 1 BrS ECG changes occurred late after cessation of flecainide. This case supports more prolonged ECG monitoring when flecainide challenge test is initially negative. Cessation of monitoring at 30 minutes after a negative test may lead to underdiagnosis in some patients.

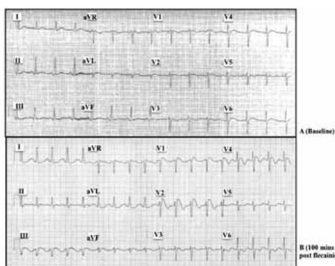


Figure 1

P5-074

Radiofrequency catheter ablation at ventricular insertion site of left anterolateral accessory pathway with trans-septal approach

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Background : Trans-septal ablation increased success rate of ablation at left-sided accessory pathway (AP) and reduced the complications of aorta and coronary artery. However, sometimes it is difficult to approach the left ventricular insertion site of AP, especially anterior or anterolateral site. We presented a patient who had frequently recurrent AP conduction in spite of many radiofrequency current pulses at atrial insertion site of left anterolateral AP with the trans-septal approach.

Case : A 47 year-old women was diagnosed with paroxysmal supraventricular tachycardia at emergency room. During the electrophysiology study, atrioventricular reentrant tachycardia (AVRT) was induced with stimulation test. The earliest activation site was located at left anterolateral area. So, firstly, the ablation of AP was performed at atrial insertion site of left anterolateral AP according to the earliest activation site. However, recurrent AP conduction occurred frequently in spite of the ablation. And then, we attempted to search for the earliest activation site at ventricular side of mitral annulus. Finally, the earliest activation site was founded and was ablated at the ventricular insertion site of AP. After the ablation of that site, AP conduction did not occurred and AVRT was not induced.

Conclusion : The ablation at ventricular insertion site of left anterolateral AP by trans-septal method was often not available. Frequently, it needs retrograde aortic approach. Our case showed that the mapping and ablation at the ventricular insertion site via trans-septal method was available to abolish the left anterolateral AP that was frequently recurrent AP conduction in spite of atrial insertion site ablation.

P5-075

Pacemaker prevents ventricular tachycardia in the patient with intermittent complete atrioventricular block

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Background : Implantable cardioverter defibrillator (ICD) is often used for the prevention of sudden cardiac death (SCD) by ventricular tachycardia (VT) or ventricular fibrillation (VF). However, sometimes only pacemaker implantation could prevent SCD due to VT or VF during the complete atrioventricular (AV) block. We presented a patient suffered from the frequent VT with intermittent complete AV block.

Case : An 82 year-old women was diagnosed with complete AV block and left bundle branch block (LBBB) on arrival in emergency room (ER). She already has had hypertension and diabetes mellitus. After the patient underwent the chest computer tomography at ER, VT developed and cardiopulmonary resuscitation (CPR) was performed. Coronary angiography did not showed the significant stenosis of coronary artery and a temporary pacemaker was inserted because of bradycardia with intermittent complete AV block. After the sinus rhythm recovered, the temporary pacemaker was removed. About one and one half months later, she complained dizziness again, her ECG showed the complete AV block and QTc 515 ms. VT was also developed. Lidocaine eliminated VT but severe bradycardia occurred. Finally, she underwent a dual chamber pacemaker implantation. After that, VT has not developed until now.

Conclusion : ICD was often considered as the first choice of the treatment for the prevention of SCD following VT or VF. However, significant bradycardia with complete AV block could lead to VT or VF. By cases, considering the mechanism of VT or VF, only pacemaker could prevent the development of VT or VF and save the medical cost.

P5-076

A pseudo-decremental accessory pathway: where did it block?

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A 47-year-old woman was admitted for paroxysmal palpitations, with the wide QRS complex tachycardia(WCT) characterized by a cycle length(CL) of 390ms and RBBB morphology. Atrial pacing could readily entrain and terminate the tachycardia, and a PVC with a coupling interval(CI) of 370ms, which fell into the ERP of His bundle, could reset the tachycardia. Thus, the diagnosis of VT, AT or AVNRT was precluded.

During ventricular programmed stimulation, the VA interval in CS gradually prolonged, which seemingly indicated the diagnosis of PJRT, with the AVN as the anterograde limb of the circuit and the decremental accessory pathway(AP) as the retrograde one. However, the target, which was localized to the 7 o'clock of the tricuspid valve annulus(TVA), showed a VA-fusion pattern, which was paradoxical to the "decremental conduction". A single application of radiofrequency interrupted AP conduction.

After ablation, the retrograde ERP of the His-Purkinje system was determined as 600ms, which meant that the retrograde pathway during previous ventricular pacing did always be the AP, rather than the AVN. Surprisingly, the pseudo-decremental conduction was found to be lie in the delay in the cavo-tricuspid isthmus(CTI). The right atrium was activated along the TVA from both clockwise and counter-clockwise directions simultaneously during a relatively long CI, with the A wave in CSO ahead of that in HBE. During a shorter CI, however, the activation appeared to delay and eventually block at CTI, leading to a significantly delayed A wave in CSO and an unchanged timing of A wave in HBE(Figure 1).

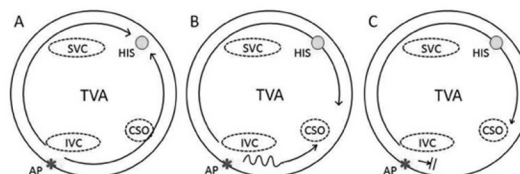


Figure 1 The schema of the pseudo-decremental conduction: delay and block at the region of CTI (TVA: tricuspid valve annulus, SVC: superior vena cava, IVC: inferior vena cava, CSO: coronary sinus orifice, HIS: His Bundle, AP: accessory pathway)

P5-077

The SCN5A mutation in the patient with the progressive cardiac conduction defect - case report

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There are some reports in which the SCN5A gene mutations were seen in patients with progressive cardiac conduction defect.

A 46-year-old woman came to our hospital after an ECG recording obtained after sudden cardiac death of her younger brother. The ECG shows 1st degree atrio-ventricular block, complete right bundle branch block and right axis deviation. The PQ interval was 0.20sec and the QRS width was 0.20sec. She was asymptomatic however she had strong family history of cardiac sudden death. Her father died at 45-year-old in his bed after two days attack of convulsion and incontinence while sleeping. Her elder brother died at 48-year-old in his bed after lunch when he caught a cold and stayed at home. Her younger brother died hypoxic encephalopathy at 41-year-old one month later of the attack occurred in his office when he joined to morning meeting. She was diagnosed clinically as progressive cardiac conduction defect. She had novel SCN5A missense mutation. R878H-mutated SCN5A was identified by direct sequencing(G-to-A mutation). She has four children(1 women and 3 men) and 2 of them have R878H-mutated SCN5A. She was implanted Implantable cardioverter-defibrillator.

P5-078

Delayed disappearance of premature ventricular complex after radiofrequency catheter ablation

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Background: The ablation of premature ventricular complex (PVC) was considered successful if the PVC disappeared during application and was not reintroduced. We present a patient whose PVC could not be eliminated completely, despite a lot of radiofrequency application. PVC remained but frequency of PVC reduced and QRS morphology of PVC changed. Next day PVC disappeared.

Case: A 52 year-old women was diagnosed with right ventricular outflow tract (RVOT) ventricular tachycardia (VT) and frequent PVC at another clinic 15 years ago. Before she visited our clinic, she had already experienced taking some antiarrhythmic agents (amiodarone, sotalol, beta blockers). Amiodarone made her thyrotoxicosis. Sotalol was not available in our country from some time. After she visited our clinic, dronedarone, verapamil, or flecainide was prescribed but not effective. Whenever she visited our clinic, her ECG showed frequent PVC as always. So, she underwent radiofrequency catheter ablation. Firstly, the ablation of PVC was performed at RVOT (posterior septal wall and anterior wall) according to the mapping. However, PVC recurred frequently. And then, we attempted to search for the earliest activation site at coronary cusp. Finally, the earliest activation site was founded and was ablated at the right coronary cusp. After the ablation of that site, PVC was markedly reduced in frequency and slightly narrowed in QRS duration. VT was not induced despite isoproterenol infusion. The next morning, PVC disappeared. Telemetry did not show PVC any more. At outpatient clinic 4 months later, she did not have symptom and PVC on ECG without any antiarrhythmic agent.

Conclusion: Delayed disappearance of PVC following marked reduction of PVC frequency and slight narrowing QRS duration of PVC after the ablation is our first experience. This findings following the ablation could lead successful ablation in some cases.

P5-079

Ventricular tachycardia complicated with chronic pressure or volume overloading at right ventricular outflow tract in a patient who underwent device closure for patent ductus arteriosus: a case report

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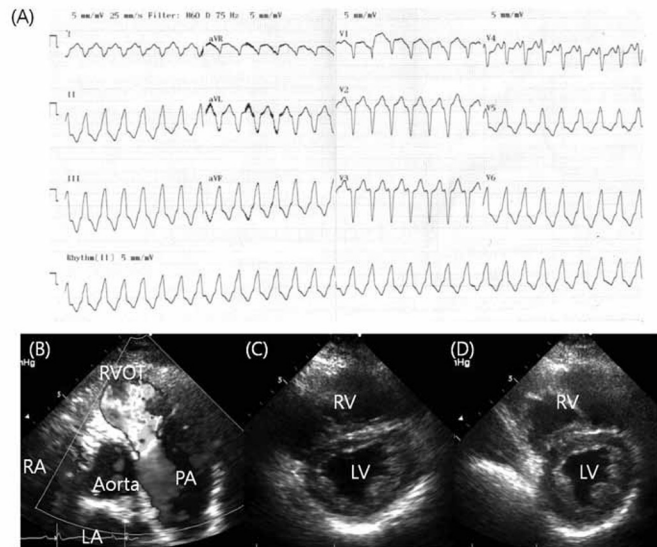
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Introduction: Ventricular tachycardia (VT) complicated with long-lasting pressure or volume overloading at the right ventricular outflow tract (RVOT) due to incomplete coaptation of pulmonic valve (PV) in a patient with patent ductus arteriosus (PDA) is rarely reported.

Results: A 49-year-old woman was referred to our electrophysiology laboratory because of sustained VT. Seven years ago, she presented with dyspnea and was diagnosed PDA. Mild degree of regurgitation of PV due to incomplete coaptation of PV was identified at the diagnosis. She has undergone device closure for PDA successfully and she has been doing well until symptom aggravated. Surface ECG during palpitation showed right inferior axis deviation and precordial transition in V5 with left bundle branch wide QRS morphology compatible with VT from RVOT (A). Ventricular premature beats of which same morphology with clinical VT were often observed and VT was reproducibly induced during exercise tolerance test. Echocardiography revealed that aggravated pulmonic valve regurgitation to moderate degree (B) and RV dysfunction without visible shunt flow across PDA closure site. In addition, left ventricular (LV) dysfunction (LV ejection fraction: 40%) with D-shaped LV was documented (C). Medical therapy with vasodilator was started to reduce pressure overloading, and then catheter ablation of VT along with surgical correction of PV was considered. After medical therapy, dyspnea and palpitation relieved and echocardiography revealed improved RV and LV function with resolution of D-shaped LV (D), even though PV incoaptation was still shown. Repeated exercise tolerance test did not induce VT and Holter monitoring revealed rare ventricular premature beat. The patient remained free from VT with maintaining vasodilator without antiarrhythmic drug, catheter ablation or surgical correction of PV during follow up > 2 months.

Conclusion: Prior to invasive therapy, optimal medical therapy is requisite for VT complicated with long-lasting pressure or volume overloading at RVOT.

Keywords: Ventricular tachycardia (VT); patent ductus arteriosus (PDA); right ventricular outflow tract (RVOT)



P5-080

Prinzmetal's angina with ventricular arrhythmia presented as seizure and incontinence during sleep in a young womanMing-Chih Lin,¹ Tsun-Jui Liu,² Sheng-Ling Jan¹Department of Pediatrics¹; Cardiovascular Center², Taichung Veterans General Hospital, Taichung, Taiwan

Background: Prinzmetal's or variant angina is caused by coronary artery spasm with or without atherosclerotic changes. The diagnosis is based on documentation of ST-segment elevation during resting angina episodes. Its presentations include chest pain, short of breath or syncope. However, seizure and incontinence during sleep is rarely reported.

Case Report: A 21-year-old woman suffered from intermittent generalized tonic clonic seizure attacks for one year. Most of those episodes happened in the night and early morning. Chest pain was sometimes felt before attack. Incontinence with postictal loss of conscious was noted. Brain CT and MRI revealed non-specific findings. No significant findings were shown in both echocardiography and 12-leads electrocardiography. Complete atrioventricular (AV) block with bradycardia followed by ventricular arrhythmia was noticed by a 24-hour Holter monitor. Prinzmetal's angina was proved by coronary artery spasm which was relieved by nitrates in angiography. The patient was then treated with calcium channel blocker. No similar episodes were noticed after starting medication.

Conclusion: Prinzmetal's or variant angina is not a benign condition. It can lead to high-degree AV block, bradycardia, asystole, and ventricular arrhythmia. Those conditions could cause sudden cardiac death. The treatment options include smoking cessation, calcium channel blockers, nitrates, pacemaker implantation, and implantable cardioverter defibrillator (ICD). More evidences are needed to determine what the best way to treat those patients is.

P5-081

Voltage mapping guided ablation in patients with macroreentrant tachycardia developed after prior atrial fibrillation ablationDae In Lee¹, Jae Joong Lee¹, Rho Seung Young¹, Yae Min Park², Jin-Keun Jang³, Whan Cheol Park⁴, Jong-Il Choi¹, Hong-Eui Lim¹, Sang-Weon Park¹, Young-Hoon Kim⁵¹ Department of Cardiology, Korea University Anam Hospital, Seoul, Korea; ² Department of Cardiology, Gachon University Gil Medical Center, Incheon, Korea; ³ Jeju Halla General Hospital, Jeju, Korea; ⁴ Hanyang University Guri Hospital, Gyeonggi, Korea; ⁵ Korea University Guro Hospital, Seoul, Korea

Background and Objectives: Macroreentrant tachycardia (MRAT) has become common in patients who have undergone catheter ablation of atrial fibrillation (AF). Conventional strategies including activation mapping and pacing maneuvers did not clarify the accurate spatial pathway of MRAT. This report describes series of cases undergoing voltage mapping guided MRAT ablation in redo procedure for AF patients.

Methods: After the geometry of the left atrium (LA) and right atrium (RA) was obtained, voltage mapping was performed in atrium and scar area was defined as area with voltages of < 0.1 mV. The critical isthmus between extensive scar areas was identified. As occasion demands, we performed entrainment or activation mapping. After critical isthmus was confirmed, radiofrequency (RF) energy was delivered to this area.

Results: Case 1 was a 46-year-old male who had undergone extensive LA and RA ablation at the index procedure. The low crista terminalis was identified as critical isthmus by contact voltage mapping. RF energy delivery at this area resulted in successful ablation. Case 2 was a 60-year-old male with prior ablation for paroxysmal AF. Activation mapping demonstrated the earliest activation in right high septum. Scar mapping revealing the critical isthmus in right high septum was guided successful termination. Case 3 was a 60-year-old male. Perimitral flutter was confirmed by entrainment mapping and by identification of critical isthmus on scar mapping. Case 4 was a 55-year-old man in whom scar mapping guided ablation at high crista terminalis terminated MRAT, in this patient, classical entrainment or pacing mapping was not performed.

Conclusion: Accurate identification of critical isthmus by contact voltage mapping was helpful for ablation of MRAT developed after AF ablation.

Keywords: scar mapping, macroreentrant atrial tachycardia, atrial fibrillation, catheter ablation

P5-082

Case report: brugada syndrome: 10-year follow up of the first triplet family with brugada syndrome in Hong KongSiu-hong Wan¹, Ping-wah Yam¹, Mitchell Milanovic¹, Jessica Jellins¹, David-Joel Taitz²¹School of Medicine Sydney, University of Notre Dame, Australia²Department of Medicine & Geriatrics, Tuen Mun Hospital, Hong Kong

In January 2003, an 18-year old male, Mr. PS, an identical triplet (homozygous) presented to the Emergency Department with chest pain associated with a suspected Brugada type electrocardiogram (ECG) pattern. Family history revealed that Mr. PS's triplet brothers had both died suddenly, one in 2002 and the other the day before his presentation. Mr. PS had no history of syncope or pre-syncope. A flecainide provocation test was positive, showing a Type-1 coved Brugada ECG pattern. Based on the family history of sudden death and after detailed discussion with the patient and family, a single chamber implantable cardioverter-defibrillator (ICD) was implanted.

Beginning in July 2005, the AICD delivered 6 appropriate shocks over a 3-month period for ventricular fibrillation (VF). In May 2006, he received 2 appropriate shocks for episodes of VF. The device was replaced in March 2007 as per the elective replacement indicator (ERI). In February 2010, there were 2 appropriate shocks for VF. All shocks delivered in this 6 year period were between the hours of 10 PM and 9 AM. In March 2010, quinidine therapy (200mg 4 times daily) was commenced and to date (May 2013) no additional VF episodes have been recorded.

The patient has 2 elder brothers, Mr. KY and Mr. YS, aged 28 and 30 respectively at the time of last consultation. Both elder brothers had a spontaneous Type-3 Brugada ECG pattern, converting to a Type-1 ECG on flecainide provocation test. There was no history of syncope or pre-syncope in both older brothers and no programmed electrophysiological study (EPS) was performed. Similarly, in consultation with the family and based on the strong family history of sudden death, both brothers received an ICD implantation. Mr. KY had 1 episode of T-wave over-sensing without shock delivery and received a device replacement in January 2008 as per the ERI. In 2012, he had lead erosion and refused ICD re-implantation after the lead removal. Mr. YS had one episode of atrial tachycardia and received a device replacement in October 2007 as per the ERI. There have been no syncopal attacks recorded in either brother to date (May 2013).

We conclude that in Mr. PS's (one of the triplets) ICD therapy has proved beneficial due to the repeated episodes of VF, which have occurred in clusters of approximately 1-3 year intervals. The adjunct quinidine therapy appears to be quite effective in reducing the recurrence of VF episodes. Mr. KY and Mr. YS (elder brothers), despite positive provocation tests, have had no VF episodes recorded to date. This could reflect the variable expression of the gene in family members and the low predictive value of the drug provocation test for future VF occurrence.

P5-083

Successful upstream therapy with angiotensin receptor blockers for secondary prevention of paroxysmal atrial fibrillation: case reports

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Recent placebo-controlled, double-blind trials on upstream therapy with angiotensin-receptor blockers (ARBs) for the secondary prevention of atrial fibrillation (AF) have failed to show convincing results. This led to the conclusion by the authors in the 2012 Focused Update of the ESC Guidelines for the Management of AF that there is now little reason to consider the use of ARBs for the secondary prevention of AF recurrence in patients with little or no underlying heart disease (1). The conclusion may be premature and further studies may be warranted, as the following reports of successful upstream therapy with ARBs for the secondary prevention of paroxysmal AF indicate.

P5-084

Dramatic improvement of recurrent anemia due to intracardiac mechanical hemolysis in a patient with hypertrophic obstructive cardiomyopathy by dual chamber pacing

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Anemia is one of serious complications in patients with hypertrophic obstructive cardiomyopathy (HOCM). A 59-year-old female with HOCM was admitted with progressive exertional dyspnea and worsening of heart failure (NYHA class IV). Left ventricular outflow tract (LVOT) pressure gradient (PG) was of 156mmHg. The patient has also developed pulmonary hypertension (estimated systolic pulmonary artery pressure of 119mmHg) and normocytic and normochromic anemia with hemoglobin level of 8.6g/dL. Total bilirubin (1.3mg/dL) and total lactic dehydrogenase activity (264IU/L) were slightly raised and haptoglobin significantly reduced (7mg/dL). There were no abnormal findings on bone marrow examination, Coombs test, biochemical and other hematological tests. Based on these findings, mechanical intravascular hemolysis were diagnosed. Moreover, gastric hemorrhage from gastric antral vascular ectasia were diagnosed. LVOT obstruction worsened due to the increased left ventricular contractility provoked by the anemia and lead to severe LVOT obstruction and congestive heart failure. The resulting obstruction further led to hemolytic anemia. A vicious obstruction-anemia circle was thus established. Her heart failure and repeated anemia failed to control with optical medications and myectomy. Congestive heart failure due to LVOT obstruction and repeated serious anemia were simultaneously controlled using dual-chamber pacing with short A-V delay. Three weeks later, LVOT PG decreased to 26mmHg and anemia did not recur and haptoglobin level normalized.

P5-085

Evaluation of pulmonary vein stenosis following extensive encircling pulmonary vein isolation (EPPVI)

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Background: Pulmonary vein(PV) stenosis is well-known complication of PV isolation. But Few studies have explored the occurrence of PV stenosis after extensive encircling pulmonary vein isolation(EPPVI). We investigated the incidence, severity and characteristics of PV stenosis following EPPVI with computed tomography(CT).

Methods and Results: Ninety-seven patients were enrolled; All of them have been undergone 2nd session, and performed CT both 1st and 2nd session. Mean age was 61 ± 10 years old and 71 were men. Mean duration of 1st and 2nd session was 420 ± 307 days. A total of 383 PVs were analyzed. PV stenosis was classified follow; insignificant(-25%), mild(25-50%), moderate(50-75%) or severe(50-75%). PV stenosis was observed in 18 of 383 PVs(4.7%). In detail, insignificant PV stenosis was observed in 12(3.1%), mild stenosis in 5(1.3%), moderate stenosis in one(0.3%). No instances of severe PV stenosis were observed. They were all asymptomatic, and none required treatment. The result of this study demonstrated that detectable PV stenosis occurred in 4.7% of the PVs, and most stenosis were less than mild. 4 PV stenosis were observed in LSPV, 8 were in LIPV, 6 were in RIPV. In RSPV, no stenosis were found.

Conclusion: The local electrocardiogram-guided EPPVI was relatively safe regarding severe PV stenosis.

P5-086

Persistent focal atrial fibrillation in an isolated pulmonary vein: a case report

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A 64 year old man was referred with symptomatic paroxysmal atrial fibrillation (AF) and atrial flutter. There was no relevant past medical history. Echocardiography showed a structurally normal heart.

AF ablation was performed using an electroanatomic mapping system (CARTO, Biosense Webster, Israel) and remote magnetic navigation (Niobe, Stereotaxis Inc.).

Rapid potentials were seen in the left superior pulmonary vein (LSPV) and the right inferior PV (RIPV). RF ablation was used to circumferentially isolate the left-sided PVs. Right-sided PVs were then isolated separately, during which potentials from the anterior RSPV was noted. These could not be ablated and it was suspected they represented far-field SVC potentials. Following isolation of both left and right PVs, AF confined within the isolated LSPV was noted. The LSPV was then mapped, and a rapid firing focus was demarcated at the anterosuperior aspect. RF ablation at this site promptly terminated the AF. Due to the suspicion of far field SVC potentials in the right superior PV, the SVC was then explored. This confirmed the presence of SVC potentials. The SVC was then mapped and RF ablation without complete encirclement (around the septal, posterior and lateral SVC) resulted in isolation of the SVC. Finally, CTI ablation was performed.

This interesting case illustrates persistence of atrial fibrillation from a focal source isolated to a single pulmonary vein. We were able to promptly terminate the PV atrial fibrillation by ablation at this single site.

P5-087

The clinical application of home monitoring pacemaker in monitoring arrhythmia: a report of 14 cases

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Objective: To study the clinical application of Home Monitoring pacemaker.

Methods: After pacemaker implantation in 14 patients, the pacing system and arrhythmia events were monitored through the network daily.

Results: Home Monitoring can effectively monitor the pacing system and a variety of arrhythmic events.

Conclusion: Home Monitoring is another important function of pacemaker which may have important significance in the clinical work.

Key words: Home Monitoring; pacemaker; follow-up; Arrhythmia

P5-088

Radiofrequency catheter ablation of common atrial flutter via an anomalous IVC with azygos continuation and SVC by a femoral approach*Yasutaka Hirayama
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Infrahepatic interruption of the inferior vena cava with azygos continuation is a congenital anomaly and the prevalence is 0.6%.

In this condition the inferior vena cava is typically interrupted above the level of the renal veins, and the systemic venous drainage below the interruption is via an enlarged azygos vein usually into the superior vena cava.

A 71 year old woman was admitted to our hospital because of dyspnea. On admission, 12 leads surface ECG showed 2:1 common AFL with a rate of 150 beats per minute. We administered verapamil to control her heart rate and then we planned the catheter ablation. Before the ablation procedure, the duodecapolar catheter was inserted from a right femoral vein. However, the catheter ran left side of the vertebra at the liver level, and it was impossible to advance it into the right atrium directly. Therefore, an IVC venography was performed, and it revealed that interrupted IVC with azygos continuation communicated with SVC. So we could advance the catheter into the right atrium via a femoral vein, IVC and dilated azygos vein, and SVC. We report the radiofrequency catheter ablation of common atrial flutter via an anomalous IVC with azygos continuation and SVC by a femoral approach.

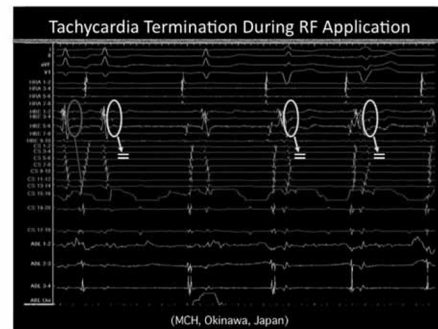
P5-089

Successful isolation of arrhythmogenic area in a patient with focal atrial tachycardia originating from para-hisian region*Satoshi Higa, Sugako Ishigaki, Akira Maesato, Kazuhito Tatsu, Takashi Nomura, Naoya Maehira, Tohru Uezu, Youichi Uechi, Moriuchi Sugama
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Background: Tachycardias originating from the muscle sleeve around thoracic veins can be cured by electrical disconnection of the arrhythmogenic tissues. However, there has not been reported an electrical isolation of focal activity in focal atrial tachycardias (ATs) arising from para-Hisian region.

Results: We experienced recurrent focal AT originating from para-Hisian region in a 32-year-old female. Surface ECG during focal AT showed negative P wave in inferior leads. Simultaneous recordings of intracardiac electrograms showed earliest activation during focal AT was His recording site (anterior septum) and earlier than coronary sinus ostium (posterior septum). We delivered RF energy using non-irrigated (<25W, 50°C) and irrigated (<25W) tipped ablation catheters on mid to posterior septum and coronary sinus ostium remote from earliest activation site (His recording site). We observed successful electrical disconnection between para-Hisian region (origin) and posterior septum (exit site) without any complication and recurrence (follow-up 10 months).

Conclusion: We experienced successful electrical isolation of arrhythmogenic area in a patient with recurrent FAT originating from para-Hisian region. RF application to exit site remote from AT origin was feasible to cure this tachycardia.



P5-090

Successful electrical disconnection of VT substrate in a patient with ARVC*Kazushige Yamaguchi, Kenji Natsuyama, Kazuya Ueda, Masahiro Yamasaki, Yukiko Kuga, Naohiro Yoshida, Koichiro Asava, Seiji Matsuhisa, Hiroshi Ueda, Kojiro Yoshimura, Yasunori Nishida
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Background & Objectives: Multiple VT channels are sometimes present in patients with ARVC. Therefore, Ablation (ABL) should be performed against all VT channels to eliminate all VTs.

Methods: A 52-year-old female underwent catheter ABL in another hospital but slow VT refractory to ATP of ICD remained. She was referred to our institution for a treatment of VT. QRS morphology of VT was LBBB pattern and superior axis. Delayed potentials (DPs) during sinus rhythm (SR) were identified at posterobasal area of RV. VT could be induced and terminated feasibly by pacing at the site where DPs during SR were recorded. Concealed entrainment at the site where diastolic potential was recorded during VT was demonstrated and PPI matched VT CL. Mechanical bump terminated VT and decreased the inducibility of VT, so we performed ABL to isolate the degenerative area with DPs from RV during SR.

Results: Isolated degenerative area was bounded by the tricuspid annulus and ABL points. Endocardial and epicardial mapping showed no potential other than dissociated potential and pacing at the area could not produce QRS complex. These findings strongly suggested complete isolation of the degenerative area from RV was performed. After the isolation of the degenerative area with DPs, VT was no longer induced by any stimuli including isoproterenol administration. After discharge, patient is free of VT without any antiarrhythmic drug.

Conclusion: Electrical disconnection of the degenerative area with DPs during SR in patient with ARVC rendered not only clinical VT but also non-clinical VT non-inducible.

P5-091

Entrainment pacing from coronary sinus ostium may support slow pathway as an antegrade limb of the reentry circuit in fast-slow atrioventricular nodal reentrant tachycardia*Takafumi Iijima, Yoshiaki Kaneko, Tadashi Nakajima, Tadanobu Irie, Masaki Ota, Mio Tamura, Takashi Izuka, Shuntaro Tamura, Akihiro Saito, Masahiko Kurabayashi
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Introduction: It remains controversial whether fast pathway (FP) is actually incorporated as an antegrade limb of the reentry circuit in fast-slow (F-S) atrioventricular nodal reentrant tachycardia (AVNRT) with the earliest atrial activation at coronary sinus (CS) ostium, presenting long RP tachycardia.

Results: We present two cases in which entrainment pacing from CS ostium orthodromically captured the atrium at the region of His-bundle with a long conduction time consistent with slow pathway conduction and subsequently His-bundle, suggesting that the reentry circuit does not involve the fast pathway as the antegrade limb.

Conclusions: Entrainment pacing from CS ostium suggests slow pathway as both antegrade and retrograde limb of the reentry circuit with a long lower common pathway, thus presenting long RP tachycardia.

P5-092

Implantation of a transvenous right ventricular pacing lead via collateral veins in a nonagenarian with total occlusion of the subclavian vein

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Background: In implanting transvenous pacemaker electrodes, total occlusions of the subclavian vein (SV) are considered obstacles that can hardly be overcome, typically calling for switching over to the contralateral side or complex attempts to reopen the occlusion. We report a case of successful ipsilateral lead placement via venous collaterals in a nonagenarian with total occlusion of the left SV.

Case description: A 90-year-old female with total AV block, slow ventricular escape rhythm and repeat asystole of up to 8 sec duration was scheduled for implantation of a single-chamber pacemaker.

After blind puncture of the left SV, the standard guidewire could not be advanced due to a total occlusion of the proximal left SV with extensive collateral veins. Using a combination of guidewires and guiding catheters, a 9F 25 cm introducer sheath could ultimately be advanced through the collaterals into the superior Vena cava, allowing for swift placement of the pacemaker electrode in the right ventricular apex. There were no intra- or postoperative complications; measurements and pacemaker function remained stable at all follow-ups.

Conclusion: This case illustrates how transvenous electrode placement via collateral veins can safely be achieved in the setting of total subclavian vein occlusion. The authors believe that this approach may be a valuable alternative strategy in patients in which it is considered crucial to keep the operative trauma at a minimum.

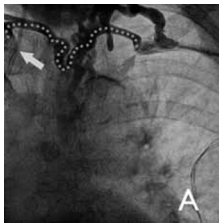


Fig. A: Intraoperative Venogram red arrow: SV occlusion green dotted line: collateral veins used yellow arrow: superior Vena cava

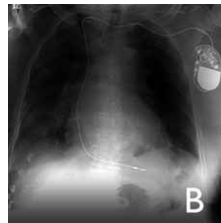


Fig. B: Postoperative Chest Radiograph

P5-093

Effect of hybrid approach including adaptive servo-ventilation and catheter ablation on reverse remodeling in long-standing atrial fibrillation with dilated cardiomyopathy

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A case was a 68-year-old man with 4-year-lasting persistent AF in April 2011. He underwent implantation of a permanent pacemaker for complete atrioventricular block with normal left ventricular function in 1992. He was diagnosed with dilated cardiomyopathy (DCM) showing depressed left ventricular ejection fraction (LVEF) and heart failure (NYHA II) in 2006. The pacemaker was upgraded to cardiac resynchronization device in 2007. Atrial fibrillation (AF) was documented shortly after that, and lasted 4 years with resistance to amiodarone and DC shock. A remarkable progression of the left atrial (LA) enlargement (LA diameter of 58mm) was observed. Because the LVEF and the NYHA status were gradually worsened in spite of cardiac resynchronization therapy, he started to use adaptive servo-ventilation (ASV). After 1 month, the electrocardiogram showed atrioventricular sequential pacing rhythm with spontaneous termination of the AF. Although paroxysmal AF was remained, the LA enlargement was slightly improved for 6 months. Then the radiofrequency catheter ablation (CA) was performed for paroxysmal AF. During follow-up period of 18 months after successful CA, the LA diameter, the LVEF and the NYHA status were remarkably improved. ASV therapy prior to CA obviously contributed to the termination of the long-standing AF and the outcome of the CA. This clinical course suggests that the arrhythmogenic substrate in left atrium could be improved by ASV therapy. We report 24 month outcome of a case with DCM that showed long-term reverse remodeling after hybrid approach including ASV and CA for long-standing AF.

P5-094

Interatrial electrical dissociation after radiofrequency catheter ablation for persistent atrial fibrillation

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Background: Multiple and extensive radiofrequency catheter ablation (RFCA) are often necessary in patients with persistent atrial fibrillation (PeAF). We describe cases of interatrial electrical dissociation (IED) after RFCA for PeAF because of extensive biatrial ablations.

Methods: Since January 2010, a total of 8 cases of IED occurred in patients (mean age 55±16 years, 87.5% male) with drug-refractory PeAF who underwent RFCA using a stepwise approach (including pulmonary vein isolation, biatrial ablation of complex fractionated electrograms and linear lesions). We investigated the clinical characteristics of patients and thromboembolic event during follow up.

Results: 1. Five patients experienced IED in first procedure and 3 patients in repeated procedure. Ablation sites which caused IED were anterior wall (3), right septum (2), medial cavotricuspid isthmus (2), and proximal coronary sinus (1). 2. Mean AF duration, CHADS2 score, left atrium size, left ventricular ejection fraction, ablation time, and procedure time was 7±4 years, 1.38±1.19, 40.4±6.7 mm, 48.9±11.1%, 170±59 min, and 415±134 min, respectively. 3. During 18±14 months of follow-up, clinical recurrence of atrial arrhythmia after 3 months of blanking period occurred in 5 patients (62.5%). Although oral anticoagulation was discontinued in 4 patients with low CHADS score (<2), there was no stroke or systemic embolism.

Conclusions: Unexpected electric sequelae, IED, might occur in the sequential ablations for PeAF. Further evaluation of recovery of conduction and long term thromboembolic risk should be warranted.

Keyword: interatrial electrical dissociation, atrial fibrillation, catheter ablation

P5-095

Self-terminating ventricular fibrillation - a case report

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A 65-year-old man with hypertension, coronary artery disease, and a history of coronary artery bypass grafting 14 years ago, was admitted to the hospital because of recurrent episodes of short (up to 4 beats) nonsustained polymorphic tachycardia episodes up to 250bpm found on ambulatory Holter recordings. Physical examination, laboratory tests and echocardiography did not reveal any abnormalities. ECG showed a sinus rhythm with normal QT. Exercise treadmill test was clinically and ECG negative at 13 METs. Patient had Holter monitoring repeated. On the night of ECG recording the patient presented with an episode of total loss of consciousness. Holter monitoring analysed on the subsequent day showed that at 4:45 a.m. a single ventricular extrasystolic beat with short coupling interval triggered polymorphic ventricular tachycardia 240 beats per minute. The QT interval in the preceding beats was not prolonged. The arrhythmia then accelerated and degenerated into ventricular fibrillation (VF). The episode of VF lasted 2 minutes and 13 seconds, and was followed by 19 second asystoly. Native rhythm restored itself with three ventricular beats, then a nodal rhythm and return of a sinus rhythm. The patient was qualified for implantation of automated cardioverter defibrillation accompanied by amiodarone and betablocker therapy.

So far, there have been 14 case reports describing self-terminating VF. Five cases described adults who had ventricular fibrillation lasting for more than 2 minutes. The number of described cases is very low - it may prove that the incidence of self-termination of VF in human is very rare.

P5-096

Pacemaker lead perforation at the right ventricular outflow pacing*Akihiro Sunaga**Japan*

A 70 aged woman underwent a dual-chamber pacemaker implantation for episodes of sinus pauses and syncope (Zephyr XL, St Jude Medical Inc, St Paul, MN, USA). A 7-French passive fixation lead (St Jude IsoFlex S 1646-T) was inserted via the left subclavian vein approach and positioned in the right ventricular (RV) apex without any immediate complications. The atrial and ventricular sensing were measured at 1.0 and 10.4 millivolts, respectively. The pacing thresholds (volts/milliseconds) were 1.0/0.5 and 0.5/0.5 in the atrial and ventricular leads, respectively. Impedances were in the normal range (atrial lead 429 ohms and ventricular lead 727 ohms). Six days post-implant, pacemaker interrogation revealed ventricular undersensing and loss of capture with high pacing output (7.5 volts at 1.5 ms). The chest X-ray obtained in the postero-anterior view revealed the RV lead outside the heart silhouette. A chest computed tomography with tridimensional reconstruction confirmed RV lead perforation through the RV outflow tract, with 1 cm of lead positioned outside of the heart. There was a little pericardial effusion. Patient underwent lead removal and repositioning in a slightly different place in the RV apex. A pericardial drain was also inserted to monitor bleeding. The post-operative course was uneventful. The pericardial drain was removed after minimal drainage and patient was discharged home.

P5-097

Spontaneous restoration of sinus rhythm after deployment of a left atrial appendage occlusion device in patients with persistent atrial fibrillation*Dae In Lee¹, Jae Joong Lee¹, Rho Seung Young¹, Yae Min Park², Jin-Keun Jang³, Whan Cheol Park⁴, Jong-Il Choi¹, Hong-Eui Lim¹, Sang-Weon Park¹, Young-Hoon Kim¹**¹ Department of Cardiology, Korea University Anam Hospital, Seoul, Korea; ² Department of Cardiology, Gachon University Gil Medical Center, Incheon, Korea; ³ Jeju Halla General Hospital, Jeju, Korea; ⁴ Hanyang University Guri Hospital, Gyeonggi, Korea; ⁵ Korea Univeristy Guro Hospital, Seoul, Korea*

Background and Objectives: While left atrial appendage (LAA)-occlusion device (OD) is known not to be inferior to warfarin therapy, the effect on the electrical activity of the LAA remains unknown. This report demonstrates LAA-OD can lead to the restoration of sinus rhythm.

Methods: We implanted WATCHMAN LAA occlusion device (Atritech, Plymouth, MN, USA) in a 69-year old male. Warfarin was stopped and clopidogrel was added after confirming that there was no flow leakage between the WATCHMAN device and LAA.

Results: This patient experienced ischemic brain stroke three times and had a history of diabetes and hypertension. The duration of atrial fibrillation was 3 year and refractory to antiarrhythmic drugs (AADs). The mean of LA anterior-posterior diameter was 46.8mm and maximal LAA size was 30.827.7 mm. WATCHMAN LAA-OD (diameter: 30mm) was deployed. 8 weeks after the procedure, no flow leakage was confirmed by transesophageal echocardiography and warfarin was stopped. 12 weeks after the procedure, sinus rhythm was maintained with AAD. Without AAD, besides, AF has not recurred for 6 months.

Conclusion: LAA-OD may not only provide stroke prevention but also influence the electrical activity of LAA.

Keywords: Atrial fibrillation, left atrial appendage, occlusion device, sinus rhythm

P4-079

A new algorithm differentiate the septum originated ventricular arrhythmias from the free wall in the right ventricular outflow tract

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Background: Until now, no ventricular arrhythmias QRS axis dominated ECG algorithms was used to differentiate ventricular tachycardia or premature ventricular complexes (VT/PVCs) originating from the free wall or septum in the RVOT.

Objectives: In this study, we designed new ECG criteria and investigated the sensitivity and specificity of them in practice.

Methods: Consecutive 120 patients with left bundle branch block morphology and precordial transition lead \geq V4 were successfully underwent mapping and ablation. They were rolled into the septum group (n=95) and the free wall group (n=25) according to VT/PVCs origin. We analyzed the ECG pattern with following criteria. 1) QRS axis $>89^\circ$; 2) R wave amplitude in lead III $>$ II, and 3) A2III score included QRS axis $>84.5^\circ$ (score = 1), lead III QRS duration >154.5 ms (score = 1) and AVL QRS duration >156.5 ms (score = 1).

Results: Retrospective analysis showed that VT/PVC axis $>89^\circ$ or R wave amplitude in lead III $>$ II predict VT/PVC originating from the septum with 100.00 % sensitivity, 93.94 % specificity, and 97.78% positive prediction value. A2III score ≥ 2 predicts VT/PVCs originating from the free wall in the RVOT with 80.00 % sensitivity, 87.50 % specificity and 84.09 % positive predictor value. The new algorithms predict VT/PVCs originating from the free wall in the RVOT with the overall sensitivity, specificity, and positive predictor value were 81.48 %, 91.30 % and 88.76%. Prospective analysis in 20 patients showed that VT/PVCs originating from the free wall in the RVOT with the overall sensitivity, specificity, and positive predictor value were 90 %, 89.74 % and 95%.

Conclusions: VT/PVC axis $>89^\circ$, R wave amplitude in lead III $>$ II and A2III score $<$ 2 with very high sensitivity, specificity and positive prediction value for prediction VT/PVCs originating from the septum origin in the RVOT. A2III score ≥ 2 predicts VT/PVCs originating from the free wall in the RVOT.

Keywords: ventricular tachycardia, premature ventricular complexes, right ventricular outflow tract, septum, free wall

P4-080

ECG abnormalities in kawasaki disease

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Background: Kawasaki Disease is a common cause of acquired heart disease in children and may present with cardiovascular complications.

Electrocardiogram changes in Kawasaki Disease are usually non-specific, as arrhythmias, abnormal Q wave, prolonged PR and/or QT interval, abnormally low voltage, or ST-T wave changes.

Method: A retrospective analysis of all patients discharged with a diagnosis of Kawasaki Disease at Wonju Severance hospital.

Result : A total of 98 patients were included in this study.

Patients were grouped by coronary artery involvement or not.

Coronary artery involvement group(57/98, 58%), had a higher prevalence of ECG abnormality, prolonged P-R interval (45/57, 79%), abnormal Q wave (7/57, 12%), S-T segment elevation (6/57, 10%).

Coronary artery non-involvement group(42/98, 43%), prolonged P-R interval (12/42, 29%), abnormal Q wave (3/42, 7%), S-T segment elevation (2/42, 5%)

Conclusion: We found a higher prevalence of ECG abnormalities in coronary artery involvement group than coronary artery non-involvement group. Especially, in case of myocardial infarction and manifest as ST segment elevation abnormal Q wave were found.

P4-081

Electrocardiography recordings in higher intercostal space for children with right ventricular outlet obstruction reconstruction operation

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Background and Objectives: We checked traditional and high-level precordial electrocardiogram (ECG) leads in patients who had undergone right ventricular outlet obstruction (RVOT) reconstruction surgery and evaluated the effect of ECG lead position on their QRS duration.

Methods: We enrolled 34 patients who had undergone surgery for congenital heart disease with RVOT obstruction and who had received followed up care that included recorded ECG at a pediatric cardiac out-patient clinic. The control group included 29 patients who did not have hemodynamically significant intracardiac abnormality. We recorded traditional standard 12-leads ECG from the 4th intercostals space, and moved the precordial leads to the 3rd and 2nd intercostals spaces, and recorded ECGs repeatedly.

Results: In all groups, there was no significant difference of mean QRS duration and QTc interval between traditional standard 12-leads ECGs and ECGs at higher intercostals spaces. There was no significant difference of ECG parameters between groups. In the control group, the degree of the change between the 4th intercostals space (ICS) QRS and 3rd ICS QRS was significant ($p=0.031$), and although, it was insignificant, ECGs at the 3rd ICS showed decreased QRS duration in group 1 (V1: 3rd ICS 119.21 \pm 21.53 msec vs. 4th ICS 122.80 \pm 31.78 msec. V2: 3rd ICS 113.68 \pm 19.43 msec vs. 4th ICS 118.24 \pm 19.16 msec).

Conclusion: Although the positional change of ECG leads did not result in a significant effect on measuring QRS duration after surgery, ECG leads at the 3rd ICS rather than at the 4th ICS may cause alteration of ECG readings. Therefore, we suggest that ECGs should be recorded in as accurate a position as possible.

P4-082

Clinical relevant factors associated with irregular pulse rate in general population

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Background & Objectives: Irregular pulse (iP) is barrier to know exact measurement of heart rate in large population-based survey. The aim of this study was to know which clinical factors were associated with iP in general population.

Methods: We analyzed 5494 subjects ≥ 19 years of age using the database from the Korean National Health and Nutrition Examination Survey 2011. The iP or not was screened during 15 seconds (iP15) and confirmed during 60 seconds (iP60) by well-trained nurses.

Results: The prevalence of iP15 was 530 (9.6%). Among iP15, 17% was classified as iP60. The iP60 group was older (60.7 years CI 55.5-66.0 versus 45.7 years CI 44.9-46.6, $p<0.001$). Their waist circumference was higher (83.8 cm CI 81.5-86.1 versus 81.3 cm CI 80.9-81.8, $p=0.031$) but, there was no difference in BMI ($p=0.405$). After multiple stepwise logistic regression analysis, age (adjusted OR=1.049 CI 1.026-1.073, $p<0.001$), serum creatinine level (adjusted OR=1.525 CI 1.026-2.266, $p=0.037$) and BMI (adjusted OR=1.087 CI 1.008-1.173, $p=0.030$) were risk factors for the iP60.

Conclusion: Age, decreased renal function and general obesity had correlation with iP. Therefore, more careful attention must be paid when measuring the heart rate in subjects with older age, higher serum creatinine level and more obesity in population-based survey.

P4-083

Electrocardiographic voltage criteria for diagnosis of inappropriate left ventricular mass in Korean patients*Jin-Kyu Park¹, Jeong Hyun Kim², Heon Gil Lim², Jinho Shin²*¹Yonsei University Health system, Seoul, Republic of Korea

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Background & Objectives: Inappropriate left ventricular mass (iLVM) is known to predict cardiovascular events independently of left ventricular hypertrophy (LVH). The electrocardiographic voltage criteria are a simple and cost-effective method for diagnosis of LVH. The aim of this study was to investigate the correlation between electrocardiographic voltage criteria and iLVM in Korean patients.

Methods: We analyzed both electrocardiographic and echocardiographic data of 334 consecutive patients (male=161, female=173). The Sokolow-Lyon and Cornell voltage criteria and their product were measured. The iLVM was defined as observed LVM greater than 130% of predicted LVM.

Results: All criteria were significantly correlated with iLVM in both gender ($p < 0.05$). The Cornell voltage criteria had shown better performance than Sokolow-Lyon voltage criteria in the analysis of the area under the ROC curve in both gender (Male: AUC=0.599 CI 0.519-0.675, $p=0.046$; female: AUC=0.672 CI 0.596-0.741 $p=0.022$). However, the sensitivities for iLVM were low with a high specificity of 95% (23% and 12% for males and females, respectively).

Conclusion: The Cornell voltage criterion was more associated with iLVM than the Sokolow-Lyon voltage criteria. However, it might have limitation for diagnosis of iLVM due to low sensitivity.

P4-084

Prevalence and characteristic of J wave in patients with sarcoidosis*N Hashiguchi, M Ueda, K Miyazawa, M Ishimura, T Kajiyama*

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Background: J wave has attracted attention as it is associated with idiopathic ventricular fibrillation. On the other hand, relative high prevalence of J wave in some organic heart diseases was reported. In patients with sarcoidosis which may involve the heart and cause ventricular arrhythmia, prevalence and characteristics of J wave are still unknown. The aim of this study was to clarify these points.

Methods: We retrospectively evaluated consecutive 184 patients with sarcoidosis (age: 51.8±16.4 years, male/female: 62/122 patients, with/without cardiac involvement: 37/147 patients, follow-up period: 43.4±47.5 months) regarding prevalence and characteristics of J-wave in their 12-lead electrocardiography. All patients performed assessments for cardiac involvement from April 2001 to February 2013. Patients whose electrocardiogram showed permanent complete atrio-ventricular block and/or ventricular paced rhythm were excluded.

Results: There was a high prevalence of J-wave in patients with/without cardiac involvement (43.2%(16/37 patients) vs. 38.8%(57/147 patients), respectively, $p=0.620$). Morphology and distribution of J wave were similar (notch-type/slur-type: 5/11 vs. 14/43 patients, in inferior/in lateral/in infero-lateral: 12/0/4 vs. 35/6/15 patients, respectively). J wave of more than 0.2mV was observed in 5 patients with cardiac involvement and 14 patients without cardiac involvement. Seven of 16 patients (43.8%) who had cardiac involvement with ventricular tachyarrhythmia had J wave (notch/slur: 1/6 patients, inferior/lateral/infero-lateral: 5/0/2 patients, >0.2mV: 2 patients).

Conclusions: Prevalence of J wave was high in patients with sarcoidosis regardless of cardiac involvement. There were no specific features of J wave in patients who had cardiac sarcoidosis with ventricular tachyarrhythmia.

P4-085

P-QRS complex duration of manifest WPW syndrome correlates with the PQ interval after catheter ablation*T. Kajiyama, K. Miyazawa, M. Ishimura, N. Hashiguchi, T. Kanaeda, Y. Kondo, M. Ueda, Y. Kobayashi*

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Background: A fused P-QRS wave complex on the surface electrocardiogram is one of the features of manifest WPW syndrome. However, it is unclear what kind of factors have an influence on P-QRS complex duration

Methods: We analyzed the electrocardiogram in 59 patients with manifest WPW syndrome who underwent catheter ablation at our facility. The P-QRS duration before the ablation and PQ interval after the elimination of the delta-wave were measured and analyzed along with the patient characteristics.

Results: Fifty-nine patients were included and none had any ventricular fascicular block. Although the P-QRS complex duration significantly correlated with the age (Pearson coefficient, 0.382, $p < 0.01$), it was more strongly correlated with the PQ interval (Pearson-coefficient, 0.55, $p < 0.001$). There was no difference in the P-QRS duration between the accessory pathway locations.

Conclusion: The P-QRS complex duration is likely to be affected by an alteration in the conduction velocity along with aging. Furthermore, the AV node conduction may have a strong impact on the P-QRS complex duration.

P4-086

Electrocardiographic findings in takotsubo cardiomyopathy: ECG evolution and difference from ECG of acute coronary syndrome*June Namgung, Hyung Yoon Kim, Won-Ho Choi, Sung Uk Kwon, Joon Hyung Doh, Sung Yun Lee, Won Ro Lee*

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Background & Objectives: ECG manifestations of Takotsubo cardiomyopathy (TC) produce ST-segment elevation or T wave inversion and mimicking acute coronary syndrome (ACS). We describe ECG manifestation of TC, including ECG evolution, different point from ACS.

Methods: We studied 37 consecutive patients (age 67±15 years, range 23-89, M:F=12:25) with a diagnosis of TC who were proven to be apical ballooning on echocardiography or left ventricular angiography and normal coronary artery from March 2004 to November 2012. We analyzed their standard 12 leads ECG including rate, PR interval, QRS duration, corrected QT interval, and ECG evolutions, and arrhythmia events.

Results: Two common ECG finding in TC is ST-segment elevation (13, 35%) and T inversion (24, 65%), mostly in the precordial leads. After ST-segment resolution in the few days (3.5 days), diffuse and often deep T wave inversion develops. 8 patients (22%) had transient Q-waves lasting a few days in precordial leads. There was no reciprocal ST-segment depression. T-wave inversion continues to several months. QT prolongation (>440 msec) observed in 37 patients (97%). There were no significant life threatening arrhythmias except atrial fibrillation (N=6, 16%).

Conclusion: There are distinct differences between ECG of TC and ACS. These differences will help to differentiate TC from ACS.

P4-087

Markers of susceptibility to heart rhythm disturbances in adolescents with arterial hypertension

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Objective: To study the dispersion of the QT interval as a criteria of instability of myocardium electrophysiological properties.

Methods: An electrocardiogram (ECG) in 12 standard leads was recorded («FCP - 4101U Fukuda DenshiÅ», Japan) in 79 adolescents with arterial hypertension and 76 adolescents of the control group. Dispersion of the QT interval was evaluated in all patients during standard resting ECG analysis. Correlations between QT and QTp adjusted for heart rate was carried out using the Bazett formula. We determined the interval dispersion-corrected QT (QTsD, ms) and dispersion-corrected intervals QTp (QTpsD, ms). Echocardiography was performed by iU 22 ultrasound system (PHILIPS Medical Systems, USA).

Results: The distribution of mean values of the left ventricular mass index (LVMI) and QTD data in 79 adolescents with hypertension in comparison with the same in 76 adolescents of the control group was $94,73 \pm 2,4$ and $112,88 \pm 3,8$ g / m² (LVMI, g / m²); $40,6 \pm 20,4$ and $48,4 \pm 22,6$ (QTsD, ms); $35,2 \pm 16,7$ and $39,2 \pm 16,5$ (QTpsD, ms) respectively.

Conclusion: The values of QTsD does not depend on the magnitude of left ventricular mass directly. Nevertheless, increasing of this value is associated with left ventricular hypertrophy, especially in the case of its concentric mode. Elevated blood pressure has directly influence on QTsD amount, regardless of left ventricular hypertrophy and left ventricular mass quantities. The dispersion of QT interval reflects inhomogeneity of repolarization and could underlie on ventricular arrhythmias in these patients.

P4-088

Prediction of clinical courses of patients with acute myocarditis by electrocardiographic parameters on admission

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Background and Objectives: The clinical course of acute myocarditis greatly varies and is hardly foreseen at an early stage. We sought parameters which predict the fulminant course in an electrocardiogram on admission.

Methods: Clinical data and electrocardiograms on admission from 30 consecutive patients hospitalized with acute myocarditis between January 2003 and December 2012 were analyzed. Clinical courses of patients were categorized as fulminant or not according to the requirement for mechanical circulatory and/or respiratory support during hospitalization. The correlation between electrocardiographic parameters and clinical courses was determined using logistic regression analysis.

Results: 16 patients deteriorated into fulminant course; 6 required percutaneous cardiopulmonary support (PCPS), 2 left ventricular assist device, and 2 died. Presence or absence, nor the number of leads of ST-elevation did not predict the fulminant course (P= 0.12 and 0.25, respectively). However, ST-elevation in leads II, III and aVF showed significant negative correlation with the fulminant course (odds ratio 0.06, P= 0.003). Moreover, ST-elevation in lead V1 correlated with requirement for PCPS (odds ratio 11, P= 0.03).

Conclusion: No electrocardiographic parameters on admission predict the fulminant clinical course. ST-elevation in inferior leads suggests nonfulminant course, while ST-elevation in V1 could be an alarm against impending hemodynamic collapse.

P4-089

Delayed atrioventricular conduction in type 2 diabetic patients with vitamin D deficiency

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Background: Vitamin D deficiency is common especially in diabetes patients, and is linked to abnormal calcium metabolism which could impact on cardiac electrophysiology. However, the relations between vitamin D deficiency and electrocardiogram (ECG) parameters were unclear.

Methods: We studied 275 Type 2 DM patients (mean age 64.7 ± 10.6 yrs; male 58%) recruited from medical outpatient clinics (all diagnosed > 6 months). Serum 25-hydroxyvitamin D [25(OH)D] was measured by ELISA assay. Vitamin D deficiency was defined as 25(OH)D <20ng/mL. PR interval and QTc interval as determined from complete 12-lead ECG was respectively used as indicators of atrioventricular conduction and ventricular repolarization.

Results: 36% (99/275) diabetic patients were vitamin D-deficient. Mean PR interval was 166 ± 28 ms. Vitamin D deficiency was associated with increased PR interval (B=9.3 ms, 95%CI: 2.4 to 16.3, P=0.008, age and sex-adjusted) but not with QTc interval (P=0.997). The association between vitamin D deficiency and increased PR interval remained statistically significant after adjustment for age, sex, prior coronary disease/ stroke, body-mass index, physical activity, caloric intake, smoking, systolic/ diastolic blood pressure, resting pulse rate, serum LDL and HDL-cholesterol, triglycerides, HbA1c, creatinine and the use of beta-blocker, calcium channel blockers/ angiotensin-converting enzyme inhibitors/ angiotensin receptor blockers, aspirin and statins (B=10.7ms, 95%CI: 0.02 to 1.81, P=0.019).

Conclusions: In patients with Type 2 diabetes, vitamin D deficiency is associated with delayed atrioventricular conduction.

P4-090

The usefulness of quantitative analysis of late potential after Pilsicainide challenge test in diagnosis of Brugada syndrome

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Previous reports have shown that characteristic change of ECG is induced by challenge test of Pilsicainide (Pil) in Brugada syndrome (BS), and that evaluation of late potential is useful for risk of VF in BS. We analyzed consecutive 42 patients who were represented Type 2 or 3 Brugada ECG, and measured late potential before and after Pil infusion. The patients were divided into a BS group (14 patients) who met the diagnosis criteria of BS, and non BS group (28 patients) who did not met the criteria. Before Pil infusion, positive rate was significant higher in qualitative analysis (86% vs. 64%, p=0.02). But, in quantitative analysis, RMS40 (17.3 ± 25.4 mcV vs. 20.2 ± 15.8 mcV, p=0.65), LAS40 (46.4 ± 11.3 ms vs. 41.1 ± 13.4 ms, p=0.21) and fQRS (126.2 ± 17.3 ms vs. 120.6 ± 11.3 ms, p=0.21) were not significant different between two groups. And, after infusion Pil, positive rate was not significant different (93% vs. 82%, p=0.35). On the other hand, in quantitative analysis, RMS40 (9.7 ± 13.3 mcV vs. 13.9 ± 10.1 mcV, p=0.26) was not different, but LAS40 (60.0 ± 13.3 ms vs. 49.6 ± 16.8 ms, p<0.05) and fQRS (147.1 ± 21.2 ms vs. 133.3 ± 14.3 ms, p=0.02) were significant higher in BS group than non BS group.

Conclusion: The quantitative analysis of late potential before and after Pil infusion would be helpful for diagnosis of BS.

P4-091

Evaluation of continuous analysis of ventricular late potentials detected with a holter-based signal-averaged ECG system in obstructive sleep apnea syndrome patients

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Background & Objectives: Recent studies reported the usefulness of ventricular late potentials (LP) detected with a Holter-based signal-averaged ECG system to perceive the daily variations of LPs on Brugada syndrome and J wave syndrome. We investigated whether the daily variations of ventricular LPs can be also seen in the obstructive sleep apnea syndrome (OSAS) patients.

Methods: Twenty consecutive patients who had undergone Polysomnography for suspected OSAS between January 2012 and April 2013 were enrolled in this study. On a retrospective basis, we analyzed the LPs detected in nocturnal sleep using a Holter-based signal-averaged ECG system made by FUKUDA DENSHI.

Results: Nineteen of the 20 patients were diagnosed as OSAS. Six of the 19 patients were diagnosed as mild OSAS, three patients were moderate and 10 patients were severe. The continuous analysis of ventricular LP showed that two (10%) of the 20 patients were positive, and 18 (90%) of the 20 patients were negative. Two patients of LP positive were mild and severe OSAS respectively. Both LP positive patients had no cardiac disease and no abnormal electrocardiogram. Dynamic daily variations of three LP parameters (filtered QRS duration, root mean square voltage of the terminal 40 ms of the filtered QRS complex, and duration of low-amplitude signals [$<40 \mu\text{V}$] in the terminal) were not seen in both two LP positive patients.

Conclusion: Abnormal depolarization, autonomic nerve activity, and daily variations of the ventricular LPs were not deeply associated with the obstructive sleep apnea syndrome (OSAS) patients.

P4-092

Evaluation of a holter based methodology for screening of sleep apnea syndrome

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Introduction and Background: To evaluate a holter based technology consisting of an overnight continuous holter study combined with a sleep apnea software.

Methods: 68 ambulatory patients underwent a simultaneous polysomnogram and holter study. The holter recordings were analysed with a dedicated sleep apnea software (Del Mar Reynolds Life-screen Version 3.14, Hertford, UK) designed for detection of sleep apnoea utilising the analysis of 1) heart rate variability and 2) R wave amplitude variations reflective of respiratory frequency. Holter derived estimated apnoea hypopnea (AHI) index were compared with the overnight polysomnogram. By examining holter derived AHI cutoff values of 5, 15 and 30 (similar to polysomnogram threshold values for sleep apnea severity), we studied the sensitivity and specificity of this holter based software.

Results and Discussion: There was good correlation between the holter and polysomnogram derived AHI. (Correlation coefficient $r=0.68$). In the diagnosis of sleep apnea (Polysomnogram AHI >5), a holter based estimated AHI value of 5 would yield a sensitivity of 92% and a specificity of 41%. For moderate and severe sleep apnea, an estimated AHI of ≥ 15 gave a sensitivity of 91% and specificity of 54%. For severe sleep apnea, an estimated AHI of ≥ 30 had a sensitivity and specificity of 70% and 80.9% respectively. There was high sensitivity but low specificity in the holter based sleep apnea assessment.

Conclusion: A holter based screening method can be a sensitive and easy screening tool for the diagnosis of sleep apnea syndrome. Nevertheless the low specificity is a limitation.

P4-093

A potential pitfall of modified 12-lead ECG (mason-likar modification) in catheter ablation of idiopathic ventricular arrhythmia originating the outflow tract

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Background: The Mason-Likar ECG (ML-ECG) represents the modified 12-lead ECG, a lead system with the limb electrodes alternatively placed on the trunk. ML-ECG is generally used during catheter procedures. ML-ECG could be interchangeable with the standard 12-lead ECG of the limb electrodes on the extremities (Standard-ECG) without affect on diagnostic interpretation during sinus rhythm. But the morphological differences during ventricular arrhythmia in all leads of ML-ECG have not been clarified enough.

Methods & Results: This study included 53 patients with premature ventricular contraction predicted originating from the ventricular outflow tract (OT-PVC). OT-PVC was recorded simultaneously by those two ECG methods and the QRS morphology of them were compared. The amplitude of negative deflection in lead I and R-wave amplitudes in all inferior leads of ML-ECG were greater than those of Standard-ECG (all for $p<0.001$). Q-wave depth in lead aVL of ML-ECG was greater than that of Standard-ECG ($p<0.001$), resulting in a greater aVL to aVR Q-wave ratio ($p=0.014$). S-waves in leads V1-4 of ML-ECG became shallower than that of Standard-ECG ($p=0.016$ in lead V1, $p<0.001$ in the others). Therefore, the transition zone in the precordial leads shifted to counter-clockwise in 18 patients with ML-ECG. 40 patients with OT-PVC underwent catheter ablation. The specificity of localization by ML-ECG with current published criteria that distinguish the left from the right ventricle origin was poorer than that by Standard-ECG.

Conclusion: The prediction of the origin of OT-PVC by ML-ECG that could involve the morphological differences might result in a misdiagnosis and failed ablations.

P4-094

Incidence and related factors of junctional ectopic tachycardia in infants after cardiac surgery for congenital heart disease

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Background & Objectives: Junctional ectopic tachycardia (JET) is common after cardiac surgery for congenital heart disease. However, the incidence and related risk factors of JET in infants after cardiac surgery is not well known. The objectives of this study were to determine the overall incidence and related factors of JET in this group of patients.

Methods: From January 2008 to December 2010, 214 patients younger than 1 year of age underwent open cardiac surgery at Severance Cardiovascular Hospital. Exclusion criteria of this cohort of patients were immediate post-operative mortality, other arrhythmia detected during perioperative period and prematurity. We reviewed these patients' data retrospectively.

Results: The overall incidence of JET was 9.3% (20/214). From multivariate analysis, short PR interval and presence of early repolarization at preoperative ECG, total correction of tetralogy of Fallot and longer aortic cross clamp times, increased the risk of developing JET. Patients with JET had longer intubation time and ICU stay.

Conclusion: JET is a common arrhythmia after cardiac surgery for congenital heart disease in infants. Sometimes patients with developing JET after cardiac surgery in infants have specific findings in preoperative electrocardiogram. The related factors of developing JET were associated with not only anatomic substrates but also with surgical procedural factors.

P4-095

Replication study for association between electrocardiographic voltage criteria and candidate single nucleotide polymorphisms associated with left ventricular hypertrophy from HyperGEN study in a Korean population

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Background & Objectives: The electrocardiographic left ventricular hypertrophy (ECG-LVH) and echocardiographic LVH (Echo-LVH) predicted mortality independently and carried different prognostic information. The aim of this study was to investigate the association between the single nucleotide polymorphism (SNPs) for Echo-ECG identified in HyperGEN study and ECG-LVH for Korean ethnicity.

Methods: For 1659 subjects (682 males, 977 females) from the population cohort in Yangpyeong, South Korea, we performed assays for 12 SNPs from HyperGEN studies. Using PLINK software, multiple linear regression were performed for Cornell voltage and Cornell product. Adjusted covariates were age, gender, body mass index (BMI), systolic blood pressure (SBP), heart rate (HR) and antihypertensive medication.

Results: Age, BMI and SBP were 61.1 ± 10.4 years, 24.7 ± 3.3 kg/m², and 124.3 ± 17.8 mmHg. Hypertension was present in 44.1% and antihypertensive drug was taken in 29.3%. Among 12 candidate SNPs, rs1155635 on chromosome 13 was significantly correlated with both Cornell voltage and product (p=0.008 and 0.00328, respectively) and rs2415872 on chromosome 14 was also associated with Cornell product (p=0.04556).

Conclusion: This study suggests that rs1155635 and rs2415872 for western Echo-LVH had conservation of susceptible loci for Korean ECG-LVH.

P4-096

Focal atrial tachycardia with polarity change from small positive or flat to negative of P wave in inferior leads in the surface electrocardiogram has a possibility to be ablated successfully in non-coronary aortic sinus

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Introduction: Ablation for focal atrial tachycardia (AT) originating around the His bundle region is complicated procedure because of the risk of atrio-ventricular block. Some cases were successfully ablated at the non-coronary aortic sinus (NCAS) without complications. The aim of our study is to characterize remarks in the surface electrocardiogram (ECG) of focal AT originating around the His bundle region, especially of NCAS.

Method: Twenty two patients with focal AT around His bundle region defined by the site with earliest atrial activation or successful ablation were enrolled. Parameters in ECG (P-wave morphology in inferior leads (II , III , aVF), aVR, and precordial leads) were investigated.

Result: AT origin site was 7 in NCAS, 5 in parahisian area (pHis), 5 in coronary sinus ostium (CSos), 5 in posterior septum of right atrium (PSRA). Mean cycle length of AT was 424±95msec, and there was no significant difference between AT origin sites. In ECG remarks, positive P wave in inferior leads and negative P wave in lead aVR indicated AT origin was in NCAS and pHis, with a sensitivity of 75% and a specificity of 90%. Among 12 AT originated in NCAS and pHis, polarity change from small positive or flat to negative of P wave in inferior leads indicated AT origin in NCAS, with a sensitivity of 100% and a specificity of 60%.

Conclusion: AT with polarity change from small positive or flat to negative of P wave in inferior leads has a possibility to be ablated successfully in NCAS.

P4-097

Long term prognosis of intraventricular conduction delay in patients with structurally normal heart

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Background: Long-term prognosis of nonspecific intraventricular conduction delay (IVCD) remains unclear. This study was performed to elucidate long-term prognosis of IVCD in structurally normal heart.

Methods and Results: We evaluated 831 patients (mean age, 52.5 ± 15.5; male 84.7%) with IVCD who underwent 12-lead ECG in a single university hospital between 2000 and 2005 and followed them. IVCD was defined QRS > 110ms without the criteria of complete or incomplete bundle-branch block. And structural heart diseases (myocardial infarction, valvular heart disease, congenital heart disease and cardiomyopathy) were excluded.

We compared incidence rates, cumulative incidence rate and hazard ratios (HR) of complete atrioventricular block, sick sinus syndrome, atrial fibrillation, heart failure and all-cause mortality during follow-up between with IVCD and with narrow QRS complex. Incidence rates and cumulative incidence rates of advanced AV block, sick sinus syndrome, atrial fibrillation, heart failure, and all-cause mortality were significantly increased IVCD groups. By multivariate Cox's regression, the IVCD patients had increased risk of complete AV block, sick sinus syndrome, atrial fibrillation, heart failure and all-cause mortality. (HR=1.23, 1.42, 1.33, 1.26 p=0.009, <0.001, 0.005, 0.008)

Conclusion: IVCD is an independent risk factor for future development of complete AV block, sick sinus syndrome, atrial fibrillation, heart failure, and all-cause mortality.

P4-098

Structure-preserving epicardial potentials reconstruction from multiple channel ECG data via an iterative reweighted regularization scheme

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 This work was supported by grants from the National Natural Science Foundation of China (Grant No. 61271336 and 61233012)

Background & Objectives: L1-norm regularization methods have been proposed to solve the inverse problem of electrocardiology. However, while these methods focus on sparse information, little attention has been paid on the structure information of epicardial potentials. The aim of this study was to propose an iterative reweighted regularization scheme to include more structure information for the potentials estimation on the epicardial surface.

Methods: A boundary element method (BEM) was employed to discretize the torso surface geometry model and the epicardial surface geometry model to derive the relationship between BSPs and EPs. The transfer matrix for the inverse problem was computed during the discretization procedure. The epicardial potentials (EPs) were computed using an iterative reweighted L1-norm regularization scheme by fusing high-resolution body surface potentials (BSPs) and three patients' cardiac anatomy models constructed from magnetic resonance images. In the proposed scheme, L1 regularization was replaced with power law regularization and the objective function was solved in an iterative reweighted manner.

Results: Results showed that the proposed iterative reweighted regularization scheme achieved more accurate results (Average Relative Error = 0.27) than general L1-norm (Average Relative Error = 0.35) and L2-norm (Average Relative Error = 0.41) based methods. As the proposed method involves more structure information in the computation, we can clearly detect some potential-related structures, which cannot be distinguished by general L1-norm and L2-norm based regularization methods.

Conclusion: The proposed scheme can achieve better results in estimation of EPs. Experimental results demonstrate the proposed scheme can be used as a complementary noninvasive tool to detect potential-related structures, which is useful to understand the pathogenesis of cardiac arrhythmias.

P4-099

The clinical correlates and prognostic impact of QRS prolongation in patients with dilated cardiomyopathy

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Background: Prolongation of the QRS duration (≥ 120 ms) has been suggested to be an independent risk factor for mortality in patients with heart failure. The purpose of this study was to examine the association between the QRS duration and survival in patients with dilated cardiomyopathy (DCM).

Methods: A retrospective observational cohort study was undertaken in 1119 patients with DCM and a median follow-up of 3.5 years. All patients were subsequently divided into the following groups: QRS >150 ms, QRS=120-150 ms, and QRS<120 ms, the outcome was assessed with all-cause mortality after admission.

Results: Of the 1108 patient with DCM, 19.3% (n=216) had QRS >150 ms, 23.0% (n=257) had QRS=120-150 ms, and 57.7% (n=646) had QRS<120 ms. The all-cause mortality rates were highest in patients with QRS >150 ms (33.3%), intermediate in those with QRS =120-150 ms (33.1%), and lowest in those with QRS<120 ms (17.2%) after the mean follow-up of 3.5 years, showing a significant difference in the all-cause morbidity risk among the QRS duration groups (log-rank $\chi^2=42.811$, $P<0.001$). In the subgroup patients with LVEF $\leq 30\%$ and NYHA III or IV, QRS prolongation was associated with a significant increase in the all-cause mortality rate. After adjustment for baseline variables, Cox regression analysis further revealed that the QRS, left atrium diameter and NYHA functional classes were independent predictors of all-cause mortality in patients with DCM.

Conclusions: QRS prolongation is an independent predictor of increased all-cause mortality in patients with DCM.

Keywords: QRS duration; LVEF; Dilated cardiomyopathy; Survival

P4-100

Evaluation of spontaneous variability in the frequency of premature ventricular complexes using 7-day holter monitor

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Background: Spontaneous variability in the frequency of premature ventricular complexes (PVCs) appears to have great impact on assessments of the efficacy of antiarrhythmic treatments or progression of disease. However, the degree of variation in PVC frequency in general population remains to be elucidated.

Objective: To evaluate spontaneous variability in the frequency of PVCs using 7-day Holter monitor.

Methods: A total of 82 patients with prior ambulatory ECG recordings that showed PVCs were included in this prospective study. A 7-day Holter monitor was performed in each patient. Overall variability during the 7 days of recording was analyzed by the percentage difference between the maximum and minimum daily frequency of PVCs obtained.

Results: For patients who had $\geq 10,000$ PVCs/24 h (n = 51) recorded by the initial 24 h Holter monitor, the percentage change between maximum and minimum values of the number of PVCs was 20.3%. Spontaneous variability accounted for as much as 67.4% of the change in frequency of PVCs in patients who had <10000 PVCs/24 h, which was significantly higher when compared with patients who had $\geq 10,000$ PVCs/24 h ($P<0.001$). However, spontaneous variability in the frequency of PVCs has no significant correlation with the sites of origin of PVCs.

Conclusions: Changes of $\leq 67.4\%$ in the frequency of PVCs might be within the limit of spontaneous variability in patients with PVCs. This degree of variability should be considered particularly in the assessment of the efficacy of antiarrhythmic treatment.

P4-101

Early repolarization is associated with atrial and ventricular tachyarrhythmia in patients with acute ST elevation myocardial infarction undergoing primary percutaneous coronary intervention

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Background: Early repolarization (ER) is a common electrocardiographic variant and was considered as a benign finding in patients without structural heart disease. However, recent study showed that the ER is significantly more common in survivors of aborted sudden cardiac death. We hypothesized that ER might be more common in patients with ST elevation myocardial infarction (STEMI) who are complicated with various arrhythmias.

Methods: This study included 266 patients with acute STEMI undergoing primary percutaneous coronary intervention. Twelve-lead electrocardiograms were analyzed for ER defined as J-point elevation ≥ 0.1 mV and "notching" and "slurring" of the terminal part of the QRS complex in at least 2 lateral or inferior leads. Incidences of acute atrial and ventricular arrhythmic events were evaluated. Patients with documented atrial or ventricular arrhythmia before MI were excluded and reperfusion arrhythmia after successful intervention was also excluded.

Results: The ER pattern was observed in 76 patients (28.6%). Atrial and ventricular arrhythmia developed with the incidence of 16.2% (43/266) and 12.0% (32/266), respectively, in acute phase of STEMI. ER was more common in patients complicated with atrial arrhythmia [21/43 (48.8%) vs 55/223 (24.7%)] and ventricular arrhythmia [18/32 (50.0%) vs 60/234 (25.6%)] than those without.

Conclusions: The ER pattern is commonly observed in patients with STEMI associated with atrial and ventricular tachyarrhythmia. Further study to assess ER as one of risk stratification in patients with STEMI is warranted.

Key words: early repolarization (ER); ST elevation myocardial infarction (MI); atrial and ventricular arrhythmia

P4-102

Impact of autonomic nerve systems to atrial and ventricular ectopic beats: comparison study using 24hr holter monitoring

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Background: The distribution of autonomic nerve systems (ANS) to atrium and ventricle is somewhat different. Heart rate variability (HRV) is an indirect estimator of autonomic modulation of heart rate. The aim of this study is to estimate the impact of ANS to atrial and ventricular ectopic beats (PAC and PVC).

Methods: Among 1222 patients who performed 24hr holter monitoring in 2007, 765 patients who checked the parameters of HRV were enrolled. All patients were divided into 4 groups according to the distribution of isolated APC and VPC, as : 1) Control : PAC+PVC < 1000, 2) frequent PVC dominant group : PAC+PVC>1000 and PVC/(PAC+PVC)>0.70, 3) intermediate group : PAC+PVC>1000 and 0.70 \leq PVC/(PAC+PVC)<0.30, 4) frequent PAC dominant group : PAC+PVC >1000 and PVC/(PAC+PVC) \leq 0.30. We compared the HRV parameters including LF, HF, LF/HF ratio, SDNN, SDANN, RMSSD and pNN50 between each groups.

Results: The patients in frequent PAC dominant group showed significantly higher levels of LF, HF, LF/HF ratio, SDNN, SDANN, RMSSD and pNN50 than control group ($p<0.001$). However, in frequent PVC dominant group, there were no differences in HRV parameters compared to control group.

Conclusions: In our study, we concluded that the patients with frequent PAC were more frequently modulated by ANS as compared to the patients with frequent PVC.

	Control (n=545)	Frequent PAC (n=128)	Frequent PVC (n=128)	p value (Control vs. PAC)	p value (Control vs. PVC)
Frequency parameters					
LF (msec ²)	19.3 \pm 10.0	44.1 \pm 25.7	19.4 \pm 12.2	<0.001	0.937
HF (msec ²)	12.8 \pm 6.7	21.8 \pm 10.6	11.1 \pm 5.3	<0.001	0.043
LF/HF	1.6 \pm 0.4	2.0 \pm 0.7	1.8 \pm 0.9	<0.001	0.052
Time parameters					
SDNN (msec)	139.5 \pm 45.4	193.8 \pm 84.9	134.9 \pm 58.4	<0.001	0.434
SDANN (msec)	127.4 \pm 58.5	160.9 \pm 79.8	117.2 \pm 51.1	<0.001	0.161
RMSSD (msec)	31.9 \pm 15.1	60.0 \pm 34.3	30.5 \pm 16.2	<0.001	0.469
PNN50 (%)	10.4 \pm 10.1	30.3 \pm 23.9	9.4 \pm 10.8	<0.001	0.436

P4-103

Clinical implication of amiodarone induced QT prolongation in patients underwent cardiac surgery

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Background & Objectives: Amiodarone is shown to be effective for preventing atrial fibrillation (AF) after cardiac surgery. However it is not well known about the incidence of Torsades de pointes (TdP) in patients with amiodarone induced QT prolongation after cardiac surgery.

Methods: Two hundred patients (mean age 61±12; 52% men) prescribed amiodarone after cardiac surgery, were included. Ablation for AF/atrial flutter during cardiac surgery was performed in 71 patients (36%). We assessed the change of QT intervals and cardiac events including in-hospital death and TdP.

Results: Baseline QT interval was 449 ± 28 ms, ranging from 376 to 523 ms on preoperative ECG. Amiodarone significantly increased maximum QT interval to 519 ± 74 ms, ranging from 399 to 710 ms (P=0.003) in patients undergoing cardiac surgery. QT intervals ≥550 ms were shown in 64 patients (32%) and there were no differences in gender and age among those patients. In-hospital death developed in 7 patients (4%) including 6 multi-organ failures and 1 fatal myocardial infarction. There were no significant differences in maximal QT intervals (522±90 ms versus 519±74 ms, P=0.916) according to the presence or absence of the in-hospital death. Also there was no difference in in-hospital death (1.6% versus 4.4%, P=0.434) between maximal QT interval ≥550 ms and <549 ms.

Conclusion: Serious ventricular arrhythmia such as TdP was not developed although amiodarone significantly prolonged QT interval in patients undergoing cardiac surgery. Thus amiodarone can be safely used to prevent AF with diligent monitoring after cardiac surgery.

P4-104

Correlation between the obstructive sleep apnea and QT interval, QTc interval

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Background: The risk of cardiovascular complication is known to be increased with obstructive sleep apnea syndrome (OSA). Prolongation of the QT interval secondary to delayed cardiac repolarization is one of the well-characterized precursors of arrhythmia. The purpose of this study was to investigate the possible correlation between the severity of OSA and QT/QTc intervals in patients with OSA.

Method: We enrolled 69 patients who underwent overnight polysomnography (PSG), echocardiography, and 12-lead electrocardiography (ECG) between 2008 and 2013 in this institution retrospectively.

Baseline characteristic, PSG, echocardiographic and ECG parameters were analyzed.

Result: Mean age of the patients was 55.3±13.0 (male 80.3%). Mean systolic BP (SBP) was 133±18 mmHg, and body mass index was 26.0±4.7. Apnea-hypopnea index (AHI) was 34.0±24.7, arousal index (AI) was 32.5±16.6, respiratory distress index (RDI) was 41.3±23.0 and SPO2 was 83.6±7.2%. Echocardiographic parameters showed LVIdD 51.1±5.3 mm, EF 66±8.3%, E/A ratio 1.04±0.5, and LA volume index 30.9±11.9, respectively. Mean QTc interval was 430.5±37.3 msec and QT interval was 391.4±38.0 msec.

AHI was correlated with SBP (r=0.438, p=0.000) and age (r=0.281, p=0.022). AI was correlated with QTc interval (r=0.398, p=0.001), QT interval (r=0.306, p=0.013), SBP (r=0.344, p=0.005), and age (r=0.276, p=0.025). RDI was correlated with QTc interval (r=0.287, p=0.020), SBP (r=0.445, p=0.000), and age (r=0.358, p=0.003).

Conclusion: This study showed that the severity of OSA measured by AI, AHI and RDI has statistically significant correlation with age, SBP, and QT/QTc intervals. These findings may be one of the responsible explanations for more severe arrhythmia in patients with advanced OSA.

P4-105

Incidence and midterm outcome of arrhythmia in patients with atrial septal defect treated with percutaneous septal occlude

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Background: Transcatheter closure of atrial septal defect (ASD) has been used as an alternative to open heart surgery. Although transcatheter closure of ASD with the atrial septal occluder (ASO) is a safe and feasible method in pediatric patients, there is little published data on incidence and outcome of arrhythmia following transcatheter device closure of secundum ASD. We evaluated cardiac dysrhythmias with ECG monitoring after transcatheter closure of ASD with ASO.

Method: A total of 322 consecutive patients with ASD underwent transcatheter closure of secundum ASD with Amplatzer septal occluder (AGA medical Corp, MN, USA) between October 2003 and October 2007. Mean follow up was 22.0±4.5 months and patients was performed ECG or 24 hours Holter monitoring at pre-, post procedure, 1month, 6 month, 12 month, 1yr, 2yr and 3yr after procedure.

Baseline ECG revealed 177 patients had RBBB and 20 had first degree AV block.

Results: Clinical, ECG, procedural characteristics are shown in Table 1.

During the procedure, transient complete atrioventricular (AV) block was seen in two patients. During follow up, preexisting or newly developed dysrhythmia and ECG abnormality were significantly decreased (statistically significant after 6months) but a few arrhythmias were persistent. Holter recordings demonstrated supraventricular and ventricular extrasystole (i.e., arrhythmia burden) were decreased at 10.1±5 months after procedure.

Conclusion: dysrhythmias after transcatheter device closure of secundum ASD with Amplatzer device are rare and benign. However, clinically relevant dysrhythmias after surgical ASD closure are mainly observed later after the procedure. Therefore, long term studies after transcatheter closure of ASD with ASO are mandatory.

Table 1. Clinical, ECG, procedural characteristics of patients

Variables	patients (N=322)
Sex(M:F)	79/243
Age(years)	22.6±18
BSA	1.20±0.5
No of defect (>2)	30 (9.4%)
Combined anomaly	77 (23.9%)
Pre/post RV pressure (mmHg)	39.3/29.0
RA pressure (mmHg)	6.6±2.5
Q _p /Q _s	2.42±0.7
Size of device (mm)	22.4±7.3
Residual leak	63 (19.6%)
RBBB	177 (55.0%)
1 AVB	20 (6.2%)
Dysrhythmia	-
Pre-procedure	-
atrial fibrillation (%)	3 (0.9%)
atrial flutter (%)	2 (0.6%)
Ectopic atrial rhythm (%)	11 (3.4%)
Post (new developed)	-
AV block	6 (1.9%)
AV dissociation	2 (0.6%)
Idioventricular rhythm	2 (0.6%)
Atrial fibrillation	3 (0.9%)
Atrial flutter	1 (0.4%)

P4-106

The association between pulmonary dysfunction and the presence of electrocardiographic left ventricular hypertrophy in healthy middle aged

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Background: Previous studies revealed systemic manifestations have become increasingly recognized in lung diseases, particularly obstructive disorders. However, there were little data regarding the association between pulmonary function and cardiovascular risk. In this study, we investigated the association between left ventricular hypertrophy (LVH) detected by electrocardiography and pulmonary function in healthy middle aged subjects.

Methods: In this community-based cross-sectional study, 2,534 voluntary subjects aged 40-70 years in Kanwha county were enrolled during 2006. Spirometry was performed by specially trained medical doctors according to the 1994 American Thoracic Society (ATS) recommendations. Of the 2,534 subjects, 1,454 (57.3%) underwent at least two spirometry measurements acceptable by ATS criteria. After excluding 182 subjects with cardiovascular diseases, diabetes, tuberculosis, chronic bronchitis and asthma, 1272 (539 men and 733 women) were finally included in the analysis. ECG was measured on the resting 12-lead electrocardiogram (Philips 12-Lead Algorithm, PageWriter Trim III Cardiograph, Netherlands). The product of QRS duration multiplied by the Cornell voltage combination (RaVL + SV3, with 8 mm added in women) higher than 2440 mm x msec or Sokolow-Lyon voltage (SV1 + RV5/6) higher than 38 mm were used to identify LVH. All the analyses were stratified by gender. FEV1 and FVC were divided as quintiles, respectively.

Results: Baseline characteristics were shown in Table 1. Of the 1,272 subjects, 64 (4.5% in men and 5.5% in women) showed LVH. The proportions of predicted FVC<80% were 7.6% and 6.4% in men and women, respectively.

After adjustment for age, body mass index and pack year in men, decreased FEV1 was significantly associated with the risk of LVH (odds ratio 2.60, p=0.045). However, in women, there were no statistically significant association.

Conclusion: this study suggested that decreased pulmonary function is associated with left ventricular hypertrophy which was the cardiovascular risk factor. However, this association was disappeared in women. This gender difference could partly explain the different cardiovascular risk according to the gender. The pulmonary dysfunction could be a cardiovascular risk factor in men.

P4-107

The long-term effect of remote ischemic preconditioning induced by repetitive transient limb ischemia on ventricular premature contractions and heart rate variability

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Background & Objectives: Recently, animal experiments and in vivo data suggested that remote ischemic preconditioning (RIPC) induced by transient limb ischemia could reduce the size of myocardial infarction and the severity of ventricular arrhythmias induced by ischemic reperfusion. However, the effect of RIPC on ventricular premature contractions (VPCs) in non-coronary disease patients is uncertain.

Methods: Thirty one consecutive patients (14 men, mean age 45.4 ± 15.4 years) with frequent VPCs (> 5/minute) were enrolled. Coronary disease was ruled out by coronary angiography, and anti-arrhythmia agents were stopped for at least 5 half life in all patients. RIPC was induced by 4 cycles of nondominant forearm ischemia (5-minute inflation of a 12 cm wide blood pressure cuff placed around the upper limb to a pressure of 200 mmHg and deflation). The RIPC procedure was performed twice daily for one month. Ambulatory ECG was monitored one day before and after the RIPC procedure to assess the ventricular ectopies and heart rate variability (HRV, including SDNN, SDANN, SDNNI, rMMSD, PNN50%).

Results: After RIPC procedure, the total VPCs were reduced from 7691 ± 1259 to 2147 ± 853 (p < 0.05), including reduction of more than 90% in 8 cases, between 50-90% in 16 cases, less than 50% in 7 cases. The SDNNI was increased significantly, while other HRV parameters were not affected by RIPC procedure (Table).

Conclusion: RIPC induced by repetitive transient limb ischemia can reduce VPCs and partially improve HRV in non coronary disease patients.

Table

	SDNN(ms)	SDANN(ms)	SDNNI(ms)	rMMSD	PNN50 (%)
Baseline	97.24±25.37	98.33±26.42	38.92±7.6	21.36±4.50	5.27±2.83
Post RIPC	104.58±26.29	101.74±27.39	43.68±8.62*	22.36±3.09	6.37±2.81

*p<0.05

P4-108

STUDY QT changes IN hemodialysis in the fourth stage renal failure

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Objective: Study QT changes before and after hemodialysis in the fourth stage renal failure and compare to healthy persons.

Methods and Results: 35 fourth stage renal failure patients and 35 healthy people were enrolled (all of them were male). In the study, the normal 12 lead electrocardiograms were measured in 35 patients before and after hemodialysis, the mean age was 41.4±13.6 years (disease group) and 35 healthy people, the mean age was similar (34.9±13.9). The results as below :

There was no difference between the QT intervals in disease group after hemodialysis and the QT interval in control group (p > 0.05)

The QT correction intervals (QTc) in disease group after hemodialysis (QTc interval lead D3, QTc interval lead AVF and QTc interval lead V6, respectively) were higher than the QTc interval in control group (QTc interval lead D3, QTc interval lead AVF and QTc interval lead V6, respectively) with p < 0.05 .

QT dispersion (QTd) interval after hemodialysis were higher than that the QTd before hemodialysis with p < 0.05.

Conclusion: QT interval leads changed before and after hemodialysis in the fourth stage renal failure. The QTd after hemodialysis was higher than that the QTd before hemodialysis. No difference between the QT intervals in disease group after hemodialysis and the QT interval in control group.

P4-109

QTc prolongation after ventricular septal defect repair in infants

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Background & Objectives: QTc prolongation in EKG has been reported after cardiac surgery in some studies. However, not many studies have been reported on QTc prolongation in infants undergone open cardiac surgery for VSD repair. This study was performed to define the change of QTc and related factors after open cardiac surgery in this group of patients.

Methods: From 2008 to 2012, there were 154 infants undergone VSD repair at Severance Cardiovascular Hospital, among them, 122 patients were included in this study. QTc of ECG before and after the surgery was measured in these patients, retrospectively. Demographic data and perisurgical data such as Aristotle score, Crossclamp time and bypass time was measured. The exclusion criteria were multiple VSDs, small VSDs, undergone direct closure.

Results: Mean post-operative QTc was increased than pre-operative measurements. (from 429.7±4.5 to 444.1±3.5, P=0.05). In the multiple linear regression, total Aristotle score was associated with increased QTc (P<0.001). Incidences of transient arrhythmias such as atrial tachycardia, junctional ectopic tachycardia, PAC, PVC were associated with QTc prolongation (P=0.006). Also, prolongation of QTc was related with cross clamp time (P<0.001) and low weight (P=0.02). Total stay of ICU and intubation time after surgery was not associated with QTc prolongation.

Conclusion: Prolongation of QTc could be seen after VSD repair in infants. This phenomenon was associated with perisurgical factors such as Aristotle score and cross clamp time. Also, patients with QTc prolongation after cardiac surgery had a tendency of arrhythmogenicity in the post-operative period.

P4-110

Electrocardiographic features of therapeutic hypothermia

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Background & Objectives: It has been known that hypothermia can induce electrocardiographic J waves. However, ECG features, clinical meaning and arrhythmogenic potential of the hypothermia-induced J waves remain unknown.

Methods: We analyzed ECGs from 34 patients who underwent therapeutic hypothermia between November, 2010 and July, 2012. The prevalence of J waves, amplitudes/distribution of the J waves and the development of malignant arrhythmia (e.g., ventricular fibrillation) were analyzed.

Results: Average body temperature was 33.4±0.9 °C during hypothermia. Twenty two patients (62.9 %) showed J wave, which was observed primarily in lead II, III, aVF and lead V4-6. (table) J waves were newly developed in twenty patients and preexisting J waves were augmented in two patients. The average amplitude of J waves was 2.55±1.41 mm. There was no ventricular fibrillation during hypothermia. The maximum augmentation of the J waves (the largest difference in J wave amplitudes during and after hypothermia) in patients without idiopathic VF (IVF) were 3.5 mm. In two patients with IVF, J waves were markedly augmented during hypothermia (mean 4.27±3.32 mm). The maximum augmentation of J waves in IVF patients exceeded that of the patients without IVF (13.0 mm and 5.0 mm in each IVF patient).

Conclusions: J waves are seen most frequently in the inferior limb leads or lateral precordial leads during therapeutic hypothermia. Although malignant arrhythmias associated with J wave were not observed in this study, proarrhythmic potential of hypothermia in patients with IVF needs to be evaluated in the future study.

P4-111

Seismic waves in the heart? — a novel understanding on the origin of torsades de pointes and U wave: physical, electrophysiological and beyond

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In 1966, Dr. F. Dessertence first described a special arrhythmia of torsade de points (TdP), which was a polymorphic ventricular tachycardia that had three traits: 1. QRS complexes twisting around the isoelectric line in a sinusoidal fashion; 2. the precondition of a prolonged QT interval; 3. the predictor of an appearance of U wave. Since then, the studies, as well as controversies, on TdP origin had been kept due to its bizarre features. The particularity of TdP must conceal the attractive secret, and the characteristic morphology of “twisting of the spikes” definitely implicates the physical particularity, yet never has been detected. TdP wave is set up by the superposition of longitudinal wave (ventricular tachycardia wave) and transverse wave, and the intercellular collision and slippage are the unique origination of transverse wave. Seismic wave (Love wave and Rayleigh wave) is described here, because seismic wave vividly reveals the genesis of TdP and U wave. This work explores every detail of TdP in depth via the novel angle, from when, where, how to why. However, what brings forth following “open sesame” is not only the treasure of TdP, but the brand-new sky leading to the understanding of (i) the “smart” permeable substrate, (ii) action potential-chemo-mechanical coupling, (iii) action potential-underlying extra-intracellular synergism, (iv) compliance and its opposite stiffness, which carry out heart working (systole & diastole) amazingly, and foremost, perfectly.

P4-112

Spontaneous high-frequency action potential

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Action potential, which is the foundation of physiology and electrophysiology, is most vital in physiological research. This work starts by detecting cardiac electrophysiology (tachyarrhythmias), combined with all spontaneous discharge phenomena in vivo such as wound currents and spontaneous neuropathic pain, elaborates from generation, induction, initiation, to all of the features of spontaneous high-frequency action potential SSL action potential mechanism, i.e., connecting-end hyperpolarization initiates spontaneous depolarization and action potential in somatic membrane. This work resolves the conundrums of in vivo spontaneous discharge in tachyarrhythmias, wounds, denervation supersensitivity, neurogenic pain (hyperalgesia and allodynia), epileptic discharge and diabetic pain in pathophysiological and clinical researches that have puzzled people for a hundred years.

P1-062

Long-term results after cardiac resynchronization therapy with or without surgical revascularization in patients with ischemic heart failure and left ventricle dyssynchrony

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Introduction: We have tested the hypothesis whether epicardial cardiac resynchronization therapy (CRT) concomitantly with surgical revascularization is superior to CRT and medical therapy in patients with ischemic heart failure, LVEF<35% and LV dyssynchrony, who were eligible to coronary artery bypass grafting or medical therapy.

Methods: Ninety seven consecutive patients with severe ischemic heart failure were randomly assigned to endocardial CRT implantation plus medical therapy (n=48) or epicardial CRT implantation plus CABG (n=49). The primary end point was reduction in left ventricle systolic volume (LVESV) by 15% measured by echocardiography. The major secondary endpoint included the all cause death. The patients were followed up during 24 months.

Results: At 24 months, the mean LVESV was significantly lower in epicardial CRT plus CABG group compared with CRT plus medical therapy group (115.4±22.4% vs. 137.8±19.7%, P=0.002). In epicardial CRT plus CABG group 6 patients (12.2%) died at 2-year follow compared with 11 (22.9%) in CRT plus medical therapy group (Log-Rank test, p=0.02). Totally, the number of patients with LVESV reduction by 15% were 37 (86%) in epicardial CRT plus CABG group and 25 (67.6%) in CRT plus medical therapy group (p=0.034).

Conclusions: In ischemic heart failure patients with LV dyssynchrony, who are eligible to surgical revascularization or medical therapy, epicardial implantation of a CRT system concomitantly with CABG is superior to CRT plus medical therapy in terms of cardiac reverse remodeling and is associated with low mortality in long-term follow up.

P1-063

Effect of milrinone on short term outcome of patients with myocardial dysfunction undergoing off-pump coronary artery bypass graft: a randomized clinical trial

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Background & Objectives: Myocardial dysfunction is a major complication in cardiac surgery that needs inotropic support. This study evaluates the effect of milrinone on patients with low ventricular ejection fraction undergoing off-pump coronary artery bypass graft (OPCAB). The present study is designed to evaluate the effect of milrinone on myocardial dysfunction.

Materials & Methods: Eighty patients with low ventricular ejection fraction (<35%), candidates for elective OPCAB were enrolled in this study. They were randomly assigned to two groups. One group received milrinone (50 µg/kg) intravenously and another group received a saline as placebo, followed by 24 hours infusion of each agent (0.5 µg/kg/min). Short outcomes of patients such as hemodynamic parameters and left ventricular ejection fraction were variables evaluated.

Results: Serum levels of creatine phosphokinase, the MB isoenzyme of creatine kinase, occurrence of arrhythmias and mean duration of mechanical ventilation were significantly lower in milrinone group (P<0.05). The mean post operative left ventricular ejection fraction was significantly higher in milrinone group (P=0.031). There were no statistically significant differences between the two groups in terms of intra-aortic balloon pump, inotropic support requirement, myocardial ischemia, myocardial infarction, duration of inotropic support, duration of intensive care unit stay, mortality and morbidity rate.

Conclusion: Administration of milrinone in patients undergoing off-pump coronary artery bypass graft with low ventricular ejection fraction is useful and effective.

Keywords: Off-pump coronary artery bypass graft, milrinone, myocardial dysfunction, low ventricular ejection fraction

P1-064

P1-065

Predictive value of plasma NT-proBNP to long-term response to cardiac resynchronization therapy

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Background and Objectives: Plasma concentration of NT-proBNP correlated with the severity of HF. It was uncertain about the accurate relationship between baseline and changes of NT-proBNP with CRT responsiveness. This study is set to solve this issue.

Methods: We retrospectively analyzed data of patients underwent CRT implantation in our center from Jan 2009 to Dec 2011. Plasma NT-proBNP was tested by ELISA kit at baseline and 3 to 6 month post-operation. NYHA functional class and echocardiography were evaluated during follow-up. Simpson method was applied to measure LVEF. Improvement of LVEF ≥5% and decrease in NYHA class ≥ 1 grade was defined as responders. Improvement of LVEF by twice or the absolute value ≥ 50% and NYHA class I or II grade was defined as super-responders. Improvement of LVEF <5% or decrease in NYHA class <1 grade or the patient died or received heart transplantation was defined as non-responders.

Results: Overall 93 patients age of 60.8 ± 11 years old included in this observational study. During 27 ± 11 (12-50) months follow-up, there were 34 non-responders, 24 responders and 35 super-responders. Concentration of plasma NT-proBNP (fmol/ml) was 2498.9 ± 1555.0, 2198.7 ± 1690.4 and 1528.6 ± 1193.4 (p=0.023) at baseline and was 2423.8 ± 1699.0, 1973.2 ± 1691.6 and 837.1 ± 395.4 (p=0.001) at 3 to 6 month follow up. Reduction of NT-proBNP was expressed as mean ± S.E. and was -220.0 ± 233.3, 157.6 ± 363.6 and 744.5 ± 187.3 (p=0.013) in three groups. Collinearity was observed between baseline and repeat measurement (r=0.624, p=0.001). Significant difference had been observed between super-responders and non-responders at baseline measurement. Correlation between basal NT-proBNP and CRT response was r = -0.291 (p=0.005) and between changes of NT-proBNP and response was r=0.349 (p=0.002).

Conclusions: Baseline and changes of NT-proBNP were predictors to long-term response to CRT. Low basal concentration and significant reduction suggested super-responders.

Keywords: heart failure; cardiac resynchronization therapy; NT-proBNP; responsiveness

P1-066

Mycocardial gap junction remodeling and sodium channel dysfunction in alcoholic cardiomyopathy: mechanistic insights into the cardiac electrical conduction disturbances

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Background: Alcohol-induced cardiac hypertrophy has been well documented. Data and the exact mechanisms regarding various dosages of daily alcohol consumption and ventricular electrical conduction disturbances remained unknown.

Methods: Among 238 subjects from a community-dwelling population eligible for data analysis, we examined the QRS and corrected QT interval by categorized daily alcohol consumption groups (non-, light-moderate: ≤ 90 gm/day, or heavy: >90 gm/day). C57BL/6 mice were fed a liquid diet containing 4% alcohol (4%Group) or 6% alcohol (6%Group) or a normal diet (Ctrl) for 14 weeks followed by electrical conduction and echocardiographic as well as sodium channel (Nav1.5) and gap junction (GP, Cx43) examinations.

Results: We observed that echo-derived left ventricular end-diastolic volume, left ventricular end-systolic volume, ventricular mass, were all positively associated with higher alcohol consumption. Significantly widening of QRS and prolonged QT interval with correction were observed in the heavy ethanol intake group. Both 4%Group and 6%Group showed significantly reduced ventricular conduction velocity (47 ± 3 cm/sec and 28 ± 8 cm/sec) compared to the Ctrl group (71 ± 7 cm/sec), as examined by optical mapping. The attenuation effect on conduction velocities in the myocardium on both Alc groups were decreased significantly by perfusion with a sodium channel blocker TTX or a GP blocker heptanol, compared to Ctrl group.

Conclusion: A dose-related differential effect of myocardial electromechanical disturbances observed in mice with chronic alcohol ingestion was manifested by early electrical instability and slowed conduction velocity, which probably results from functional decline of individual sodium channels and depressed expression of GP.

P1-067

Long term performance of active fixation leads in the coronary sinus for left ventricular pacing : a three year follow-up

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Background: The use of active fixation leads had been used to improve stability in pacing the left ventricle via the coronary sinus. Procedural safety and stability of pacing parameters during short-term follow-up had been demonstrated in this setting. However, long term lead performance in this setting has not been established.

Method: Seventy-eight patients underwent implantation of a 4F active fixation lead (SelectSecure Model 3830, Medtronic Inc, Minneapolis, USA) to pace the left ventricle. Pacing parameters, stability and complication data were collected at implant and during follow-up.

Results: The mean age in this group of patients was 56 ± 14 years. 89.5% were male, 46% with ischaemic aetiology and mean LV ejection fraction was $34\% \pm 10.6\%$. All patients underwent successful implantation procedure. In 56.4% of patients, the main indications of using active fixation lead were due to conventional lead instability. Other indications were phrenic stimulation, lead dislodgement and difficult anatomy at 9.0%, 6.4% and 14.1% respectively. Pacing thresholds were 1.44 ± 0.86 at implant, $1.39V \pm 0.74$ at predischARGE, $1.28V \pm 0.64$ at 1 year, $1.35V \pm 0.60$ at 2 years and $1.33V \pm 0.52$ at 3 years (p=NS). The pacing impedances were 1023 ± 492 at implant, significantly dropped to 678 ± 330 (p<0.05) and then remained stable throughout the three years follow-up duration. There were no lead related complications.

Conclusion: Long term stable performance with regards to pacing thresholds and lead impedances has been demonstrated in this group of patients.

P1-068

Robust automated assessment of myocardial iron loading

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Background: Cardiac damage in patients with thalassemia major is mainly characterized by left ventricular dysfunction caused by or related to iron overload. Traditional manual techniques for myocardial iron loading assessment were often time-consuming and lacked reproducibility. The objective of this study was to investigate automatic approach to guarantee a robust and accurate assessment.

Methods: We first aligned the sequential MRI images to a reference image using mutual information (MI) as a similarity criterion. Level set based geodesic active contour (GAC) model was then implemented to segment the ventricular septum. To improve the assessment accuracy, the extracted ventricular septum was equally divided into 12 small regions. T2* values were calculated accordingly in the 12 small regions of interest, and the minimum value was adopted to assess the risk of myocardium iron overload.

Results: Our segmentation method could significantly reduce the computational cost. In particular, the computational time of our method could be reduced by 86.50% on extracting ventricular septum compared with the time of previous GAC method. Furthermore, the T2* value calculation was automatically performed, and the final assessment results could be obtained accordingly. Partial results of iron loading assessment are shown in Figure 1.

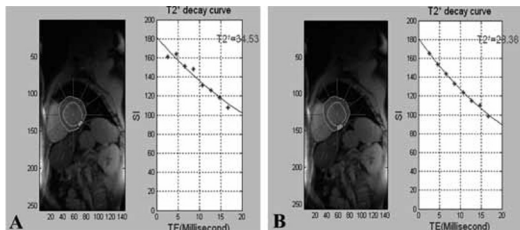


Figure 1. In each subfigure (A or B), the left part represents one small region used for T2* evaluation; the other part displays T2* decay curve within the region.

Conclusion: By adopting MI-based image registration as a preprocessing procedure, our method enables automatic assessment of myocardial iron loading with high efficiency and robustness.

P1-069

Acute beta-adrenoceptor blockade fails to bring down repolarization instability in patients with ischemic cardiomyopathy prone to ventricular tachycardia

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Background: QT variability (QTV) signifies repolarization lability and increased QTV is a risk predictor for sudden cardiac death. As sympathetic tone is elevated in heart failure, sympathetic dysfunction is believed to be a source of increased QTV.

Objective: To determine if beta-adrenoceptor blockade will bring down this repolarization instability.

Methods: The study was performed in 29 subjects: 10 heart failure patients with spontaneous ventricular tachycardia [HFVT(+)], 10 heart failure patients without spontaneous VT [HFVT(-)], 9 subjects with structurally normal heart (HNorm). Beat-to-beat QT interval was measured by automated analysis on 8-minutes records of surface ECG at baseline and during interventions [atrial pacing at 80bpm and 100bpm, esmolol (0.3 mg/kg/min), isoprenaline (3 µg/min) and atropine (0.04 mg/kg single dose) infusion]. Variability in QT intervals was expressed as the standard deviation of all QT intervals (SDQT) at baseline and in the last 3-minutes during interventions. An index of QTV normalized to heart rate variability (QTV/HRV) was calculated as ratio of SDQT to SDRR.

Results: There was a trend towards the baseline QTV/HRV being higher in HFVT(+) group compared to HFVT(-) and HNorm groups (p=0.09). QTV became significantly higher in HFVT(+) and HFVT(-) groups compared to HNorm patients during fixed rate atrial pacing (p=0.008). Compared to baseline, isoprenaline increased QTV in HNorm group (p=0.02), but not in HF patients. QTV remained elevated in HFVT(+) group relative to HNorm group despite acute beta-adrenoceptor blockade with esmolol (p= 0.02).

Conclusion: Patients with HF and spontaneous VT have larger fluctuations in beat-to-beat QT intervals. This repolarization instability appears to be a genuine effect that is not solely a consequence of heart rate variation. Importantly, acute beta-adrenoceptor blockade fails to reduce QTV in patients at risk of VT.

P1-070

Ethnic disparities in hospitalized patients with chronic heart failure in Xinjiang, China

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Background & Objectives: Reports on the large numbers of patients with chronic heart failure (CHF) in ethnic minority areas are sparse. The purpose of this study was to explore the clinical profile and management of patients with CHF in Xinjiang with a population different from the West in its cultural and ethnic origin.

Methods: This was a prospective, multi-centre, hospital-based study conducted in 15 hospitals distributed throughout the major parts of Xinjiang from January 2010 and October 2012. CHF was diagnosed by clinical and echocardiography criteria according to the modified Framingham criteria.

Results: Total of 5357 patients of all ages were enrolled, 43.8% Han and 44.1% Uygur, with the mean age of 66.72±12.66 and 62.70±12.52 years ($P<0.001$). On admission the proportion of functional class IV was 18.4% in Han vs. 25.1% in Uygur ($P<0.001$). At discharge, the prescription rates of blockers of the renin-angiotensin-system (including angiotensin-converting enzyme inhibitors or angiotensin-receptor-blockers) was 74% in Han vs. 68% in Uygur, 69.7% Han vs. 62.2% Uygur patients received beta-blocker therapy. One-year mortality rate of patients discharged alive was 11% in Han and 14% in Uygur ($P=0.002$).

Conclusion: The present study reports the clinical characteristics and prognosis of patients with CHF as it presents in Xinjiang. Ethnic groups living in Xinjiang has striking differences in CHF. Standard treatment for CHF seems to be less than optimum, particularly in Uygur patients. Early identification, treatment and prevention of the CHF are major challenges in the general population in Xinjiang.

Keywords: Chronic heart failure; ethnicity; disparities; Xinjiang

P1-071

The evaluation of efficacy to use quadripolar left ventricular lead compared with existed bipolar lead in CRT-D patients

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Objective: Efficacy of CRT has been demonstrated, but nonresponder is still present. Difficulty of left ventricular (LV) pacing by phrenic nerve stimulation (PNS) and high pacing threshold was one of the causes. Previously bipolar LV lead (Bi) was only available, but quadripolar LV lead (Quad) became available. By using Quad, it was expected threshold improvement, PNS avoidance and shortening LV lead procedure time. We evaluated the efficacy of Quad compared with Bi.

Methods: In consecutive 12 patients who was performed CRT-D implantation using Quad, LV lead pacing threshold and PNS were measured at operation (OPE) and 1 week after operation (1week). Quad was denoted as 1-2-3-4 from distal to proximal, 1-2 pacing was denoted distal pacing (Dp) and 3-4 was denoted proximal pacing (Pp). Pacing thresholds, PNS and LV lead procedure time in Quad patients were compared with those in 30 Bi patients.

Results: In Quad group, Pp threshold was higher than Dp. Comparison between Quad and Bi, there was no significant difference in Dp threshold and LV lead procedure time, but Pp threshold was significant higher than Bi threshold (1.3±0.6 vs 3.6±2.4). However one patient in Quad needed to proximal pacing, and another patient in Bi was abandoned LV pacing because of PNS.

Conclusions: We could not indicate the efficacy of quadripolar lead to improve LV pacing threshold and shorten LV lead procedure time compared with bipolar lead. Quadripolar LV lead might be effective for pacing difficult cases at LV distal site due to PNS.

P1-072

Automatic detection and analyses of uneven membrane electrical activity for high incidence localization on the murine heart by using optical mapping

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Optical mapping has been frequently applied in the research of cardioelectrophysiology, detection of uneven membrane electrical activity (UMEA), which indicates the initial of cardiac arrhythmias in the optical cardiac signal, is still performed manually and imprecisely. A new automatic UMEA detection algorithm is developed by adapting template matching with local maxima and minima detection. The feasibility of the developed method was verified by analysis on a murine heart with alcoholic cardiomyopathy. Immunohistochemical result of the murine heart was shown that the process of tissue remodeling was increased in the ventricle of mice after long-term excess alcohol ingestion. The immunohistochemical result was corresponded to high incidence of UMEA being identified on the surface of ventricle. In addition, to further verify the observed phenomenon, isoproterenol (ISO, 0.5 microM) was perfused into the ventricle of mice to record the optical cardiac signal for analysis. The average initial point number under the drug-free was approximately 25.8 beats/sec while the average initial point number was significantly increased to 250.2 beats/sec after ISO was perfused. The experimental results found that UMEA was generated during repolarization for long term alcohol-ingested mice and after ISO perfused. The phenomenon could be generated by 3 factors those were the abnormal ion channels of myocardial cells, the abnormal transmission among different layer action potential of myocardial cells and the generation of UMEA from early afterdepolarization or delayed afterdepolarization. We designed a new automatic detection and analyses of UMEA method for high incidence localization on the murine heart with abnormal cardiac conduction.

P1-073

The effectiveness of OptiVol monitoring as a predictor of heart failure hospitalization

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Background: Intrathoracic impedance is inversely correlated with pulmonary capillary wedge pressure and fluid balance and decreased before the onset of patient symptoms and before hospital admission for fluid overload. Optivol index is record visually easy to change the intrathoracic impedance. Optivol index is expected to be new marker of prehospitalization for early phase heart failure.

Methods: Between July 2007 and December 2012, We studied 59 patients who had undergone implantation of an implantable cardioverter defibrillators (ICDs) or cardiac resynchronization therapy with defibrillator (CRT-Ds), and hospitalized. They divided into 2 groups (group A was hospitalization for heart failure, group B was hospitalization for the other cause), and we measured Optivol index and NT-proBNP. We classified Optivol index every 20, we evaluated semi-quantitatively.

Results: Group A included 10 patients, group B included 49. Median Optivol index were significant difference in two groups (A: 90.0 ± 85.0, B: 19.2 ± 47.4 ($p=0.0005$)). Also median NT-proBNP were significant difference in two groups (A: 7142.9pg/ml ± 7086.6pg/ml, B: 2481.4pg/ml ± 6071.0pg/ml ($p=0.04$)). The sensitivity, specificity, positive predictive value and negative predictive value for heart failure hospitalization of OptiVol index 60 were 50%, 89.8%, 50% and 89.8%.

Conclusions: Optivol index is useful for diagnosis of heart failure. Moreover using of remote monitoring system, it is effective to detect heart failure earlier.

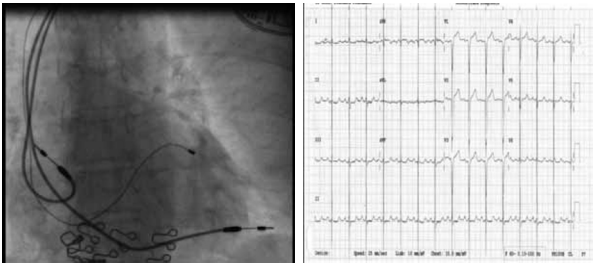
P1-074

RV lead migration in CRT-P device, turning complication in to opportunity- a case report

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65 years old lady, who had undergone bi ventricular pacemaker implantation 10 years back, presented with NYHA class III –IV symptoms after 8 years since last OPD visit with loss of Bi ventricular pacing. Device interrogation showed end of life as the device could not be interrogated. Patient was taken up for device replacement. During procedure fluoroscopy showed migration of RV lead outside of cardiac border. Venogram revealed totally occluded left subclavian vein. As the patient was very frail and associated increased risk for fresh implant on other side, another possible option was to use this limitation to our advantage in form of some sort of adaptive pacing. However dedicated adaptive pacing device was not yet available at that time in our country. We then programmed the existing device to obtain adaptive pacing physiology (Figure 1).

Figure 1



Electrical fusion has been shown to be associated with a significant acute improvement in the cardiac function compared with the native conduction. In this patient, the AV interval was kept at 140 msec, this resulted in fusion between the intrinsic QRS morphology and LV pacing with significant improvement in symptoms on follow up.

P1-075

Effects of cardiac resynchronization therapy on MTWA

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Background: It is not clear whether CRT affects on microvoltage T wave alternans (MTWA).

Objective: To study the long-time effects of CRT on MTWA.

Methods: Patients who received CRT implantation were included. Echocardiography, electrocardiogram, and MTWA test were performed before implantation, and repeated after 6 months. When Biventricular (BiV) pacing, MTWAs were tested at 90bpm, 100bpm and 110bpm respectively by treadmill exercise test with GE CASE 8000. All patients were divided to responders and non-responders, according to whether the LVEF increased $\geq 5\%$ absolutely than baseline or not. The MTWAs at 0 and 6 months were compared.

Results: 17 patients were included, in which 9 were responders, and 8 were non-responders. Responders had same LVEF ($34.99\% \pm 4.68\%$ Vs $31.63\% \pm 5.99\%$, $p=0.21$) and same MTWA ($12.56 \pm 8.35\mu V$ Vs $14.00 \pm 9.94\mu V$, $p=0.77$) as non-responders before implantation. And they had higher LVEF ($40.94 \pm 10.57\%$ vs. $33.41 \pm 5.44\%$, $p=0.003$) and lesser amplitude of MTWA ($5.65 \pm 5.72\mu V$ vs. $13.24 \pm 8.87\mu V$, $p=0.01$) than non-responders after 6 months. A significant negative correlation was found between the change of MTWA and amplitude of first MTWA at 90bpm ($r=-0.5600$, $p=0.0194$) and 100bpm ($r=-0.7994$, $p=0.0001$).

Conclusion: MTWA amplitude changes with heart function. When heart function improved, MTWA decreased. After resynchronization therapy, the patients who had higher MTWA before implantation, have more reduction after 6 month, and the reduction had a significant negative correlation with the MTWA before implantation.

P1-076

The clinical characteristics and predictors of delayed responders to cardiac resynchronization therapy

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Background: Among all the patients with chronic heart failure who undergo cardiac resynchronization therapy(CRT), most patients had great reversal of heart remodeling and improvement of live quality within six months, but some patients only show the improvement after one year or more. We defined these patients as delayed responders(DRs).The attributes of these patients need to be investigated.

Objective: The purpose of this study were to describe the clinical characteristics and to find the valuable predictors of these delayed responders.

Methods: We reviewed the clinical data of 55 patients with chronic heart failure who implanted a CRT-P/CRT-D device between April 2005 and November 2011 in our center. The standards of response to CRT were (1)the NYHA decreased by one class or more.(2)the absolute value of left ventricular ejection fraction(LVEF) increased by 0.05 or more. Patients who fulfill with these two standards within six months after implantation was considered as responder to CRT. The patient who did not fulfill with the two standards within half a year, but met these two requirements one year or later was defined as delayed responder. The non-responder did not meet these criterions meanwhile till one year or more. Clinical characteristics of delayed responders among all the patients were analyzed retrospectively, and the impact factors were predicted.

Results: The average follow-up time was 24.33 ± 16.18 months. 33(60%)patients met the criteria for responders, their LVEF were significantly higher(45.03 ± 8.23 vs 31.84 ± 4.43 , $P < 0.001$) than those before implantation .There are 13(23.64%) patients in the delayed response group, whose LVEF were significantly higher(47.00 ± 9.16 vs 34.33 ± 3.06 , $P < 0.001$) than before. The rest 9(16.36%) patients were non-responders and the maximum of LVEF after pacing were not statistically different from those before implantation (33.89 ± 5.35 vs 34.67 ± 5.55 , $P=0.402$). Response group(RG) and delayed response group(DRG) had statistically significant difference in QRS wave form($P=0.013$), but the proportions of patients with each type of the QRS morphology between the two groups were not different statistically. Multiple logistic regression analysis showed that the baseline NYHA class was predictor of CRT delayed responder (OR 0.096,95%CI 0.013 to 0.715; $P=0.022$).

Conclusion: The patients with better activity endurance before implantation may present delayed response after CRT.

Keywords: Delayed responder; Chronic heart failure; Cardiac resynchronization therapy

P1-077

Evaluation of cardiac synchronization in CRT super-responders

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Objective: To evaluate the cardiac synchronization of CRT super-responders in sinus rhythm and bi-ventricular pacing mode and to investigate the necessity of long-term bi-ventricular pacing for CRT super-responders.

Methods: In this study, patients with severe heart failure as a result of idiopathic dilated cardiomyopathy or ischemic cardiomyopathy who underwent CRT or CRTD implantation in our center from Nov 2006 to Jul 2012 and showed super-response to CRT were enrolled. The 12-lead electrocardiography, echocardiography and gated myocardial perfusion SPECT were recorded for every patient both in sinus rhythm with intrinsic QRS and bi-ventricular pacing mode. The data we collected included QRS duration, PR interval and synchronous data which consists of interventricular mechanical delay(IVMD), LV filling ratio(LVFT/R-R), Ts-max and Ts-SD with echocardiography and phase SD and bandwidth with SPECT.

Results: A total of 10 patients were included, mean age of 60.4 ± 9.2 years, 4 male patients, 5 patients implanted CRTD. After 38.3 months of follow-up, the overall left ventricular end-diastolic diameter (LVDD) reduced significantly from 72.6 ± 7.0 mm to 52.2 ± 3.8 mm, ($p < 0.001$); left ventricular ejection fraction (LVEF) increased significantly from $31.0 \pm 5.1\%$ to $60.8 \pm 4.7\%$ ($p < 0.01$). Each patient had an increase of LVEF more than 20%, and LVDD less than 55mm. There were no significant differences in QRS duration(160.9 ± 28.6 ms vs 151.3 ± 18.2 ms, $P=0.435$), IVMD, the ratio of left ventricular filling time to R-R cycle, Ts-max, Ts-SD, phase SD and bandwidth in sinus rhythm with intrinsic QRS and bi-ventricular pacing mode($P > 0.05$). All parameters were in normal range.

Conclusion: CRT super-responders shows superior cardiac mechanical synchronism in both intrinsic QRS and bi-ventricular pacing mode.

Keywords: Cardiac resynchronization therapy; Super-responder; Cardiac synchronization

P1-078

Remote PHM cloud cluster for heart failure prognosis and drug therapy optimization

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Background & Objectives: Prognostic and Health Management, PHMs a new IT trend whose purpose is the development of methods, algorithms and computing clusters to identify hidden early predictors of cardiovascular risks on basis of parallel computing resource. Cloud computing cluster supports low-cost ECG ultra-portable recorders and not limits the possibilities of using a more complex patient telemetry containing implantable sensors as pulmonary artery sensor, left atrial pressure sensor, CRT devices.

Methods: Using the above-mentioned technology and PHM predictive methods of detecting of early predictors of ventricular tachycardia were studied methods for optimizing drug treatment of arrhythmias in the persistent phase. ECG monitoring was carried out episodically or permanently depending on the ECG dynamics. The minimum time of ECG recording was in different cases from 5 minutes to 10 hours daily. ECG recording length was determined automatically by cloud cluster algorithms in interactive regime.

Results: Monitoring was held to 20 patients with persistent atrial fibrillation. Change of antiarrhythmic drugs was controlled cloud cluster. Early criteria of drug ineffectiveness were established. It also specified criteria of efficiency on the basis of modeling the evolution of latent early predictors. In some cases, the PHM systems prevent development of life threatening arrhythmias.

Conclusions: Thus ECG analysis on base PHM cloud cluster is new possibilities for heart failure management, drug control efficient and drug therapy optimization. Low cost of recorders and cloud computing service makes available remote preventive monitoring to all patients, and the potential risk groups.

P1-080

Antidromic snare technique for when the LV lead cannot be advanced in the target vein: results, safety and feasibility in 13 patients

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Background and Objectives: To describe an approach for LV lead placement when a wire cannot be advanced directly into the vein from the coronary sinus.

Methods: In 13 cases (6 with prior implant failure) where the target could not be entered with a wire, an adjacent vein was cannulated and contrast injected to identify collaterals to the target vein. A 300 cm hydrophilic wire was directed through the collaterals into the target vein then into the CS where it was snared. A microcatheter was advanced through the collateral to cover the wire. While advancing the wire into the microcatheter, the snared distal end was pulled into the CS access catheter and out the hub where the snare was released and the tip trimmed. The pacing lead was advanced antidromic over the soft end of the wire antegrade into the target vein

Results: In all 13 cases the LV lead was successfully placed antegrade into the vein by advancing the pacing lead antidromic down the soft end of the wire. Balloon venoplasty was required prior to LV lead placement in 6, augmented by a cutting balloon in one. There were no complications.

Conclusion: If a wire cannot be advanced from the CS into the target vein it can often be advanced retrograde from an adjacent vein then back into the CS where it can be snared, pulled into the pocket and the LV lead advanced antidromic down the soft end of the wire antegrade into the target vein.

P1-079

Novel non-invasive mapping reveals variable electrical synchrony during multipolar pacing - potential new tool for vector optimization

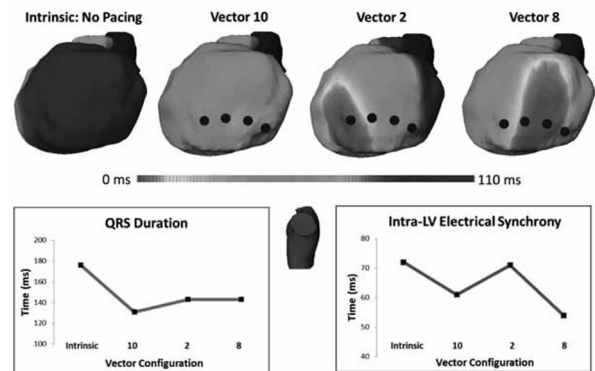
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Background & Objectives: Left ventricular (LV) pacing and activation are important factors affecting CRT response. Recent advances in multipolar LV leads offer variable pacing configurations. To evaluate activation patterns for various pacing vectors, a non-invasive biventricular mapping system (ECSYNC™, Cardiolsight, OH) was used.

Methods: CRT patients (n=10, 8 males, age 65±12, QRSd=178±16ms) with previously implanted quadripolar LV leads (Quartet™, St. Jude Medical, MN) were evaluated during various follow-up visits (8±5 mo post-implant). LV lead positions included 6 posterolateral, 3 anterior, and 1 infero-apical. Patients had heterogeneous etiology including ischemic and nonischemic cardiomyopathy and various conduction disorders. In each patient, activation patterns and electrical synchrony were evaluated for each of the 10 pacing vectors using ECSYNC.

Results: Visually assessable and quantifiable changes in activation and electrical synchrony were observed for each pacing vector. LV activation time varied by 31±11ms within each patient, but QRSd was not useful in delineating such changes and only varied by a nonspecific 14±4 ms. Figure shows a typical patient with delayed sinus LV activation and 3 variable pacing vectors. Vector 10 improves all but anterior LV, Vector 2 improves all but LV base, and Vector 8 provides best overall LV activation.

Conclusions: For the first time, patient specific variability in ventricular activation for various LV lead configurations were mapped and quantified using a novel CRT mapping system, demonstrating its potential for lead optimization.



P1-081

Carelink: to evaluate the amount of time a patient saves by using a remote monitoring as compared to an in-office check

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Introduction: Carelink is a remote device data transmission system which allows the transmission of clinical data from a patient's home to a secured website. The data is then assessed, similar to in-office checks. This study aims to compare time taken for patients on remote device data transmission to transmit their data vs in-office device check for patients on Carelink.

Method: A self-administered survey was completed by 15 of the 60 Carelink patients recruited (Age 64.9 ± 14.6, Male 60%) at 3 months follow up post device implantation with regards to the amount of time spent for an in-office check. This was defined as the total time taken from traveling to the hospital to the time they reached home. This excluded physician visit. Out of the 15 patients, 7 had non-wireless devices (6 pacemaker, 1 CRT-D), 8 had wireless devices (7 AICD, 1 CRTD).

Results: 13% took <1 hour for a clinic follow up, 67% spent 1-3 hours and 20% took > 3 hours. Patients with non-wireless devices reported spending an average of 10 minutes from the time the transmission wand is placed over their device to the time the transmission is completed. Patients with a wireless device took 0 minutes as the device has been configured to automatically transmit data without any patient intervention.

Conclusion: It appears that Carelink takes significantly lesser time from the patient's point of view. It could be a substitute or enhancement to in-office checks as it benefits patients in terms of time savings.

P1-082

Does remote monitoring reduce actionable implantable device checks compared to in-office evaluation?

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Introduction: Remote monitoring (RM) of implantable devices allows transmission of data from patient homes to a secure website. We hypothesised that RM may affect the number of actionable device evaluation compared to in-office device evaluation.

Method: Consecutive patients undergoing device implantation in a tertiary hospital were enrolled. Clinical demographics, RM and in-office device check data was collected. Actionable device checks were defined as: VT/VF episodes, battery ERI, lead impedance and threshold variation >20% compared to previous check. Comparisons were performed using a two-tailed chi-squared test.

Results: 122 patients were enrolled. 77 patients underwent in-office device checks (69% pacemakers, 31% ICDs) versus 45 patients who underwent remote monitoring (18% pacemakers, 82% ICDs). The remote monitoring systems used were: Medtronic Carelink (80%), St Jude Medical Merlin (16%), Biotronik home monitoring (4%). There were 5 actionable device checks (RM - 2 VT/VF; In-office - 1 battery ERI, 2 VT/VF). The proportion of patients with actionable device checks was 4.4% (RM) versus 3.9% (in-office check) (p=NS).

The clinical demographics were similar for both groups.

Conclusion: There is no significant difference in the number of actionable device checks between patients who undergo RM versus in-office device check. RM may be a suitable alternative to in-office device check.

P1-083

Nonpharmacological treatments compliance among heart failure patients

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Background & Objective: Compliance with nonpharmacological treatments is important measure in regulating and improving the disease outcomes among heart failure patients. Research supported that compliance for nonpharmacological treatments of lifestyle recommendations including diet and fluid restriction, daily weighting, and exercise yielded satisfactory clinical outcomes and significantly enhanced quality of life among heart failure patients. The objective of this study is to review the attributes on heart failure patients' compliance on nonpharmacological treatments.

Methods: A systematic review on recent research on the attributes influencing heart failure patients' compliance on nonpharmacological treatments using keywords "heart failure", "compliance", "nonpharmacological", "treatment" were searched by multiple databases. Results were reviewed and presented.

Results: Multiple attributes were suggested to influence heart failure patients' compliance to nonpharmacological treatments. The patients' demographic background, clinical condition, physical and emotional functioning, beliefs and knowledge on the disease and treatment outcomes, educational support, stringent requirements of lifestyle restrictions and treatment regimen were highlighted and showed impact on the nonpharmacological treatment compliances.

Conclusion: Since compliance to nonpharmacological treatments is as important as that for pharmacological treatments in improving heart failure outcomes. The present study supported that the multiple variables would influence the patients compliance. Thus, healthcare providers should address the attributes while implementing nonpharmacological treatments for heart failure patients to yield positive outcomes.

P1-084

A pilot study for new wireless smartphone-based ECG recording for detecting arrhythmias

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Background & Objectives: The current available ambulatory electrocardiogram (ECG) devices for non-invasive monitoring such as Holter monitor and patient-triggered event recorders are bulky in size and require leads, which limited their clinical implication by the patients inconvenience and intolerance. A mobile wireless ECG is used to monitor cardiac arrhythmia while allowing the patient to remain fully mobile and comfortable.

Method: We developed a new smartphone-based ECG recording system to monitor cardiac arrhythmias. The Fairy® recording system used a recently-introduced, wireless, non-invasive continuously ambulatory ECG recording device. The ECG data passed through a bluetooth wireless link to smart-phone, and then be transmitted to a cloud platform. A total of 40 patients with suspected arrhythmia were given both a 24-hour Holter monitor and a Fairy® recording system to wear simultaneously with the same instructions. All patients received a questionnaire with a comfort and convenience score on an 11-point scale (0-10) for both devices.

Results: Total of 14 arrhythmic events were recorded by Holter monitoring. Sensitivity and specificity values of the Fairy® recording for arrhythmia screening were 83.3% and 100% for brady-arrhythmias and long pauses, and 100% and 100% for tachy-arrhythmias (including 0 SVT, 8 AF/AFL, 0 VT). Fairy® recording detected PAC with sensitivity of 72.4% and specificity of 100%; PVC with sensitivity of 75.8% and specificity of 100%. The Fairy® recording system were more tolerable than Holter recording (mean comfort and convenience score 8.6 vs. 5.9, P < 0.001).

Conclusion: This wireless smartphone-based ECG recording system is promising for arrhythmia screen and more comfortable and convenient than Holter monitor.

P1-085

Multipoint left ventricular pacing provides similar acute hemodynamic improvement in both ischemic and non-ischemic cardiac resynchronization therapy patients

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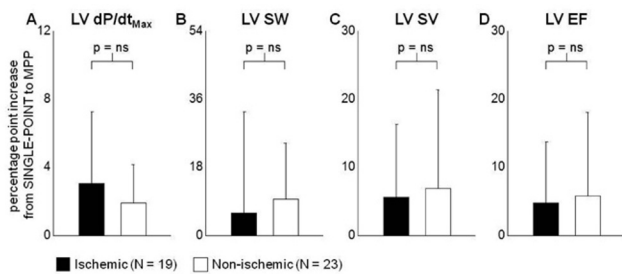
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Background & Objectives: Patients with cardiomyopathy of ischemic origin have poorer response to traditional cardiac resynchronization therapy (CRT) than patients whose cardiomyopathy is of non-ischemic origin. We hypothesized that CRT with multipoint left ventricular (LV) pacing (MultiPoint™ Pacing [MPP], St. Jude Medical) in a single coronary sinus branch can produce an acute hemodynamic response in ischemic patients that is non-inferior to that in non-ischemic patients.

Methods: Forty-four consecutive patients receiving a CRT implant (Unify Quadra MP™ or Quadra Assura MP™ CRT-D and Quartet™ LV lead, St. Jude Medical) underwent LV hemodynamic assessment using a pressure-volume (PV) loop system (Inca, CD Leycom). PV loops were recorded during biventricular pacing with each of two single-point LV settings and 4-7 MPP settings. Each pacing intervention was performed twice in a randomized order with right ventricular pacing (BASELINE) repeated after every test configuration.

Results: Valid recordings were obtained in 42 patients (19 ischemic, 23 non-ischemic). The best MPP configuration improved LV dP/dt_{Max} relative to BASELINE by +3.0±4.2 percentage points over the best single-point LV configuration in ischemic patients, not significantly different from the improvement in non-ischemic patients (+1.9±2.3 percentage points, p=0.27, Fig A). Furthermore, MPP conferred similar LV stroke work (SW), LV stroke volume (SV), and ejection fraction (EF) improvement over single-point LV pacing regardless of cardiomyopathy etiology (SW: +5.9±2.7% vs. +9.6±1.5%, p=0.57, Fig B; SV: +5.6±1.1% vs. +6.9±1.4%, p=0.74, Fig C; EF: +4.7±9.0% vs. +5.6±1.2%, p=0.78, Fig D).

Conclusion: MPP results in similar acute hemodynamic response in ischemic and non-ischemic patients.



P1-086

Improvement in 3-month echocardiographic and clinical response to cardiac resynchronization therapy with multipoint left ventricular pacing in a single coronary sinus branch

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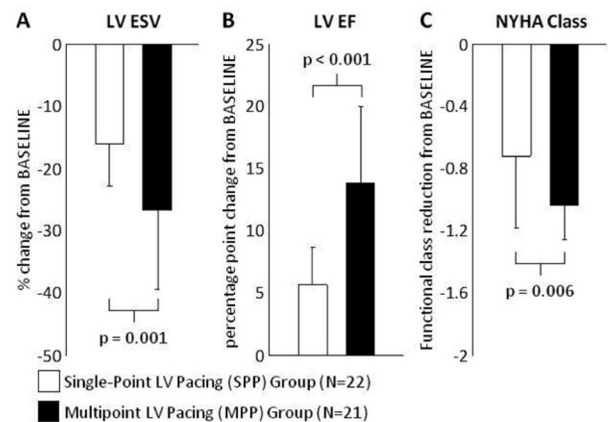
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Background & Objectives: Cardiac resynchronization therapy (CRT) with multipoint left ventricular (LV) pacing (MultiPoint™ Pacing [MPP], St. Jude Medical) in a single coronary sinus branch improves acute LV function. We hypothesized that MPP can also improve echocardiographic and clinical response to CRT.

Methods: Consecutive patients receiving a CRT implant (Unify Quadra MP™ or Quadra Assura MP™ CRT-D and Quartet™ LV lead, St. Jude Medical) were randomized to receive pressure-volume loop optimized biventricular pacing with either conventional single-point pacing (SPP group) or MPP (MPP group). A clinical evaluation and echocardiography were performed prior to implant (BASELINE) and 3-month post-implant and analyzed by a blinded observer.

Results: Forty-three patients (79% male, NYHA 3.0±0.0, end-systolic volume [ESV] 181±78mL, ejection fraction [EF] 27±6%, QRS 152±17ms) were enrolled and randomized to either SPP group (N=22) or MPP group (N=21). Patient characteristics at BASELINE were not significantly different between two groups. After 3 months, 11/22 (50%) patients in SPP group and 16/21 (76%) patients in MPP group were classified as responders by ESV reduction >15% relative to BASELINE. ESV reduction, EF increase, and NYHA class reduction relative to BASELINE were significantly greater in MPP group than in SPP group (ESV: -26.9±12.6% vs. -16.3±6.6%, p=0.001, Fig. A; EF: +13.7±6.1% vs. +5.6±3.0 percentage points, p<0.001, Fig. B; ΔNYHA: -1.1±0.2 vs. -0.7±0.5 functional classes, p=0.006, Fig. C). The occurrence of cardiac-related adverse events during the follow-up period was not significantly different between the two groups.

Conclusion: MPP resulted in a higher response rate to CRT than conventional single-point LV pacing.



P1-087

Rapid increasing of left ventricular lead impedance immediately after CRT-D implantation: report of a case

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Background & Objective: To treat ventricular tachycardia after myocardial infarction with wide QRS left ventricular low out-put, Cardiac resynchronization therapy defibrillator (CRT-D) is implanted. We experience rapid increasing left ventricular lead impedance immediately after device implantation.

Method: A 71-year-old male underwent implantation of CRT-D 2 months ago. Increasing of left ventricular (LV) lead impedance was detected by the remote monitoring system. Dislodgement of LV lead was suspected but an intrinsic R wave was 12.5 mV that was not different from the date at implantation of device. Result of father examination of LV lead leveled that lead impedance using proximal and distal electrode exceeds 2000 ohm. However, lead impedance using proximal electrode and pacemaker body was 1340 ohm and lead impedance using distal electrode and pacemaker body was 840 ohm. Intrinsic R wave using distal electrode and pacemaker body was 16 mV. Rapid increasing of pacing lead impedance is not so common. When we found rapid increasing of lead impedance, we suspected dislodgement of a pacing lead, first. However, the intrinsic R wave detected by home monitoring system was not different from the value at initial implantation. We confirm no change of LV lead position by a chest roentgenogram. One of the causes of rapid increasing of proximal electrode of left ventricular lead was supposed due to the inflammation around tip electrode.

Result: We experienced rapid increasing of LV lead impedance. Because the LV lead was inserted into small sized coronary vein, the LV lead was affected more easily by surround tissues than right ventricular lead.

Conclusion: We experienced rapid increasing LV lead impedance without lead dislodgement.

P1-088

Review of remote device transmission report is less time consuming than in-office device check

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Introduction: Medtronic Carelink was launched in National heart centre Singapore as a pilot program to find out the feasibility of remote monitoring (RM) in Singapore. We report the time taken to review RM transmission reports compared to time taken to perform an in-office device check.

Method: 9 Medical Technologists (MT) performing in-office device checks and RM transmission reports were involved in the survey. The time taken to complete an in-office device check starts from the beginning till the end of device interrogation. The time taken to complete a RM transmission review start from the time the MT retrieve the patient data till the completion the transmission report.

Results: The mean time reported for an uneventful in-office device checks is 10.5 ± 3mins. The mean time reported for actionable in-office device checks is 18.9 ± 4.2mins.

The mean time reported for an uneventful RM transmission is 5mins. The mean time reported for actionable RM transmission is 10 ± 2.5mins.

In comparison, reviewing of RM transmission is less time consuming compared to in-office device check - 50% (uneventful event) versus 48% (actionable event).

Conclusion: RM shows significant reduction in the duration needed to complete a review compared to in-office device check regardless whether there is any episodes or other issue.

P1-089

The electrocardiogram predicts super-responders in patients receiving cardiac resynchronization therapy

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Background: In multiple randomized studies of patients with chronic heart failure, cardiac resynchronization therapy (CRT) has been shown to improve the quality of life and exercise capacity. However, a few studies have reported that there are super-responders who have a more dramatic improvement in their left ventricular ejection fraction. The purpose of this study was to identify the baseline clinical attributes of super-responders and to assess the survival benefit associated with this super-response.

Method: We reviewed the clinical, echocardiographic, and Echocardiography (ECG) data from a cohort of 104 patients undergoing implantation of a CRT device at the Showa University hospital between January 2003 and August 2012. Inclusion criteria were based on standard guidelines, specifically an LV ejection fraction < 35%, QRS duration > 120 ms, and NYHA class > despite optimal medical therapy. A positive super-response to CRT was defined as a LVEF > 45% and/or a reduction in LVESV by > 15% at 6 months compared with baseline. The mean follow-up period for patients undergoing CRT implantation was 37±27 months.

Results: In this cohort of 104 patients, 24 (23.1%) met the criteria for a super-response. Super-responders had a significantly more favorable long-term survival than did non-super-responders. In a multivariate analysis, only complete left bundle branch block (cLBBB) remained significantly associated with a super-response (odds ratio & = 0.17, P=0.01).

Conclusions: In the present retrospective study, only a complete left bundle branch block was an independent predictor of super-response to CRT

P1-090

Electrocardiographic parameters associated with mortality in patients with heart failure with preserved left ventricular ejection fraction

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Background: The prognostic utility of the electrocardiogram (ECG) in predicting mortality in patients with heart failure with preserved ejection fraction (HFpEF) is still largely unproven. In particular, data on the prognostic utility of ECG parameters in the Asian population are limited. We aimed to establish the association between ECG parameters with mortality in HFpEF patients in a multi-ethnic Asian context.

Methods: This is a retrospective single-centre analysis of patients admitted with decompensated heart failure from 1 January to 31 December 2009. Patients with valvular heart disease, acute coronary syndrome, isolated right sided heart failure and left ventricular ejection fraction <50% were excluded. Presenting ECGs were examined for 18 specific parameters. Patient case notes and electronic records were reviewed until the end of the study period of 31 December 2010. The primary outcome studied was death at or before 31 December 2010.

Results: 68 patients met the inclusion criteria for the study. 6 (8.9%) patients met the primary outcome. Left bundle branch block on presenting ECG was strongly associated with the primary outcome of death (hazard ratio (HR) 16.6, p=0.002). Other ECG parameters analysed did not show any significant relationship with death, including prolonged QTc (HR 3.21, p=0.202), presence of Q waves (HR 0.63, p=0.684) and left ventricular hypertrophy (HR 1.98, p=0.463).

Conclusion: The presence of left bundle branch block on presenting ECG in patients with heart failure with preserved ejection fraction is associated with a significantly higher rate of mortality. The explanation for this is unclear and warrants further study.

P1-091

Effects of ventricular conduction block patterns and pulmonary hypertension on mortality in hospitalized patients with dilated cardiomyopathy

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Objective and Background: Ventricular conduction block (VCB) identified on a 12-lead electrocardiogram are associated with poor outcomes in patients with known cardiac diseases. The prognostic implications of VCB patterns in dilated cardiomyopathy (DCM) patients, however, need to be evaluated. The purpose of this study was to determine all-cause mortality in DCM with VCB.

Methods and Results: An observational cohort study was undertaken of patients from 2003 to 2011, 1119 patients were enrolled with median follow-up of 3.5 years. Standard demographics, echocardiography and routine blood tests were obtained shortly after admission. Outcome was assessed with all-cause mortality. All patients were then divided into LBBB, RBBB, intraventricular conduction delays (IVCD) and narrow QRS groups. Of those, 19.8% (n=221) had LBBB, 7.3% (n=82) had RBBB, 6.0% (n=67) had IVCD, 66.9% (n=749) had narrow QRS. All-cause mortality rates were highest in patients with IVCD (47.8%, n=32), intermediate in those with RBBB (32.9%, n=27) and LBBB (27.1%, n=60), and lowest in those with narrow QRS (19.9%, n=149), a significant difference in all-cause mortality risk among the VCB groups and narrow QRS group (log-rank $\chi^2=51.564$, $P<0.001$). In addition, significant mortality differences were also demonstrated between the DCM patients with VCBs and pulmonary hypertension (PH) compared with those without PH (37.9% vs. 20.9%, log-rank $\chi^2=27.087$, $P<0.001$). Presence of RBBB, IVCD, PH, left atrium diameter and NYHA functional class were the independent predictors of all-cause mortality in DCM patients.

Conclusion: VCB, in particular IVCD, predicts mortality in DCM, and that RBBB and IVCD but not LBBB are independent predictors of mortality.

Keywords: Ventricular conduction block; Dilated cardiomyopathy; Pulmonary arterial hypertension; Survival; Prognosis

P1-092

SCN5A mutations associated with dilated cardiomyopathy

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Background and Objectives: Mutations in SCN5A gene cause a variety of inherited cardiac arrhythmic syndromes, including long-QT syndrome (LQTS), Brugada syndrome (BrS), isolated cardiac conduction disease, sinus node dysfunction, and atrial fibrillation. However, the relationship between the SCN5A gene mutations and dilated cardiomyopathy is still unclear.

Methods and Results: We screened candidate ion channel genes (KCNQ1, KCNH2, KCNE1, KCNE2, KCNE3, KCNE4, KCNE5, KCNJ2, SCN5A) in 1431 probands with inherited arrhythmias by denaturing high-performance liquid chromatography with a WAVE System Model 3500 (Transgenomic, Omaha, Nebraska). In our cohort, we identified SCN5A mutations in 76 probands (38 LQTS, 21 BrS, 15 sick sinus syndrome, 5 atrial fibrillation, 4 atrioventricular block, 2 catecholaminergic polymorphic ventricular tachycardia, 3 dilated cardiomyopathy, 1 idiopathic ventricular fibrillation and 1 arrhythmogenic right ventricular cardiomyopathy, including overlap syndrome). Forty patients were associated with the phenotypes that indicated the loss-of-function mutations in SCN5A. Four of these patients (R1023C in two patients, D1275N and W1345_F1348del respectively in one patient) showed dilated cardiomyopathy.

Conclusion: In our cohort, 10% (4/40) of the patients with SCN5A loss-of-function phenotypes, exhibited LV and/or RV dysfunction.

Further experiments will be needed to reveal the relationship between SCN5A mutations and dilated cardiomyopathy.

P1-093

Diastolic LV dysfunction with left atrial dilatation: is there further value of multiple doppler indices for complete evaluation of LV dysfunction?

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Purpose: There are a plethora of echocardiographic parameters for the assessment of left ventricular diastolic function (LVDHF), however, the Doppler indices (Dp) are dependent on several factors such as loading conditions which cannot be standardized and therefore the diastolic Dp are often not helpful to complete the diagnosis of true primary LVDHF. Left atrial (LA) volume enlargement is an indicator for LVDHF in pts without atrial fibrillation and mitral valve disease and may be a more stable parameter. In this study it was hypothesized that when the left atria is dilated there is no additional value in performing additional Doppler echocardiographic studies for the assessment of LVDHF.

Methods: In 35 subjects with high likelihood of LVDHF, we studied the distribution of normal vs. abnormal Doppler indices for diastolic LV function with respect to LA volumes as measured with 2D echocardiography. We considered E/A, E'/A', IVRT, DT and color MMode velocity parameters with normal values defined according to the ASE guidelines. An indexed LA of more than 28 ml/m² was considered abnormal. Only those with sinus rhythm, normal EF and valvular function were included. Chi-square test was used for assessing the statistical significance ($p<0.05$).

Results: One presented with normal LA volume and all normal Dp. One presented with increased LA volume and all abnormal Dp. Pts in the normal group had a combined 2 to 3 abnormal and at least 5 normal Dp. There was no significant difference in the overall rate of normal and abnormal Dp within the group with increased and normal LA volumes ($p=0.94$).

Conclusions: As expected, patients with increased LA volumes have a higher incidence of abnormal Dp. However, since we assessed 7 different parameters, the rate of normal Dp is still high among this cohort. While the assessment of multiple Dp may be more sensitive for the evaluation of pts with normal LA volume, their utility in pts with increased LA volume; a strong indicator of LV diastolic dysfunction, appears less consistent.

P1-094

LV dysfunction responders: is there value in endothelium-independent dilation using peripheral arterial tonometry for evaluation of LV dysfunction?

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Background: Patients with heart failure are traditionally categorized into two groups according to size and function of the left ventricle [LV]. The systolic heart failure group with dilated LV diameters and low <45% ejection fraction [EF] or [HFrEF], and those with normal EF and no evidence of LV dilation described as HFpEF. An interesting emerging group are those found to be previously HFrEF but with time and optimal medical management are reclassified to HFpEF. We evaluated a novel tool which provides endothelial function measurements using peripheral arterial tonometry [PAT] for reactive hyperaemic index [RHI] in this group of LV responders.

Methods: 55 consecutive patients recruited into a heart failure trial (64±9 years, 35 men), undergoing Echo and CMR were included along with 20 matched controls. Investigated the relationships between PAT-RHI and clinical characteristics, risk factors, levels of inflammatory biomarkers, and end-exercise cardiac output [CO]. Contrast bolus injections were administered for optimal Echo and cMR endocardial definition. Off-line RHI as well as LV volume analysis was performed by standard manual tracing of end-systolic and end-diastolic endocardial borders.

Results: In HFpEF and HFrEF, RHI, CO, and HDL were significantly lower, and significantly higher than in the 'recovered' HFrEF and the controls. Tracing of RHI images was possible in 49 patients. In 52 out of 55 patients (94%) the RHI followed the myocardial imaging outcomes. The defining parameters obtained correlated well to both standard Echo and CMR for all: EDV (r 0.93, $p<0.01$; r 0.91, $p<0.01$), ESV (r 0.89, $p<0.01$; r 0.94, $p<0.01$), and EF (r 0.87, $p<0.01$; r 0.83, $p<0.01$).

Conclusions: Confirmed a possible link between improved RHI in the HFrEF responders by demonstrating an impairment of endothelial function associated with LV dysfunction severity.

P1-095

Winding without twiddling of the left ventricular lead in a patient of biventricular pacemaker

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Background & Objectives: Twiddler's syndrome is an uncommon cause of pacemaker failure and this report suggests that, besides twiddling, additional mechanisms might be involved. Older age and dementia constitute risk factors.

Methods: An 85 year old male hypertensive presented with breathlessness with minimal exertion despite optimal medications for last one year. He had a left bundle branch block in electrocardiogram with QRS duration of 160 milliseconds. Echocardiogram revealed severe left ventricular systolic dysfunction with 27% ejection fraction and dyssynchrony. Angiography showed only insignificant coronary plaques. In view of marked symptoms despite optimal medications and broad QRS LBBB in electrocardiogram and severe left ventricular dysfunction, he underwent cardiac resynchronization therapy. Both right atrial and ventricular leads were active fixation leads with threshold of 0.8 V and 0.6V respectively. Left ventricular lead was 6 french (Medtronic, syncra) passive fixation lead placed in the posterolateral vein with threshold of 1.4V. All the three pacemaker leads were attached to the pulse generator (Medtronic, SYNCRA) that was placed in prepectoral, subfascial pocket. Final electrocardiogram showed narrowing of QRS complex and northwest axis. After 3 days, again patient had increased symptoms and reappearance of LBBB on electrocardiogram. Chest x-ray revealed recoiled LV lead back into the pacemaker pocket. He was taken for revision and LV lead repositioned.

Conclusion: Twiddler's syndrome is a rare entity described with the cardiac resynchronization therapy. Active fixation leads might prevent this phenomenon and treatment is early detection and revision of the pacemaker leads.

P1-096

The long-term prognosis of different left ventricular lead location with cardiac resynchronization therapy in patients with chronic heart failure

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Background And Objectives: Poor left ventricular (LV) lead position is an important factor for a non-responder to cardiac resynchronization therapy. However, whether optimal LV lead position can bring further Clinical Effect than other Left ventricular lead location still needs a lot to be discovered. The aim of the study was to compare the long-term prognosis of CRT when planted in different Left ventricular lead location.

Methods: Retrospective Analysis of 68 Cases of chronic heart failure patients who respond positively to CRT. According to different branches of coronary sinus that the LV lead was planted in, they were divided into two groups: optimal LV lead position(n=40), and other LV lead position(n=28). Optimal LV lead position is defined as LV lead planted in latherier vein or latherier posterior vein or posterior vein, while other LV lead position is defined as LV lead planted in great cardiac vein or middle cardiac vein. All patients are enrolled in postoperative 3-year follow-up study. During the study, we are investigating the following indications: patients with QRS wave time, left ventricular ejection fraction (LVEF), left ventricular end-diastolic volume (LVEDV), and 6 minutes walk test (6 MWDS).

Results: We compared the outcome of all the patients between the two groups: 6 minutes walk test (6 MWDS) of the Optimal LV lead position lasted longer than the other group (518.87 ± 193.10 VS 416.11 ± 92.81 t=2.61 P=0.01).The LVEF increased (44.50 ± 3.64 VS 42.43 ± 2.32 t=2.65 P=0.01),the LVEDV decreased (201.05 ± 12.75 VS 206.43 ± 12.03 t=1.75 P=0.08),and the QRS wave time shortened in the Optimal LV lead position (130.08 ± 9.32 VS 135.04 ± 9.05 t=2.18 P=0.03),but they aren't statistically significant(P>0.05).

Conclusions: Among those patients who respond positively to CRT, it can be observed that optimal LV lead position can bring further Clinical Effect.

Keywords: left ventricular lead : chronic heart failure : cardiac resynchronization therapy;

P1-097

Cardiac resynchronisation therapy (CRT) for the treatment of heart failure: our experience in a UK tertiary centre

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Background/Objectives: CRT is an effective treatment for heart failure patients with left ventricular systolic dysfunction and conduction delay. The objective was to evaluate our use of CRT in a UK tertiary centre.

Methods: Case notes were reviewed for 170 patients who underwent CRT between 2008 and 2011, focusing on indications for CRT, complications and follow-up. Collected data was compared against current National Institute for Health and Care Excellence (NICE) guidelines in the UK.

Results: 151(89%) had NYHA Class III-IV symptoms and 19(11%) had NYHA Class I-II symptoms. 91(54%) were on optimal pharmacological therapy. 156(92%) had a left ventricular ejection fraction (LVEF)<35% and 14(8%) had a LVEF>35%. 118(69%) were in sinus rhythm, and 48(28%) in AF. 125(73%) had a QRS duration ≥150ms and 3(2%) had a QRS between 120-149ms with dyssynchrony confirmed on echocardiography. 91(54%) fulfilled NICE criteria for CRT.

2(1%) patients suffered a pneumothorax. 28(16%) experienced a major complication. 40(24%) experienced either a failed LV lead placement or any major complication.

There was documented follow-up in only 108(64%) patients, of which following CRT, 83(77%) reported symptomatic improvement, 17(16%) reported feeling the same and 8(7%) reported feeling worse.

Conclusion: Limitations included patients unable to tolerate optimal pharmacological therapy and patients with AF. Lack of access to peripheral hospital records restricted our evaluation of follow-up after CRT. Similar clinical outcomes were achieved whether NICE indications were met or not.

Our data was presented locally and recommendations for improvement included long term follow-up of CRT complications. We will re-audit in 6 months.

P1-098

Implications for cardiac resynchronization therapy; an ECG algorithm to predict the latest site of left ventricular activation in cardiomyopathy patients with left bundle branch block

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Background: In cardiac resynchronization therapy (CRT), positioning the left ventricular (LV) pacing lead at the latest activated wall of the left ventricle may be associated with superior outcomes. We hypothesized that a 12-lead electrocardiogram (ECG) could be used to determine the latest site of electrical LV activation.

Methods: 40 cardiomyopathy patients, 27 (68%) with left bundle branch block (LBBB) and 13 (32%) with normal QRS duration were studied. The latest site of activation from contact activation maps correlated with ECG characteristics and an ECG algorithm developed.

Results: Cardiomyopathy patients displayed heterogeneity of LV activation. A third had a latest activated non-lateral wall site. Normal QRS duration patients displayed less electrical dyssynchrony than LBBB patients. An ECG algorithm was able to be developed in patients with a LBBB but not in patients with a normal QRS. The latest point of activation was classified as the Anterior (anterior or anterolateral), Lateral (lateral or posterolateral) or Inferior wall. A separate arm was created in the algorithm to account for patients with past inferior myocardial infarcts with Q waves in the inferior leads. The 27 LBBB patients were correctly classified with 17 on the lateral wall, 5 on the anterior wall, 4 on the inferior wall and a patient who had an inferior MI but no Q waves in the inferior leads was correlated to the lateral wall.

Conclusion: The ECG algorithm allows rapid determination of the latest site of LV activation for LV lead placement and may have utility during CRT implantation.

P1-099

Improvement of left ventricular mechanical function by delivering electrical cardiac contractility modulation via the CRT lead configuration

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Background: Conventional electrical cardiac contractility modulation (CCM) is delivered to right ventricular (RV) septum to improve left ventricular (LV) function. This study was to determine if CCM, when delivered via the lead configuration for cardiac resynchronization therapy (CRT), would provide additional LV mechanical improvement in CRT patients.

Methods: Sixteen patients receiving CRT-ICD device were enrolled. The CRT leads were placed in RV and LV for bi-ventricular (BiV) pacing. The leads were temporarily connected to an EP stimulator for acutely delivering CCM to RV and LV simultaneously. The CCM had three electrical pulses (8V, 5 msec/pulse, 10 msec inter-pulse interval) and was delivered 30 msec after each BiV pacing beat. An LV pressure catheter was placed in the LV chamber for pressure recording from which the LV pressure and its dp/dtmax were offline analyzed.

Results: A total of 29 BiV+CCM tests were performed in 16 patients. The LV dp/dtmax was significantly higher during BiV+CCM (1444±454 mmHg/sec) than during BiV alone (1319±347 mmHg/sec, P=0.007 vs. BiV+CCM), representing a 9±16% increase. When the criterion of 5% increase in LV dp/dtmax was used to judge the positive response of the CCM, of 29 BiV+CCM tests, 14 tests met the positive response criterion (a mean increase of 21±16%) and 15 tests did not meet 5% increase criterion (a mean change of -2±4%).

Conclusion: When CCM was delivered to both RV and LV, it could improve LV mechanical function on top of BiV pacing, which may provide additional benefits for CRT patients, especially for CRT non-responders.

P1-100

Predicting score system for mid-term responder of cardiac resynchronization therapy in patients severe heart failure

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Purpose: It is well accepted that not all the patients responses to cardiac resynchronization therapy (CRT). We set up a model based on echocardiographic parameters to predict the responder in CRT patients with significantly reduced ejection fraction (left ventricular ejection fraction <35%).

Methods: A total of 188 patients (66±12 years, 140 males) receiving CRT with left ventricular ejection fraction <35%. The potential predictors for the responders at 6-month (without mortality, rehospitalization and left ventricular end-systolic volume reduction ≥15% compared to baseline) were sought on the basis of left ventricular volumes and ejection fraction, diastolic spherical index and systolic dyssynchrony measured by the standard deviation of the time to peak systolic velocity of 12 segments. A risk score system was created in 94 patients and then validate in 94 patients.

Results: At 6-month, 90 patients responded to CRT. Two independent risk factors were identified and then obtained the point according to the coefficient: with systolic dyssynchrony (defined as the standard deviation of time to peak systolic peak velocity by tissue Doppler imaging ≥33 ms) as 2 point and spherical index as 1 point. Risk scores were calculated for every patient. The C statistic for the score system was 0.78 in the development cohort (p=0.004) and 0.75 in the validation cohort (p=0.015).

Conclusions: The risk score derived from echocardiography with systolic dyssynchrony index and diastolic spherical index can be used to predict mid-term responder at 6 month; which might be useful in clinical practice.

Acknowledgement: This project was supported by the RGC Grant (RGC Ref. Number 478411).

P1-101

EXTRACT: medtronic carelink express - reducing patient transfer across the state

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Background: The inability to interrogate pacemakers and implantable cardioverter defibrillators (ICD) in remote and regional hospitals has previously delayed patient management, prolonged hospitalization and resulted in unnecessary transfer to major centers. Unlike conventional remote monitoring, the Medtronic Carelink Express module is not restricted to a single implanted device and remote review of all appropriate devices is possible.

Methods: We are examining the impact of this technology in an ongoing, prospective, observational study. Monitors have been placed in three rural hospitals. The treating doctors at the hospitals have received education on the system use. All transmissions are reviewed by a consultant cardiologist and telephone contact is then made with the referring hospital. Treating doctors are requested to complete a survey for each patient. The survey includes relevant medical history, presenting complaint, outcome of the transmission and a user satisfaction assessment.

Results: To date the system has been well received. Transmissions have been requested for assessment of patients suffering syncope, receiving ICD shocks, as part of routine follow up and for unspecified reasons. To date the major outcome has been to provide reassurance and clarity regarding device function. Routine and emergency referral to the implanting center has been prevented and in one patient anti-coagulation has been recommended following the detection of asymptomatic atrial fibrillation.

Conclusion: The ability to remotely interrogate pacemakers and ICDs in patients presenting to remote and regional hospitals is now feasible. To date this system has had a positive impact on patient management and we believe will prove to be a cost effective system to implement.

P1-102

The efficacy of cardiac resynchronization therapy on patients over 80 years-old

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Background: Cardiac resynchronization therapy (CRT) reduces mortality in patients with heart failure and wide QRS. We examined the efficacy of CRT on patients over 80 years-old.

Methods: We reviewed consecutive 22 patients who had been implanted CRT since 2010 in our institution.

Clinical characteristics of 5 patients >80-years-old were compared with those of 17 patients <79-years-old.

Univariate analyses were performed to assess predictors of responder to CRT.

Results: CRTP was implanted in >80y/o-group more than <79y/o-group (60% vs.6%. p=0.004).

Gender, left ventricular ejection fraction (LVEF), QRS duration, QRS morphology, prevalence of atrial fibrillation (AF), ischemic heart disease (IHD) and NIHD were not significantly different between groups.

In >80y/o-group (mean; 84±4yo), 20% of patient required heart-failure admission and 20% died of pneumonia during follow-up periods of 6±3 months, while 24% of patient required heart-failure admission and 6% died of pneumonia during follow-up periods of 13±6 months in <79y/o-group (mean; 64±12yo). No cardiac death was observed in both groups and no arrhythmic death was detected in patients with CRTP.

Responders to CRT (LVEF>15%) were detected in 80% of >80y/o-group and 65% of <79y/o-group.

A significant predictor of responder was LBBB (OR; 8.7, 95%CI:1.05-72, p=0.045). Neither, gender, QRS duration, NIHD, AF nor age predicted the efficacy of CRT.

Conclusion: CRT may be effective to treat patients over 80 years-old, especially with LBBB.

P1-103

Predictive Factors and Clinical Effect of Optimized Cardiac Resynchronization Therapy

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Aims: The aim of this study was to assess whether or not improve the effectiveness of cardiac resynchronization therapy (CRT) by intracardiac delay optimization using echocardiography.

Methods: This prospective study included 65 consecutive patients implanted with a CRT device, patients were randomly assigned to receive simultaneous biventricular pacing or echo-optimized sequential CRT, 42 patients were defined as responders, 23 patients were classified as nonresponders.

Results: During 12-month follow-up, the indices as response positive rate, QRS duration, New York Heart Association (NYHA) class, mitral insufficiency grade, left ventricular end-systolic volume (LVESV) and LV end-diastolic volume (LVEDV) showed good tendency between the optimized and no-optimized groups (all P>0.05), whereas 6-minute walking distance, quality-of-life score, LV ejection fraction (LVEF) and aortic velocity time integral remained significantly improvement in the optimized group (all P<0.05). Baseline QRS duration was similar between responders and nonresponders (P>0.05), whereas heart failure aetiology, clinical and echocardiographic measurements showed significant differences (all P<0.05). The mean decrease in QRS duration after 12 months of CRT for separating responders and nonresponders remained significant differences (all P<0.05), meanwhile, significant differences were observed in the mean decrease of QRS duration between responders and nonresponders (P<0.05).

Conclusions: Echocardiographic optimization may further improve the effectiveness of CRT. Moreover, besides the change of QRS duration, ischemic heart disease, worse LV function, severe mitral regurgitation and greater LV volume had a probability of worse response to CRT.

Keywords: Heart failure; Cardiac resynchronization therapy; Echocardiography; Prediction of CRT response; Follow-up

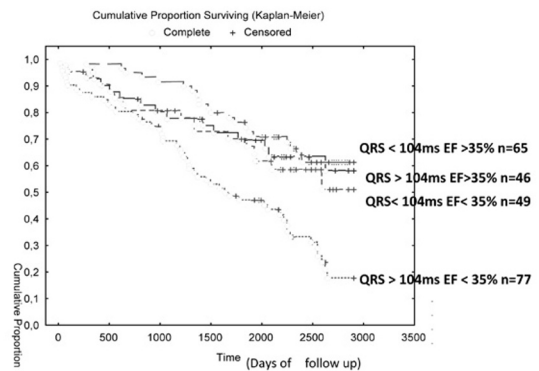
P1-104

Combination of low EF and long QRS but not EF nor long QRS alone as predictor of pure prognosis in CHF patients

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To study the factors influence prognosis we followed 239 consecutive patients with CHF (NYHA II-IV), mean LVEF 33% during 8 years. In monovariate analysis NYHA class, low LVEF, prolongation of QRS, morphology of QRS, low systolic blood pressure (SBP) ischemic etiology of CHF male gender were predictors of mortality. But in Cox proportional model of multivariate analysis only low SBP was an independent predictor of mortality, but not LVEF nor prolongation of QRS. When we restrict analysis by including only severity of CHF (NYHA), LVEF and length of QRS, all three parameters influence prognosis.

For more careful analysis we divided patients into 4 groups by median length of QRS and LVEF: QRS >104 ms +LVEF <35%, QRS >104ms, LVEF >35%, QRS < 104ms LVEF < 35%, QRS <104ms, LVEF >35%. The only group with low LVEF plus prolonged QRS had significantly worse survival. Three other groups didn't differ significantly and pts with only low LVEF (RR=0.48; p=0.004) or only prolonged QRS (RR=0.49; p=0.011) had significantly better prognosis than those with combination of these factors.



P1-105

Heart failure monitoring using remote monitoring system

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Background: Remote monitoring systems enabled healthcare professional to monitor heart failure status. Purpose: To evaluate the efficacy and efficiency of monitoring of Latitude, Boston Scientific.

Method: Since 2011 we retrospectively analyzed all patients using Latitude at Kameda Medical Center for remote monitoring data and medical charts.

Results: There were 16 patients for all, whose average age was 64.3±12. Among 16, 13 were male and 3 were female, and 9 had ICD and 7 had CRTD. Average EF was 41.0%±13 and BNP at discharge from hospital admission for device implant was 513±785 pg/dl. All the patients were able to continue measuring blood pressures and body weight at home using Latitude. Activity level was significantly lower at either all-cause death or heart failure admission group than no admission for heart failure group (3.5±1.7, 9.3±3.0, p=0.014). As a heart failure monitoring at home, blood pressures and body weight measuring and activity level were feasible monitor. However, heart rate variability, SDANN, and autonomic nerve balancing were able to be monitored only for 7 patients. The reasons for discontinuation were the increase of atrial pacing rates for 5 patients and the atrial arrhythmias for 3 patients.

Conclusions: Blood pressure and body weight measuring at home is sustainable, and patients with low activity level are at high risk of heart failure admission.

P1-106

Patients with systolic heart failure and permanent atrial fibrillation with heart rate more than 70 bpm at discharge from hospital have better long-term survival then patients with slower heart rate

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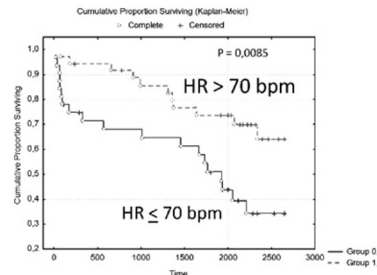
Background: There are a lot of data that high heart rate is a sign of bad prognosis of patients with heart failure and sinus rhythm. There are controversy data about influence of heart rate in patients with atrial fibrillation and heart failure.

Aim: to study influence of heart rate on prognosis of patient with heart failure and permanent atrial fibrillation.

Materials and Methods: We followed 68 consecutive patients hospitalized with CHF (NYHA II-IV) and permanent atrial fibrillation for 7 years. Mean age of patients was 58 [52; 68] years, Median LVEF was 33% [23; 46], median QRS 100ms [95; 125], median heart rate at discharge 72 [68; 78]. We use ROC curve analysis to choose heart rate which divided patients by prognosis.

Results: Patients with heart rate less than 70 bpm (median 67[64;70]) at discharge had significantly worse survival than patients with heart rate more than 70 (median 78[74;83]) (Relative risk 1.91). Groups had not differences by gender, etiology, NYHA, blood pressure, QRS duration, prevalence of LBBB, and pharmacology therapy.

Conclusion: Our data show that in patients with heart failure and permanent atrial fibrillation hadn't survival benefit with heart rate less than 70 bpm. Patients with heart rate 70-80 bpm can have survival benefit in this group of patients.



P1-107

The achievement of 60-80% max heart rate in activity trend is correlated inversely with NYHA class and BNP in patients with implanted cardiac resynchronization therapy device

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Background: Elevated heart rate is associated with worse outcomes in patients with chronic heart failure (CHF). However this association in patients with CHF and implanted Cardiac Resynchronization Therapy (CRT) device is obscure. We assessed the association between HR and advancing CHF by using of heart rate histogram with CRT device; Exercise and Activity Trending (Unify, St. Jude Medical).

Method: 16 patients (male:11, 54-84 years) with implanted CRT have been included. All patients were in sinus rhythm and NYHA functional class III or IV. Echocardiography was performed for the evaluation of LV diastolic dimension (LVDD), ejection fraction (EF), and mitral regurgitation (MR) before and three, six, nine, twelve months after CRT implantation. CRT histogram and serum BNP, NYHA class were obtained at the same time.

Result: The proportion of HR in 60-80% of achieved Max heart rate correlated inversely with advancing NYHA Class and elevated BNP ($p < 0.05$). There was no correlation between the proportion and EF, LVDD, MR.

Conclusion: Heart rate histogram with CRT is objective and promising way to know functional state of chronic heart failure.

P1-108

Catheter-based renal denervation improves cardiac function in porcine model of ischemic heart failure

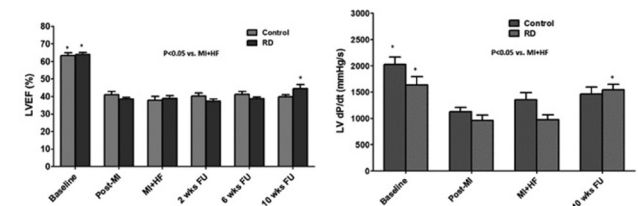
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Background: Catheter-based renal denervation (RD) has been proposed as a novel therapy for treatment of refractory hypertension via modulation of sympathorenal axis, nevertheless, the potential therapeutic effects of RD in heart failure (HF) is unknown.

Methods and Results: An ischemic HF model was created in twenty-one adult pigs induced by myocardial infarction (MI) via coronary embolization of left circumflex artery followed by rapid ventricular pacing for 4 weeks (MI+HF). Then all animals were treated with daily oral metoprolol succinate (25 mg) plus ramipril (2.5 mg), and randomized into either a control group (n=10) or bilateral RD group (n=11) using a multi-electrode RF basket catheter. Echocardiograms and invasive hemodynamic assessments were conducted to determine left ventricular ejection fraction (LVEF) and LV+dP/dt, respectively, and blood samples were collected to measure serum B-type natriuretic peptide (BNP) levels at baseline, immediately after MI (post-MI), at MI+HF and at 10 weeks follow-up. Both groups showed an increase in LVEF (9.6 ± 2.5 vs. $2.1 \pm 2.0\%$) and LV+dP/dt (571 ± 131 vs. 95.9 ± 122 mmHg/s; Fig. 1) at 10 weeks after MI+HF, however they were significantly greater in the RD group than the control group ($P < 0.05$). While both groups had a substantial decrease in serum BNP from MI+HF to 10 weeks, the reduction was greater in the RD group than the control group (-355 ± 277 vs. -176 ± 134 pg/ml) although it did not reach statistical significance ($P = 0.5$).

Conclusions: In the porcine model of ischemic HF, catheter-based RD further improves cardiac function compared with medical therapy alone, suggesting that RD is a potential novel therapy for HF.



P1-109

Improved response to cardiac resynchronization therapy utilizing more basal pacing with quadripolar left ventricular lead

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Background and Objective: Cardiac resynchronization therapy (CRT) has become the standard of care in patients with systolic heart failure (HF) and evidence of electrical or mechanical dyssynchrony. However, a significant minority of patients remains 'non-responders' to this therapy and furthermore, some with initial good response are noted to have a decline in their systolic function later on. Progression of mitral regurgitation (MR) has been suspected to be one reason for these. With the advent of left ventricular (LV) lead technology using quadripolar and more basal pacing, there have been reports of improve response to CRT.

Methods: We report in two patients (a 64 y/o male with idiopathic cardiomyopathy and a 77 y/o female with cardiomyopathy from non-compaction of the LV) whereby an upgrade from the traditional bipolar LV lead to quadripolar system (St. Jude Medical) offering a more basal pacing, improved reduction in MR with subsequent improvement in objective and subjective HF parameters.

Results: The 64 y/o male had an improvement in his MR from 'moderate' to 'mild' and in LVEF from 25% to 35% while the 77 y/o female had an improvement in her MR from 'severe' to 'moderate' with a reduction in LV diastolic diameter and systolic right ventricular pressure along with improved exercise tolerance.

Conclusion: A more basal pacing which is facilitated using the quadripolar LV lead may improve CRT response by reducing MR.

P1-110

Hydralazine inhibits ventricular tachyarrhythmias in an acquired long QT rabbit model

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Background and Objectives: Some cardioactive vasodilating agents inhibit ventricular tachyarrhythmias (VT) associated with acquired long QT syndrome (LQT). We tested whether a vasodilator without direct cardiac effect can eliminate abnormal repolarization-related VT.

Methods: The effect of hydralazine on the occurrence of VT was assessed in a methoxamine-sensitized rabbit model of acquired LQT.

Results: In control rabbits, combined administration of methoxamine and nifekalant frequently induced VTs (16/20, 80%). In contrast, VT occurred only in two of 14 rabbits treated with hydralazine (14.3%, $p < 0.0001$ vs. control). After the treatment, blood pressure was lower in hydralazine group than in control group (systolic pressure, 146 ± 19 vs. 165 ± 16 mmHg, $p < 0.0001$; diastolic pressure, 54 ± 10 vs. 101 ± 11 mmHg, $p < 0.0001$). To verify that VTs in this animal model are triggered by early after depolarization (EAD), monophasic action potential (MAP) on the left ventricular surface was recorded in 20 open-chest rabbits. EAD-like hump was less frequently detected during treatment with hydralazine (2/10) than in saline-treated rabbits (9/10, $P < 0.005$). Presence of a hump was significantly related to the appearance of VTs ($P < 0.05$).

Conclusion: Hydralazine inhibited VT in a rabbit LQT model. Vasodilation may have a therapeutic effect on abnormal repolarization-related VT.

P1-111

Does atrial fibrillation impact long-term outcomes in patients hospitalized with heart failure?

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Background: The effect of Atrial Fibrillation (AF) on short and long-term outcomes in patients hospitalized with Heart Failure (HF) is controversial. Accordingly; we examined this relationship in a national multicenter project that studied the clinical features, management, short and long-term outcomes of patients admitted with de novo versus acute on chronic heart failure (ACHF).

Methods: The hearts function assessment registry trial in Saudi Arabia (HEARTS) is a quality improvement initiative in the Arab population that enrolled consecutive patients with ACHF between October 2009 and December 2010.

Results: A total number of 2609 successive patients with HF were enrolled. Of the total cohort, 449 (17.2%) had history of AF. Patients with AF were significantly older (mean age 65.2 ± 15.0 vs. 60.5 ± 14.8), had significantly less male gender, more incidence of other co-morbidity like rheumatic heart disease (RHD) (18.1% vs. 4.6%), VT/VF (3.1% vs. 1.9%), cerebrovascular accidents or transient ischemic attack CVA/TIA (15.0% vs. 8.5%), and thyroid disorder (9.4% vs. 6.2%). Furthermore, patient with AF had more implantable cardioverter defibrillator (ICD) (9.6% vs. 7.5%). However, they were less likely to undergo percutaneous coronary intervention (PCI) (14.3% vs. 7.2%), to have ischemic heart disease (IHD) and peripheral arterial disease (PAD) (55.6% vs. 42.3% and 4.2% vs. 1.8% respectively), smoking (19.5% vs. 11.6%), and diabetes mellitus (DM) (66.0% vs. 55.9%). Mortality rates at 1st, 2nd, and 3rd years were significantly higher in patients with AF (23.2% vs. 18.3%, 27.4% vs. 22.3%, and 27.8% vs. 23.2% respectively). However, there was no significant difference in mortality rate during in-hospital stay or 30-days post presentation (6.7% vs 6.4% and 9.1% vs. 7.8% respectively).

Conclusion: In this cohort of heart failure patients receiving optimal evidence based medicine, prior history of AF was associated with increased short and long-term mortality.

P1-112

Relation between the uenous ostium imdex(VOI) of the pulmonary vein and recurrences of atrial fibrillation after catheter ablation

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Objective: The aim of this study was to investigate the relation between the uenous ostium imdex(VOI) of the pulmonary vein and recurrences of atrial fibrillation after catheter ablation.

Methods: This study included 120 patients (59±17(35 ~ 76) years,76 male)with atrial fibrillation (AF) undergoing catheter ablation. Multi-slice Spiral computer tomography(MSCT) was performed in all patients. Pulmonary vein(PV) anatomy was evaluated, and diameters of PVs ostia were measured. To determine the shape of ostia, the uenous ostium imdex(VOI) was calculated for all veins by dividing anterior-posterior measurements by superior-inferior measurements. After the procedure, patients underwent follow-up at every month. Results were compared between the 2 groups.

Results: The uenous ostium imdex(VOI) was calculated which shows that the ostia of RSPV and RIPV were more round than LSPV and LIPV. The VOI of LIPV is statistically significant difference between the two groups.

Conclusion: This study shows that: The shape of PVs are significant difference. between the unrecurrence patients. and the recurrence patients.

P1-113

Relationship between right ventricular systolic pressure (RVSP) and repeated atrial fibrillation ablation

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Introduction: Atrial fibrillation is the most common arrhythmia and is associated with increased morbidity and mortality. Radiofrequency of AF is known to be an effectively treatment option. Ablation failures are related to the presence of persistent AF, left atrial enlargement, hypertension, diabetes, age, obstructive sleep apnea (OSA)1-7. The aim of this study was to examine the relationship betweenhigh right ventricular systolic pressure (RVSP > 30 mmHg) and other prognostic factors as predictors of repeat radiofrequency ablation in atrial fibrillation patients.

Methods: In this cross-sectional study, 147 patients withreported history of radiofrequency ablation at Advocate Illinois Masonic Medical Center between Jan 2005-Jan2012 were included. Clinical and echocardiography parameters were collected.Patients were categorized bywhether they had history of ablation in the past before the index ablation. The parameters were compared between groups. Appropriate statistical analyses were performed.

Results: The population with mean age of 61±10 years consisted of 20.4% (30 of 147)female. Baseline characteristics were similar between groups . Patients with repeated atrial fibrillation ablation had higher prevalence of flecainide use (p<0.019), pulmonary hypertension (p<0.006), RVSP (p<0.001), concomitant atrial flutter (p<0.001) and COPD (p<0.019). Multivariable regression analysis showed Flecainide use (95%CI;1.150,9.328), RVP (95%CI;1.223,11.900) and concomitant atrial flutter (95%CI;1.786,18.447) are independently associated with repeat atrial fibrillation ablation

Conclusion: This pilot study demonstrated the recurrence rate of AF which required repeat radiofrequency ablation in those with flecainide use, pulmonary hypertension, high RVSP, concomitant atrial flutter, and COPD. However,persistent AF, left atrial enlargement, hypertension, diabetes, age which found to have the association with the repeat ablation were not identified as predictors for a repeat ablation in this study .

P1-114

Clinical outcomes of arrhythmogenic right ventricular dysplasia/ cardiomyopathy patients in taiwan - a large cohort observational study

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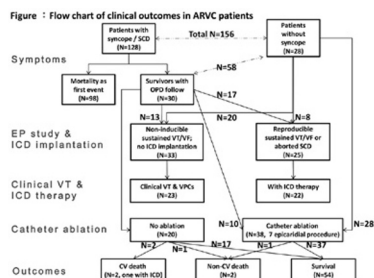
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Background & Objectives: Arrhythmogenic right ventricular cardiomyopathy (ARVD/C) is a common origin of non-ischemic ventricular tachycardia and cause of sudden cardiac death in Taiwanese. The purpose of our study was to describe the clinical manifestations and outcomes of a large cohort for ARVD/C) patients in Taiwan from 2002-2012.

Methods: The study involved 156 consecutive ARVD/C patients including 98 sudden death (SCD) patients with autopsy-proven findings and 58 survivors who fulfilled the modified Task force (TF) criteria for ARVD/C. Details of patient's clinical presentations, phenotypes, electrophysiologic (EP) study findings, ablation and implantable cardioverter defibrillator (ICD) event information were investigated.

Results: Majority of the ARVD/C patients (N=128, 82%) who presented with syncope developed ventricular arrhythmia (77% male, 38 ±14 years at initial presentation). Among the survivors, 25 patients received ICD implantation for secondary prevention (17 patients with history of SCD/ syncope; 8 patients without syncope history had positive EP inducibility studies). Appropriate ICD therapy occurred in 88% of the patients (N=22, 0.69 episode per patient year, 82% received ICD defibrillation before ablation). Overall, 38 patients underwent ablation for potentially fatal VT, including 7 with epicardial ablation. Cardiovascular death occurred in 2 patientswho did not receive ICD or ablation from SCD survivors (7%, N=2/30).

Conclusion: In ARVD/C survivors, a positive EP inducibility study could predict appropriate ICD therapy and was associated with high VT burden. Both ICD implantation and catheter ablation for VT were important for ARVD/C survivors.



P1-115

Contact force and voltage thresholds during high frequency stimulation mapping of human cardiac ganglionated plexuses

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Background and Objectives: The intrinsic cardiac nervous system consists of ganglionated plexuses (GP) localized to specific regions of the LA. The contact force associated with GP stimulation has not previously been evaluated.

Methods: Ten patients with symptomatic atrial fibrillation (AF) underwent catheter ablation of AF. Following transseptal access, 3D non-fluoroscopic mapping was obtained to recreate the LA and PVs, while merging techniques were performed to integrate CT imaging with 3D maps. Using High Frequency Stimulation (HFS), the contact force measurement from a new catheter that provides measurement of contact force (SmartTouch, Biosense-Webster, CA), was correlated with the voltage applied during HFS at 5V, 10V or 15V to obtain an autonomic effect.

Results: There were 105 applications of HFS that were well tolerated under conscious sedation. GPs were identified in all patients (mean 3.6 per patient, range 1-5). The mean contact force associated with a positive GP response correlated with anatomic localization of GPs. The LUPV and Crux regions required only a mean contact force of 9.8 gm at 5-10 V (range 3-24), as compared with the RUPV and LIPV requiring a mean contact force of 19 gm at 10V (range 5-50). The contact force associated with thresholds of 15 V were 10 gm or less in three of four patients.

Conclusions: Voltage thresholds correlate with contact force during HFS mapping of GPs. Significant contact force may be required during HFS to determine GP location, which may relate to clinical outcomes associated with catheter ablation of AF.

P2-090

Extension of ACTs is delayed with NOAC compared to warfarin by the same heparin administration protocol during catheter ablation for atrial fibrillation

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Background & Objectives: In catheter ablation (CA) for atrial fibrillation (AF), prevention of periprocedural thromboembolism and bleeding complications is an important issue. We evaluated anticoagulation effect on intraprocedural management with novel oral anticoagulant (NOAC) compared to warfarin.

Methods: Seventy six patients pretreated with (20 dabigatran (D), 18 rivaroxaban (R), 20 warfarin (W) and 18 no anticoagulant (N)) underwent CA for persistent or paroxysmal AF under a common heparin administration protocol. Changes of activated clotting time (ACT) and required dose of heparin were compared between four groups.

Results: The ACT before heparin administration in D group was significantly the highest (D/R/W/N 158±28/122±14/137±20/120±10 sec; p<0.05). The change of ACT in the initial 30 minutes in W group was significantly the largest (D/R/W/N 117±31/130±44/212±67/128±39 sec; p<0.001). It took significantly the shortest time for the ACT to reach 300 seconds in W group (D/R/W/N 72.0±35.6/81.7±20.1/34.5±11.0/91.7±36.3 min; p<0.001). The dose of heparin required to maintain ACT >300 sec in W group was the smallest (D/R/W/N 82.8±21.2/105.1±37.9/51.8±13.4/93.4±25.7units/Kg/hour; p<0.001).

Conclusion: With the common heparin administration protocol, the time it took for the ACT to reach the optimal time was longer with NOAC compared to warfarin. It should be noted that a different heparinization method between warfarin and NOAC is required.

P2-091

The accuracy of electrocardiogram criteria for left ventricular hypertrophy in established Korean cohort

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Background: Left ventricular hypertrophy (LVH) can precede overt heart failure and offers prognostic information beyond that provided by the evaluation of traditional cardiovascular risk factors. However, the validation of ECG criteria for the diagnosis of LVH is limited in Korea general population. The purpose of this study is to investigate the diagnostic accuracy of ECG criteria for the detection of LVH in general population.

Methods: In the present study, we investigated a total of 1946 adults from the community-based cohort who had all previously undergone ECG, and echocardiography assessment. The LV mass index (LVMI) was estimated with echocardiographic measurement and adjusted with body surface area (BSA). LVH was defined as a value greater than or equal to the sex-specific 90th percentile value of LV mass/BSA. ECG criteria for the diagnosis of LVH were Sokolow-Lyon criteria and Cornell criteria.

Results: The LVMI was significantly higher in male subjects (91.1 ± 23.9 g/m² vs. 83.9 ± 21.7 g/m², p<0.001). The cutoff value was 120.8 g/m² in male subjects and 112.2 g/m² in female subjects. The sensitivity and specificity of Sokolow-Lyon criteria were 5.6% and 93.6% in male, 4.1% and 97.8% in female. Those of Cornell criteria were 2.8% and 98.7% in male, 14.3% and 95.8% in female. In male, the area under the ROC curves of Sokolow-Lyon voltage and Cornell voltage were 0.53 and 0.51. And those in female were 0.59 and 0.64.

Conclusions: In our community-based sample, ECG criteria showed low sensitivity and high specificity. The performance of ECG criteria for detection of LVH was suboptimal, suggesting limited usefulness of ECG as mass screening tools.

Keywords: Left ventricular hypertrophy; Electrocardiogram

P2-092

The lifestyle factors influencing antithrombotic prophylaxis of South Korean patients with atrial fibrillation

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Background: Warfarin is superior to aspirin in prevention of stroke in atrial fibrillation (AF). Despite this, there are still a considerable number of South Korean patients with AF who are on aspirin instead of warfarin.

Objectives: This study identifies the reasons why South Korean patients are on aspirin instead of warfarin, and explore what difficulties those on warfarin face.

Methods: 105 patients with AF on warfarin or aspirin were interviewed in the out-patients. One investigator conducted all the interviews. The interview was composed of various questions exploring the difficulties patients faced with warfarin, and the lifestyle factors influencing their choice of aspirin over warfarin.

Results: 73 patients on warfarin and 32 patients were on aspirin. 43% of patients on aspirin did not take warfarin due to the evidence of limited knowledge about warfarin, 21% stated interaction with their everyday diet including herbal medications, 17% of patients had difficulty in transportation, 12% experienced side-effects, 5% had interactions with other medications and 2% were contraindicated.

46% of patients on warfarin found changing their diet the most challenging aspect of taking warfarin. 58% of these patients took regular herbal medications before commencing warfarin. 13% of patients continued with herbal medications with warfarin despite knowing of their interactions.

Conclusions: This study highlights the importance of patient education and the need to raise awareness of potential interactions between herbal ingredients (in over-the-counter medications and diet) with patients in AF and commencing on warfarin.

P2-093

Atrial fibrillation as a risk factor for gastroesophageal reflux disease

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Background: Although both atrial fibrillation (AF) and gastroesophageal reflux disease (GERD) are common diseases, the relationship between them is controversial.

Objective: We hypothesized that this relationship depends on the specific types of AF, focused on nonvalvular AF, and tested this hypothesis.

Methods: Consecutive 479 Japanese subjects (255 males and 224 females, mean age of 60.4 +/- 12.8 years) including outpatients in several hospitals (n = 201) and participants of a community-based annual health screening program (n = 278) were enrolled. Subjects with valvular AF, malignancy or dementia were excluded. The frequency scale for symptoms of GERD (F-scale) was assigned after obtaining informed consent for screening symptomatic GERD with a cut-off total score of 8 points. The score of this questionnaire was correlated to the baseline characteristics extracted from medical records.

Results: Total score of F-scale was significantly greater in the older (60 years or more) than in the younger (less than 60 years) generation (p = 0.017), and in the order of permanent AF, paroxysmal AF and sinus rhythm (p = 0.003). The incidence of GERD as against this heart rhythm classification was in the same order (p less than 0.001). Coronary heart disease, hypertension, diabetes or dyslipidemia had no correlation to the F-scale scores or incidence of GERD. Stepwise discriminant analyses demonstrated that nonvalvular AF alone is associated with symptomatic GERD significantly (Wilks lambda = 0.983, p = 0.004).

Conclusion(s): This multicenter questionnaire study demonstrated that nonvalvular AF has a significant correlation with symptomatic GERD. This small sample survey warrants a future large-scale cohort.

Keywords: atrial fibrillation, gastroesophageal reflux disease

P2-094

Radiofrequency ablation of idiopathic premature ventricular contractions

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Background: Premature ventricular contractions (PVCs) are not uncommon and cause symptoms in subjects without structural heart disease. 3D mapping which is helpful for mapping but still not always available in every EP lab. In such countries like Vietnam, conventional radiofrequency ablation guided by fluoroscopy which is still the main tool to ablate supraventricular tachycardia remains still a question of effectiveness for ventricular arrhythmias.

Objective: To evaluate if conventional radiofrequency catheter ablation (RFA) guided by fluoroscopy which is available in Hue- central Vietnam is effective and safe for the treatment of idiopathic premature ventricular beats and ascertain whether successful ablation results in symptom improvement .

Method: 101 consecutive symptomatic patients with frequent PVCs (mean age 42.9 ± 14.5 years, with 67 females and 34 males), with no apparently structural cardiomyopathy underwent radiofrequency catheter ablation at Hue Cardiovascular Centre from April 2010 to May 2013. Ablation were performed by the same team and catheter were used were bidirectional Safire (St Jude).

Results: There were 99 initial successful cases (98%) defined as no PVC post- ablation or less than 2 PVCs/hr documented in holter. There were 2 initial failures (2%) which happened in the first year of learning curve and 4 recurrence (4%) which were successfully ablated in the second procedure. There were no major complications. In 99 success group, there were 79 (79.7 %) originating in the RVOT in which anterosptum was the most common with 71 cases (71.7%) followed by Left sinus of Valsalva 12 cases (12.1%). PVCs originating from the vicinity of tricuspid annulus and posterior papillary muscle were also included with 5% and 2%, respectively. Activation map (mean 37.4 ± 7 ms) were focused more than pace- map. The mean procedure time was 34 ± 22.7 mins, mean radiation time was 8.9 ± 6.1 mins. Mean follow-up duration of 10 ± 8 months showed a definite regression of symptoms in the success group (99/99; $p < 0.0001$) but 12% who were all female still complained of atypical short of breath. In the subgroup of 28 young people less than 35 years old (accounting for 27.7% of participants), initial success rate was 28/28 (100%) who all were definitely free of symptoms after ablation

Conclusions: Conventional radiofrequency catheter ablation guided by fluoroscopy is safe and effective and not time-consuming to treat patients with persistent and symptomatic PVCs in normally structural heart. On account of high success rate and safety, should all the young subjects with symptomatic PVCs straightly undergo RF ablation avoiding long term medication.

P2-095

A prospective placebo controlled randomized study of caffeine in patients with supraventricular tachycardia undergoing electrophysiological testing. ii. effects on arrhythmia inducibility

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Background and Objectives: Patients with cardiac arrhythmias are usually instructed to avoid caffeine intake. We evaluated the effects of caffeine on inducibility of tachycardias in patients with supraventricular tachycardia (SVT) undergoing an electrophysiologic study (EPS) prior to catheter ablation.

Methods: Eighty patients with symptomatic SVT were randomized to receive oral caffeine or placebo prior to their EPS. Caffeine tablets at a dosage of 5 mg/kg (moderate intake), or placebo tablets were administered orally at a mean time of 57 ± 13 minutes prior to EPS. Catheters were introduced under fluoroscopic guidance to the RA, RV, AV node and coronary sinus (CS). If SVT was not induced in the baseline state, isoproterenol was administered to evaluate inducibility of SVT.

Results: SVT was induced in 44 patients (55 %) in the baseline state, while an infusion of isoproterenol was required to initiate SVT in 36 patients (45 %). There was no significant difference between groups receiving placebo or caffeine on SVT inducibility. The mean cycle length of clinical (323 ± 54 msec.) or induced SVT in the baseline state (386 ± 67 msec.) or with isoproterenol (320 ± 59 msec.) did not differ significantly between patients receiving caffeine or placebo.

Conclusions: In patients with a history of SVT, caffeine administration was not associated with any significant differences in SVT induction or more rapid rates of induced tachycardias. These results demonstrate that usual or moderate caffeine intake should not be restricted in patients with clinically symptomatic SVT.

P2-096

Proton pump inhibitors prevents and improves esophageal symptoms in the perioperative period of extensive encircling pulmonary vein isolation

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Pulmonary vein isolation (PVI) is the standard catheter procedure for patients with symptomatic, drug refractory paroxysmal atrial fibrillation (AF). To increase the success rate in PVI and avoid pulmonary vein stenosis, extensive encircling pulmonary vein isolation (EPPVI) is more effective than individual ostial PVI. But therefore, this procedure increases risk of esophageal injury including ulcer and critical fenestration.

Proton pump inhibitors (PPI) improve symptoms of gastroesophageal reflux disease (GERD). PPI is commonly used but there is not a quantitative assessment of the esophageal symptom in the perioperative period of PVI. We analyzed retrospectively the symptoms of patients by Frequency Scale for Symptoms of GERD (FSSG) which was composed of 12 questions related to reflux symptoms and acid-related dyspepsia. Patients were divided into three groups with no medication of 22 patients, H2-blocker (Famotidine) of 24 patients and PPI (Esomeprazole) of 22 patients. There was not a significant difference in the outcome of PVI and survival from AF recurrence. FSSG scales are the highest within 2 days after EPPVI in all groups. The groups with H2-blocker and PPI had significantly lower FSSG scale as 12.5 and 6.1 than no medication as 22.1. And especially PPI had significantly the lowest FSSG scale among three groups. This data indicates that EPPVI induces the symptoms of GERD and PPI prevents and improves those symptoms rather than other medicine.

P3-046

Pharmacological rescue of nonsense mutations of HERG gene as a potential therapeutic approach for LQT2 syndrome

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Background & Objectives: It is known that aminoglycosides and PTC124 can promote readthrough of nonsense codons to produce full-length proteins in many genetic diseases caused by nonsense mutation. The purpose of this study was to explore the effect of three different aminoglycosides and PTC124 on rescuing nonsense mutations of HERG gene associated with LQT2 syndrome.

Methods: HEK293 cells were transiently transfected with WT or HERG nonsense mutant cDNAs. Pharmacological rescue was studied by adding G418, gentamicin, tobramycin or PTC124 into DMEM for 24 hours. Western blot and patch clamp were performed to evaluate the expression of WT or mutant HERG genes with and without drugs.

Results: We found that G418 promoted significant level of readthrough with R1014X nonsense mutation in a dose-dependent manner. In spite of the lower maximal level of readthrough induced by gentamicin, the overall pattern was similar to G418. PTC124 could slightly induced readthrough of R1014X nonsense mutant. However, tobramycin was unable to show a significant readthrough effect on the expression of R1014X. The readthrough effects of G418, gentamicin and PTC124 on the expression of W927X, R863X and E698X HERG mutants were also tested. The results showed that as the mutation site more close to N-terminal, the rescue efficiency was deprived with these compounds.

Conclusion: These results indicate that chemical compounds can induce different patterns of read-through effect on nonsense mutations of HERG gene. And the site of mutations influenced the rescuing efficiency of them.

Keywords: aminoglycoside; nonsense mutation; HERG; LQT syndrome

P3-047

Updates on the management of sudden cardiac death

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Background & Objective: Sudden cardiac death is one of the major causes for morbidity and mortality among individuals. It happens on individuals no matter of their ages, sex, and races. Also, this incident is unpredictable and occurs at any place and at any time. The survival rate of out-of-hospital sudden cardiac is exceptionally low. The objective of this study is to review the current updates on the management of sudden cardiac death.

Methods: An extensive review on the current literature related to the management of sudden cardiac death among multiple databases were conducted. The results were reviewed and summarized.

Results: The acute management of providing cardiopulmonary resuscitation following a sudden cardiac death with the implementation of early defibrillation in witnessed arrest remained the most effective management that enhanced the survival rates. To prevent the episode on sudden cardiac death on high risk groups, antiarrhythmic agents such as β adrenergic blocking drugs, angiotensin converting enzyme inhibitors (ACEI) were suggested. Nevertheless, the advancement of implantable cardiac defibrillator (ICD) was supported to be the most appropriate management in reducing the mortality among high risk groups.

Conclusion: With the various causes of sudden cardiac death such as coronary artery diseases, cardiomyopathy, valvular heart diseases, and congenital heart diseases, strategies for the effective managements of sudden cardiac death were recognized in supporting positive outcomes.

P3-048

A novel KCNQ1 gene mutation R397Q in a patient with overlapping DCM phenotype could be associated with therapy

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Background: Dilated cardiomyopathy (DCM) is a major cause of sudden cardiac death with lethal ventricular arrhythmias. So far, the genetic mutations of DCM are mainly related to the sarcomeric protein, and mutations in SCN5A which encoding α -subunit of sodium channel also have been involved. However, KCNQ1 gene encoding in potassium channel has not been found in DCM patients.

Objective: This study aimed to demonstrate whether dilated cardiomyopathy (DCM) with ventricular tachycardia (VT) and prolonged QT interval is caused by mutation in KCNQ1 gene.

Methods: Twelve unrelated DCM patients with VT were included. Controls comprised 200 unrelated healthy volunteers from same ethnic background. Candidate genes (SCN5A, KCNQ1, KCNE1 KCNE2) were screened by direct sequencing. Whole cell patch-clamp analysis of HEK293 cells expressing wild-type (WT) and mutant KCNQ1 channels was used to investigate biophysical properties of channels. Current-voltage relationships, peak current, current density, voltage dependence of steady-state activation and inactivation of mutated channels were investigated.

Results: A single base G to A missense mutant R397Q in KCNQ1 gene was identified in a 60-year-old man with concomitant DCM with incessant VT and prolonged QT interval (QTc=480ms). Whole cell patch-clamp analysis of HEK293 cells expressing WT and mutant KCNQ1 showed that R397Q (n=19) decreased I_{Ks} current density dramatically compared with WT (14.34±1.73 vs. 23.25±2.31, P<0.01). However, R397Q did not influence V_{0.5} and slope factor for voltage dependence of activation compared to WT. This patient experienced recurrent VT only 20 months post radio frequency ablation(RFCA). Finally an implantable cardioverter defibrillator(ICD) was successfully implanted and he had been without complaints up to the 3 years of follow-up visit.

Conclusions: We first reported that a loss of function in KCNQ1 gene may cause the overlapping phenotype of DCM, ventricular tachycardia and prolonged QT interval. The reduction of I_{Ks} in R397Q did not significantly change the properties of gate. Although RFCA improves incessant VT in DCM patients, ICD is necessary for patients with abnormal structure heart disease and genetic background.

Keywords: Dilated Cardiomyopathy; Ventricular Tachycardia; KCNQ1; Mutation

P3-049

SCN5A mutation with lethal ventricular arrhythmias and invalidation of lidocaine in acute myocardial infarction

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Background: Patients are at high risk for potentially fatal ventricular tachycardia (VT)/ventricular fibrillation (VF) when suffering from acute myocardial infarction (AMI), due to myocardial ischemia/reperfusion injury or scar formation. Recently, it was reported that SCN5A gene mutations may also contribute to electrical storm complicating AMI.

Objective: The purpose of this study was to investigate potential SCN5A mutation in patients developing VT/VF during AMI, and reveal underlying cellular electrophysiological mechanism.

Methods: DNA samples of ten unrelated AMI patients with VT/VF were collected and clinical features were available in medical records. Candidate gene SCN5A was screened by direct sequencing. In expressed mutants, whole cell patch-clamp analysis was used to define the electrophysiologic properties. Current-voltage relationships, peak current, current density, voltage dependence of steady-state activation and inactivation of mutated channels were investigated.

Results: A missense mutation A1427S located at the S5-S6 extracellular linker of domain III (DIII) in SCN5A gene was identified in a 56-year-old female, which was not observed in 400 healthy control chromosomes of the same ethnic background. In addition, we identified three previously reported SNPs in our subjects, including A29A, H558R and D1818D. Electrophysiological analysis showed obvious reduction of sodium current in A1427S mutant without the shape change of I-V curve. Retrospective analysis of the A1427S carrier's medical records indicated that lidocaine infusion exacerbated episodes of VT/VF inversely and she finally died of refractory VT/VF complicating AMI.

Conclusions: We identified a novel SCN5A mutation A1427S that resulted in refractory VT/VF complicating AMI. Loss-of-function of the sodium channel indicates cautiously use of prophylactic lidocaine. Genetic screening could ideally identify the patients at high risk and aid in guiding the optimal therapy.

P3-050

Pressure overload causes right ventricular lethal arrhythmias: analysis by optical mapping in pulmonary artery banding and pneumonectomy model

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Right ventricular (RV) pressure overload due to severe pulmonary hypertension (svr-PH > 40 mmHg) sometimes causes lethal arrhythmias, although the mechanisms are unclear. To investigate if RV pressure overload produces RV arrhythmogenic vulnerability, we serially performed optical mapping analysis (OMP) with electrophysiological study (EPS) to the heart excised from pneumonectomy-induced (LP+H) and/or pulmonary artery banding-induced (PBI) svr-PH rats. In PBI-svr-PH, experiments were only conducted for 2 hours after PB because PBI-svr-PH was lethal. Action potential duration dispersion (APDd) and connexin43 (Cx43) expression were measured in RV. LP+H-svr-PH transiently sustained. OMP revealed abnormal RV conduction and increased APDd accompanying ventricular fibrillation/tachycardia (VF/VT) induction by EPS with normal Cx-43 in LP+H -svr-PH while PBI-svr-PH showed abnormal RV conduction and nonsustained VF/VT induction, but not increased APDd and without Cx-43 abnormality. Conclusions; Transiently sustained (>24-hours) svr-PH can cause lethal arrhythmias possibly due to the mechanoelectric transduction not including Cx43 degradation.

Figure 1. RV activation map and action Potential duration (APD) and APD dispersion

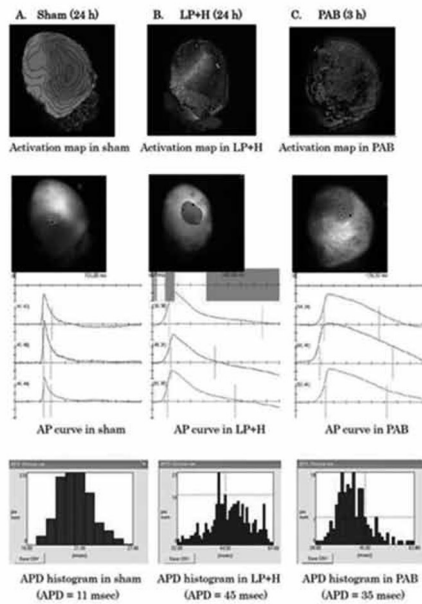
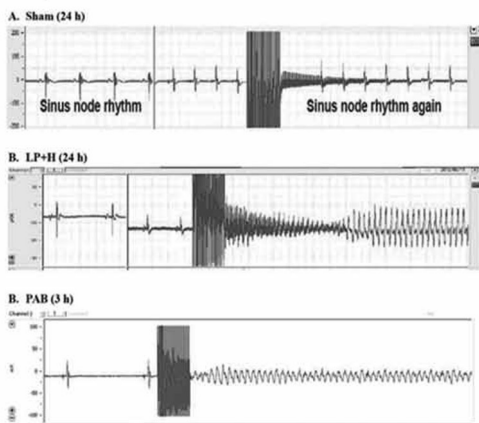


Figure 2. Induction of lethal arrhythmias by burst stimulus to the RV



P3-051

Fever and physical exercise unmasking type 1 BRUGADA ECG in a cohort of chinese patients with brugada syndrome

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Background & Objective: Brugada syndrome (BrS) is an inherited cardiac ion channelopathy characterized by ST-segment elevation in V1-V3. Fever and less commonly physical exercise may augment the Brugada ECG pattern and are proarrhythmic in BrS. We reported the experience of a local referral centre for BrS in Hong Kong.

Method: ECG, clinical and genetic data of BrS patients in our database were reviewed and analysed.

Results: Of the 110 BrS patients (all Chinese), ten (All males, mean age±SD 53.3±18.9 years) had their Type 1 Brugada ECG unmasked by fever. Two patients presented with syncope while the rest were asymptomatic. There was no VT/VF documented during fever. When fever subsided no more Type 1 Brugada ECG was observed. There was a mean drop of 3.6 mm in J point elevation on V2 and mean heart rate dropped from 104 bpm to 76 bpm. Six patients had genetic test done and 1 had *SCN5A* mutation found. Twenty of the 110 BrS patients had undergone Treadmill exercise test (TET). Two had Type 1 Brugada ECG unmasked and another patient had NSVT during TET. Among the three patients one had *SCN5A* mutation and one patient who died of sudden nocturnal death had a novel *CACNA1C* mutation found on molecular autopsy.

Conclusions: Fever and physical exercise could augment ST-segment elevation in BrS and are potentially proarrhythmic. While all BrS patients should treat fever promptly to minimize risk of arrhythmic death, those with Brugada ECG augmented by TET should avoid strenuous physical exercise and competitive sports.

P3-052

Sudden cardiac death and the indian context: the need for holistic efforts

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Background and Objectives: Despite advances in diagnostic and therapeutic skills, including vast promises of genetic medicine, SCD continues to be a major killer. This paper seeks to identify the causative factors, availability of healthcare resources and strategies towards their optimum utilization in order combat this silent killer, in the Indian context.

Methods: Data regarding SCD from various healthcare establishments i.e., primary, secondary and tertiary were analyzed. The factors such as age, sex, underlying diseases, life styles, risk factors, socio-economic background, ethnicity, demographic profile, healthcare consciousness and accessibility to medical care were analyzed and an attempt was made to determine the nexus between SCD and each of these factors.

Results: The study confirmed that SCD is multifactorial in nature. A complex interplay of genetic and environmental factors is at work. Indication are that Socio-economic transformation, leading to progressive urbanization, change in the working and dietary habits, ignorance and lack of risk consciousness, inadequacy of publicly funded healthcare facilities, inaccessibility to health check up, screening and therapeutic facilities have contributed to rising incidence of SCD in a developing country like India

Conclusion: SCD continues to be a major and silent killer worldwide, including India. It is indeed ironic that despite the killer's etiology being known and vast diagnostic, therapeutic and preventive capabilities at command the society is not free from its devastating effects. The prevailing milieu calls for a concerted and candid effort on the part of all actors of civil society including the physicians, policy makers, healthcare industry, NGOs and media