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Abstracts

ARRHYTHMIAS

470 Successful transvenous extraction of the oldest endocardial defibrillator leads implanted through subclavian vein

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Transvenous lead extraction is generally considered a difficult and high risk procedure due to the adhesion of implantable cardioverter defibrillator leads to a major vein, the right atrium, the superior vena cava and the apex of right ventricle. Number, type, duration of implant and position are lead characteristics to take into account for procedure's difficulty of lead extraction and the chances of complications.

In 1992, the patient, when she was 33 years old, was resuscitated from cardiac arrest due to ventricular fibrillation and then was referred to our department. At that time, the technique of implantation of cardioverter defibrillator provides the insertion of subcutaneous patch lead and the tunneling of the leads to the abdomen. That was the first case of a cardioverter defibrillator being implanted in the infraclavicular region and connected to a lead (Endotak C double coil with passive-fixation system) inserted in the right ventricle through the left subclavian vein. In 1993, almost one year later, due to a failure of the previous implanted lead, a new lead (Medtronic Sprint 6945 double coil) with active-fixation was implanted in the right ventricle and the lead with passive-fixation was left in place. Until 2015 three device replacement procedures were performed. In December 2016 the patient had isolated pocket erosion with local pain. Then, the patient was admitted in our department and transesophageal echocardiogram didn't show any intracardial mass. Therefore a procedure of pocket surgery was executed. In June 2019, the patient had on the device pocket local sign of inflammation as pain and erythema without erosion and without symptoms and signs of systemic infection. She was admitted in our department and transesophageal echocardiogram revealed the presence of two vegetations on the atrial segment of one of the two leads. Therefore, following this finding, a procedure of cardioverter defibrillator and leads extraction using locking stylets and dilator sheats was successfully completed without any complication. Before the discharge, in the light of the cardiac arrest due to ventricular fibrillation, a subcutaneous implantable cardioverter defibrillator (S-ICD) was implanted.

We reported a case of successfully transvenous leads extraction of 27 years old defibrillator leads by conventional traction and counter-traction techniques. The procedure was challenging owing to the characteristics of the defibrillator leads (both double coil) and the duration of the implant (27 years) of the two leads. Indeed, the extraction of old leads is particularly challenging due to the high level of adherence to adjacent tissue. To the best of our knowledge this case reports the extraction of the oldest transvenous defibrillator leads performed so far.

12 Lead extraction in congenital heart disease patients. Initial experience of single center

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Over the past decade, transvenous pacemaker (PM) and defibrillator (ICD) treatment in patient with congenital heart disease (CHD) has markedly increased. The number of these patients is expected to grow, and a subset of them will ultimately face the need for lead revision. Presently many patients with mandatory indications are not referred for transvenous lead extractions due to the misperception of the risk associated with the procedure.

Material and method: We treated consecutively from September 2017 to June 2019 ten patients with an median age of 13.5 years a median weight of 52 kgs. Seven patients had congenital atrioventricular block, one patient had long Qt syndrome and in two cases the patient had stenosis of the Mustard baffle for treatment of transposition of the great arteries.

The average age of the electrodes extracted was of 9, 8 years and a average lead extraction score was 7.4. All patients were evaluated by transthoracic and transesophageal echocardiography and CT scan to assess for residual intracardiac shunts, vegetations, valve function, chamber sizes, and basic lead courses and locations.

Result: All electrodes were extracted using through a left-handed subclavian approach in nine cases and through a combined femoral-suclavian approach in one case using 40-80 Hz laser energy with a SPECTRANETICS® Glidelight 12-14 Fr. sheats, alternated with A SPECTRANETICS® TightRail 11 Fr. In the two patients with prior Mustard operations through a femoral approach, a 45 mm length covered stent was positioned and a left atrial lead was implanted through the stent by a left subclavian approach. All cases were managed in the hybrid operating theater according to a safety management protocol between electrophysiologists, cardiac surgeons, anesthesiologists, hemodynamists and laser, radiology and perfusion technicians. The Bridge Ballon® (BB) was available for every procedure. No major complications occurred. In one patient it was necessary to reposition the atrial lead four hours from the procedure.

Conclusions: Lead extraction is a safe procedure in this patient population. Due to the highly variable anatomic substrates all device extractions require meticulous pre-procedural planning. Comprehensive review of the clinical and surgical history, inclusion of appropriate advanced imaging studies, incorporation of available tools as well as involvement of surgical and interventional services is mandatory.

13 CT-scan approach improving complete removing of infected epicardial implant in congenital heart disease patients

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Infections in cardiac implants are serious complications, with an associated in-hospital mortality of 5-15%. The aim of this abstract is to describe the algorithm of treatment of pediatric patients with infected epicardial implants.

Material and Method: We treated consecutively from January 2017 to September 2018 three patients with an average age of 15 years and an average weight of 33 kg. One patient had a congenital av block and pectus excavatum and the other two patients respectively had complex cardiac anomalies (left isomerism with azygos continuation, persistent superior vena cava and pulmonary stenosis with congenital AV block in one and congenitally corrected transposoition of the great arteries with double inlet left ventricle, pulmonary stenosis and destrocardia in the other one). All patients were treated with multiple sternal approach and have had previous infections of the epicardial implant. Two patients developed lead infection following previous partial lead transection.

Result: We used a diagnostic approach with CT scan in all three patients. We treated patients with targeted antibiotic therapy for two weeks before total lead and generator explant and for three weeks after the explant. Within three weeks of an explant, a temporary endocavitary lead was placed in all three patients. There were no recurrences of infection and no major complications occurred.

Conclusions: The CT scan made it possible to have a 3-D map of the heart surface that made it easy to localize the leads placed in place during subsequent implants repeated over the years. The combined management protocol of these patients has made it possible to avoid complications and infectious recurrences. Moreover, despite the past approach in that partially retaining a lead might be indicated in cases of device infection in patients with complex congenital heart disease, the experience of propagation of infection with biofilm system, it made us change our mind about the approach, revealing the need to completely remove infected devices and to maintain a treatment window, with a temporary implantation and targeted antibiotic therapy, before re-proposing an endocavitary implant. CT scan is a straightforward method to follow the site to be extracted without the aid of fluoroscopy.

837 ICD shocks: predictive factors and prognosis in a single-centre large cohort of patients

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Aims: Implantable cardioverter-defibrillators (ICDs) may prevent arrhythmic sudden death (SD), although imply a not negligible risk of complications and inappropriate shocks (IS) over time. This real-world registry aimed to identify prognosis and predictors of shocks over a long-term follow-up.

Methods: All patients undergoing transvenous ICD implantation at our centre between 2005 and 2017 were enrolled in the registry. Appropriate shocks (AS),

appropriate interventions (AI - shock and/or antitachycardia pacing) and IS were primary end-points. ICDs complications (cardiac perforation, haemothorax, pneumothorax, haematoma, infection, pacing lead dislodgement) and a composite of cardiac death/LVAD implantation/heart transplant were secondary end-points.

Results: 920 consecutive patients were enrolled: 167 (18%) females, 609 (66%) hypertensives, 223 (24%) diabetics, 265 (29%) with history of atrial fibrillation, 287 (31%) with NYHA III/IV class. Median age was 68 (IQR, 59-74); ejection fraction 28% (25-33), left atrial volume index (LAVi) 48 ml/sqm (38; 61). 494 (54%) patients had ischaemic cardiopathy, while 277 (30%) had idiopathic dilated cardiomyopathy. 685 (74%) patients received ICD for primary prevention of SD.

One or more shock occurred in 232 (25%) patients, AI in 256 (28%) patients, AS in 162 (18%) patients, IS in 95 (10%) patients. Complications were observed in 229 (25%) patients: the most common early complication (<30 days) was mild hematoma (5.5%), while the most frequent late complication (>30 days) was pacing lead dislodgement (4.7%). An invasive treatment was required in 110 patients (12%). The composite Endpoint of cardiac death/LVAD implantation/heart transplant was observed in 37% patients at 5-years following ICD implantation, 69% at 12-years, without any differences between patients receiving AI or not (p = 0.50, as shown in Figure below). All-cause mortality was 35% at 5-years, 67% at 12-years following ICD implantation.

A worse NYHA class (HR = 1.5, 95% CI 1.01-2.22), greater LAVi (HR = 1.02, 95% CI 1.01-1.04), worse ejection fraction (HR = 1.04, 95% CI 1.01-1.08) and ICD indication for secondary prevention (HR = 2.04, 95% CI 1.05-3.85) were pre-procedural predictors of AS during the follow-up.

Male sex (HR = 2.85, 95% CI 1.28-6.25), greater LAVi (HR = 1.02, 95% CI 1.01-1.03), worse ejection fraction (HR = 1.03, 95% CI 1.01-1.05) and ICD indication for secondary prevention (HR = 2.44, 95% CI 1.43-4) were predictors of AI. History of atrial fibrillation (HR = 2.73, 95% CI 1.64-4.54) and lack of treatment with beta-blockers (HR = 2.04, 95% CI 1.27-3.33) were predictors of IS. A decreasing incidence of IS was observed over time, according to the year of implantation (2005-2017), from 17% to 11% (p < 0.001).
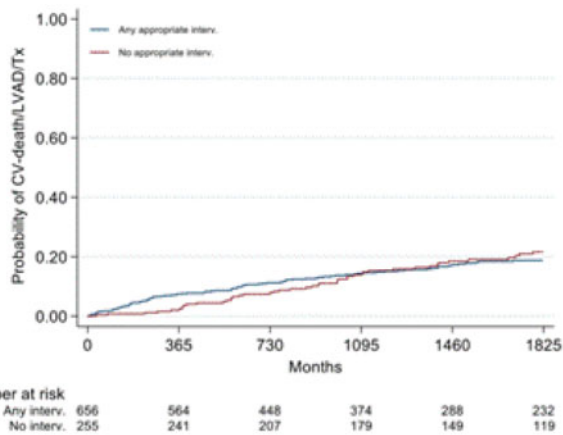
Conclusions: The factors associated with appropriate and inappropriate ICD shocks may be considered at the time of patient selection to further improve patient selection before device implantation.

472 Retrival of lead tip fragment into right atrium during lead extraction

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Background: extraction of chronically implanted transvenous lead systems is a complex procedure and is associated with considerable morbidity and mortality. There is sometimes fragmentation of leads and migration in thoracic cardiovascular system or mediastinum that leads to failure of extraction and it could provoke pulmonary embolism, sepsis, heart/big vessels perforation.

Case Description: we present a case of a male patient, 58 year old, that went at our attention to fistula and pocket erosion. He suffered of chronic ischaemic cardiopathy treated with percutaneous revascularization. In 2013 he was treated with implant of CRT-D after recovery for congestive heart failure in optimal medical therapy; in 2015 he received inappropriate defibrillator's shock by lead fracture so it was implanted new defibrillator lead. Considering the pocket disease, we performed leads and generator extraction and, later, new CRT-D implant in right side. The procedure was performed with invasive monitoring of the BP and positioning of a metallic guide in right

jugular vein (possible bridge balloon). After incision of the pocket and debridement of the leads, the working right catheter was extracted by manual traction. After that, atrial catheter and fractured right ventricular catheter were extracted with mechanical and laser devices. During laser extraction of the atrial lead, the tip of the lead was broking and floating in the right atrium. Then the fragment was recovered percutaneously, using a gooseneck catheter, a sort of lace that, after having surrounded the abandoned fragment, trapped it and allowed it to be extracted. At the end of the procedure, phlebography showed no continuity solutions of the hollow-subclavian venous tree. No post-procedural complication. After 10 days, a bicameral ICD implant was performed via right subclavian, because the coronary sinus for CRT-D was inaccessible.

Conclusion: The exposed case wants to show a possible complication during the extraction procedure and its percutaneous treatment.

519 Successful lead extraction in a patient with left ventricular assist device

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A 70-year-old man with a left ventricular assist device (LVAD) for end-stage-heart failure with severe left ventricular systolic dysfunction (ejection fraction 25%) and persistent atrial fibrillation, was admitted to perform an elective generator replacement of his implanted cardiac resynchronization therapy-defibrillator (CRT-D) device at the end of expected battery life.

During the post-operative Follow-up, hematoma with serohematic secretions was observed at the surgical site and, after some weeks, an implantable defibrillator pocket decubitus was observed too. So patient was readmitted in order to submit a pocket revision with removal of all the infected and necrotic tissue; during the procedure, samples of the pocket were obtained for cultural and antibiogram examination. Echocardiography performed during hospitalization showed a round shaped pedicular growth (5 x 3 mm) around the coronary sinus lead and a Positron Emission Tomography showed a radioactivity uptake in left paramedian anterior thoracic wall. Cultural examination of pocket samples showed oxacillin-resistant Staphylococcus epidermidis and Streptococcus parasanguinis infection and an appropriate antibiotic therapy was prescribed.

Two weeks later, patient presented with a massive bleeding from the surgical site and then he was urgently hospitalized. For this reason, our team performed a transvenous lead extraction of cardiac implantable device. Three leads (a passive fixation atrial lead, a passive fixation ventricular lead and a coronary sinus lead, implanted seven years before) were detached from the device (St Jude, Quadra Assura MP CD3361-40QC) and extracted with a manual traction, using locking stylet and dilator sheats. For persistence of tip of right ventricular electrode (cathode), a locking stylet was used. No postoperative complications were observed. Cultures of extracted lead showed Morganella morganii infection.

Two weeks later patient was submitted to implant of a single-chamber implantable cardioverter defibrillator; the incision was made in the right pectoral region, and right subclavian vein was isolated to introduce an active fixation right ventricular catheter (Boston Scientific, Reliance 4Front 0692-59, USA) for septal pacing. The device (Boston Scientific, Resonate EL ICD, USA) was inserted in a right pectoral pocket and connected to the lead.

Routine Follow-up of the device showed correct device function with optimized parameters. A transesophageal echocardiography, performed six weeks later, showed absence of vegetations.

In view of a Resonate device, a HeartLogic-enabled device, patient was also remotely monitored thanks to a multisensor algorithm that predicts heart failure events in patients with implanted device, in order to adjust the treatment and avoid potential re-hospitalisations.

Infection is a serious complication of cardiovascular implantable electronic device (CIED) and is associated with significant morbidity and mortality. The optimal management of these patients becomes more challenging when CIED infection is present in a patient with LVAD and careful considerations as well as further research are needed.

646 An Utstein-based model score to predict survival to hospital admission: the UB-ROSC score

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Purpose: Resuscitation success after an out-of-hospital cardiac arrest (OHCA) is affected by several variables, most of them available at pre-hospital time and included in Utstein style data reporting. The study aims to develop and validate a multi-parametric practical score to predict the probability of survival to hospital admission of an OHCA victim by using Utstein Style-based variables.

Methods: All consecutive OHCAs of any etiology occurring from 2015 to 2017 in two regions, Pavia Province (Italy) and Canton Ticino (Switzerland), were included. We used random effect logistic regression to model survival to hospital admission after an OHCA. We computed the model area under the ROC curve (AUC ROC) for discrimination and we performed both internal validation and external validation by considering all OHCAs occurring in the same regions in 2018. The Utstein-Based ROSC score (UB-ROSC score) was derived using the coefficients estimated in the regression model. The score value was obtained adding the pertinent score components calculated for each variable. The score was then plotted against the probability of survival to hospital admission.

Results: 1962 patients were included in our analysis (62% males, mean age 73 ± 16 years). Age, aetiology, location, witnessed OHCA, bystander CPR, EMS arrival time and shockable rhythm were independently associated with survival to hospital admission. The model showed excellent discrimination (AUC 0.83, 95%CI 0.81-0.85) for predicting survival to hospital admission, also at internal cross-validation (AUC 0.82, 95%CI 0.80-0.84). The model maintained good discrimination after external validation by using the OHCA cohort occurring in year 2018 (AUC 0.77, 95%CI 0.74-0.80).

Conclusions: UB-ROSC score is a novel practical score that predicts the probability of survival to hospital admission of an OHCA victim. UB-ROSC score shall help in setting realistic expectations about sustained ROSC achievement during resuscitation maneuvers, an important target for paramedics, rescue team and for family members.

658 Long-term survival after an out-of-hospital cardiac arrest. An Utstein based analysis

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Purpose: The majority of out-of-hospital cardiac arrest (OHCA) registries provide a follow-up limited at 1 month, so the subsequent survival remains an unexplored challenge. We sought to evaluate the long-term outcome after OHCA via an Utstein-based cardiac arrest registry.

Methods: We enrolled in the Cardiac Arrest Registry of the Province of Pavia (about 550000 inhabitants in northern Italy) all the patients who suffered an OHCA from any aetiology in whom CPR was attempted. The primary endpoint was the survival at 1 month, and the secondary endpoints were the survival at 6 months and then every year until 5 years after OHCA.

Results: 1774 resuscitation attempts for confirmed OHCAs were collected in the first 45 months (October 2014-June 2018). 59.7% of the patients were males with a mean age of 73.4 ± 16 years. The mean EMS response time was 11: 31 ± 5: 09 mins. The vast majority of OHCA occurs at home (78.8%) with a medical etiology (93%). A bystander witnessed the event in 56.1% and the EMS in 15.6%. Bystander CPR rate was 39.5%, whilst an AED was used before EMS in 2.5%. The first rhythm was shockable in 18.2% (90.7% VF, 2.5% VT without pulse, 6.8% AED shockable). Survival was significantly higher for shockable Utstein categories ($p < 0.01$) both when considering survival from the event (left panel) and from hospital discharge (right panel).

Interestingly, survival continued to decrease also in shockable rhythm categories over time, from 90% in the first year to about 80% at four years.
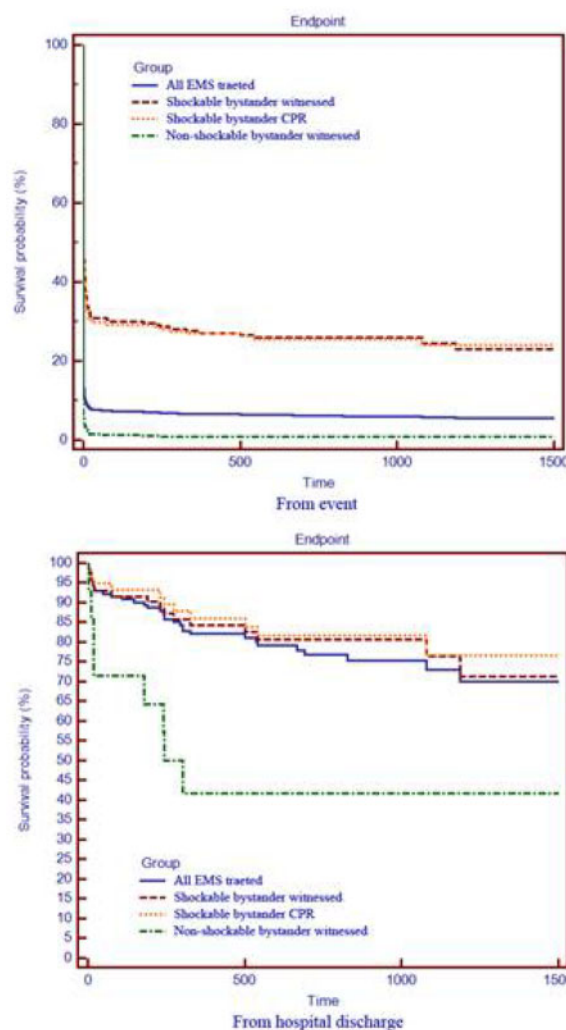
Conclusions: OHCA with shockable rhythm showed a better survival both from the event and from hospital discharge. However, our results demonstrated that survival after OHCA can change over the time in all the Utstein categories, so we believe that a longer follow-up should be encouraged by next Utstein style revision.

659 A multicenter international randomized controlled manikin study on different protocols of cardio-pulmonary resuscitation for laypeople: the MANI-CPR trial

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Purpose: Hands-only cardiopulmonary resuscitation (HO-CPR) is one of the most debated topic. However, if high-quality CPR is a key factor to improve survival after an out-of-hospital cardiac arrest (OHCA), it is very difficult to perform a high-quality CPR until the arrival of EMS with HO-CPR. Our aim was to verify whether the inclusion of intentional interruptions of different frequency and duration during the CPR could increase laypeople CPR quality compared with HO-CPR.
Methods: we randomised 572 laypeople who passed a basic life support course in 8 training centers to one of four CPR protocols in an 8 minutes simulated cardiac arrest scenario on a manikin: 30 compressions and 2 seconds pause (30c2s), 50 compressions and 5 seconds pause (50c5s), 100 compressions and 10 seconds pause (100c10s) and hands-only (HO-CPR). The primary endpoint was the percentage of chest compressions performed with correct depth evaluated by a computerised feedback system. The secondary endpoints were percentage compressions with correct release, with correct hand position, with adequate rate and the number of interruptions lasting more than 10 seconds (10 s-pause).
Results: 68.5% of the study population were males, mean age was 32.2 ± 11.6 years, mean height was 174.5 ± 8.3 cm and mean weight 73.7 ± 13.6 kg. There were no difference among the anthropometric characteristics of the 4 protocol groups. Regarding primary outcome, there was a statistical significant difference among the 4 groups ($p = 0.006$). Comparing each protocol to the standard (HO-CPR) through a post-hoc analysis, 30c2s (96%, $p = 0.007$) and 50c5s (96%, $p = 0.001$) were significantly better than HO-CPR (79%), whilst 100c10s did not reach significance (92%). Among secondary endpoint only the 10 s-pause was significantly different among the groups ($p < 0.001$), with more 10 s-pause in 100c10s (4, IQR 2-6) respect to the others (0, IQR 0-0).
Conclusions: The inclusion of intentional interruptions during CPR increase laypeople CPR quality. The protocols consisting in alternating 30 compressions and 2 seconds of pause or 50 compressions and 5 seconds of pause seems to be the more promising to maintain HQ-CPR during an 8 minutes scenario.

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756 Atrial electro-mechanical interval in patients with arrhythmias: is everyone the same?

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Background: Atrial electromechanical delay, assessed calculating the PA-TDI interval using tissue Doppler imaging, is a known and promising determinant for atrial fibrillation recurrence prediction after pulmonary vein isolation and electrical cardioversion.
Objectives: To determine the relationship between atrial electromechanical delay and the presence of atrial fibrillation.
Methods: We prospectively enrolled patients presenting at our Unit in sinus rhythm scheduled for an arrhythmogenic substrate ablation (atrial fibrillation -AF-, supraventricular tachycardia -SVT- and premature ventricular contractions -PVC). Demographic and echocardiographic characteristics were evaluated upon admission. Atrial electromechanical delay was inferred via the PA-TDI interval, obtained by calculating the time difference between the P wave onset and the A' wave peak on TDI recordings.
Results: From October 2018 to August 2019, 200 patients (60% male, mean age 58, 21 ± 14, 26, mean BSA 1, 9 ± 0, 21 m2, mean BMI 26, 42 ± 6, 28 kg/m2, mean EF 60, $91\% \pm 5$, 43%) were admitted to our unit to undergo AF (group 1: n = 145; 72, 50%), SVT or PVC ablation (group 2: n = 55; 27, 5%). Compared with the control group (group 2), patients admitted for AF ablation had a larger LA size (group 1 vs group 2: mean LA area 23, 21 ± 5, 07 vs 16, 87 ± 4, 01 cm2, $p < 0$, 001; mean indexed LA volume 46, 71 ± 20, 41 ml vs 32, 04 ± 14, 7 ml, $p < 0$, 001; mean LAD 41, 77 ± 5, 66 vs 33, 84 ± 6, 06, $p < 0$, 001) and a longer PA-TDI interval (lateral 148, 55 ± 28, 5 vs 128, 57 ± 20, 9, $p < 0$, 001; medial 125, 34 ± 21, 02 vs 109, 11 ± 21, 49, $p < 0$, 001; average 141, 43 ± 27, 58 vs 119, 08 ± 18, 63, $p < 0$, 001).
Conclusion: The PA-TDI interval is a non-invasive and easily achievable echocardiographic parameter, which is demonstrated to be prolonged in patients with a history of AF in contrast with patients with other arrhythmias. as expression of atrial conduction heterogeneity.

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683 Ventricular arrhythmias: an enemy for patient with inflammatory cardiomyopathy

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Background: Myocarditis is defined as an inflammatory disease of the myocardium diagnosed by established histological, immunological and immunohistochemical criteria. Endomyocardial biopsy (EMB) is gold standard for diagnosis and its use is limited to specific cases.
Myocarditis and inflammatory cardiomyopathy are associated with impaired ventricular function at presentation or during Follow-up, with ventricular arrhythmias and sudden cardiac deaths (SCD).
We present three clinical cases of suspected myocarditis that was correctly diagnosed with EMB guided by electroanatomical mapping (EAM) with CARTO system.
Case 1: A 16 years old female with recent history of abdominal pain with nausea and vomiting. She admitted of emergency department for fatigue and palpitations. The exams showed a narrow QRS complex tachycardia with RBBB and left anterior fascicular block morfology and a severe biventricular systolic disfunction, so she underwent electrical cardioversion with restoration of sinus rhytm. The cardiac magnetic resonsance (CMR) demostrated a mid-layer LGE-area in corrispondence of the infero-lateral wall of left ventricle. In suspicion of myocarditis was performed a EMB guided by EAM. During mapping was induced a fascicular VT which was ablated with radiofrequency in corrispondence of posterior fascicle.
Moreover bipolar mapping showed low potentials at the level of the inferior-lateral wall while the unipolar mapping showed substantially conserved voltages. The analysis of biopsy documented a inflammatory cardiomyopathy.
Case 2: A 47 years old female with systemic sclerosis and a recent viral gastroenteritis. She was referred to our centre for palpitations. At the ECG-monitoring was found an high arrhytmic burden with several non sustained VT and echocardiographic examination showed a discinetic right ventricle with a dilated RVOT and a normal left ventricle ejecton fraction. CMR documented a LGE-area in corrispondence of antero-lateral wall of right ventricle and postero-lateral wall of left ventricle. The patient underwent to EMB guided by EAM and the analysis of right ventricle's biopsy documented a chronic active myocarditis. Then we decided to implant a primary prevention subcutaneous ICD.
Case 3: A 22 years old male elite athlete. He was referred to our centre due to the finding of frequent supraventricular extrasystoles at rest and during exercise test and for evidence, on CMR, of a subepicardial area of LGE at the level of the postero-lateral wall of the left ventricle. The patient underwent EMB, which documented a chronic myocarditis, and the EAM excluded pathological electroanatomical substrate and non-inducibility of sustained ventricular arrhythmias. In the same procedure was performed also supraventricular extrasystole's ablation at level of upper right pulmonary vein.
Conclusion: Our case report series showed that a multiparametric work up including invasive EP study and EAM biopsy guided could be useful to reach a definitive diagnosis in patients with myocarditis and ventricular arrhythmias.

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685 Provoked electrocardiographic Brugada type 1 pattern in an asymptomatic woman with a new heterozygous scn5a mutation

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Background: Brugada syndrome (BrS) is a rare channelopathy and it's considered to be involved in 4% of all sudden cardiac deaths (SCDs). Not all the genetic abnormalities underlying the disease have been identified, however a mutation of the SCN5A gene is found in 15% to 30% of patients with BrS.
To date a great number of SCN5A mutations have been reported but their exact role in developing the disease remains an unresolved issue.
We report the case of an asymptomatic female patient, with a family background of BrS and who is carrier of a SCN5A mutation not described in literature (c.3818G>A).
Clinical case: A 69-years old woman, with normal 12 leads electrocardiogram and a positive genetic test for SCN5A mutation, was referred from another centre to our outpatient clinic.
She had systemic arteryal hypertension, type 2 diabetes and was asymptomatic for syncope and lipotimia. The 12-leads electrocardiogram at rest was normal.
Our patient had a cousin with spontaneous Brugada type 1 pattern who was implanted an ICD after a syncope and an asymptomatic first-degree nephew with a spontaneus type 1 pattern and a negative electrophysiological study. All these members of the family shared an heterozygous mutation (c.3818G>A) of the SCN5A. This mutation is not previously reported in scientific literature and it supposedly is pathogenic as it introduces a premature stop codon in the genetic sequence, determining a non-sense mutation.
The patient ECG was normal, both with leads V1 through V3 in a classical position and also with these electrodes placed in the second intercostal space. An echocardiographic examination showed mild left ventricular concentric remodelling without any other significant abnormality or sign of structural heart disease. The patient underwent intravenous testing with class 1 sodium channel blocker in order to clarify the significance of this genetic mutation.
We injected intravenously 2 mg/kg of flecainide in ten minutes and, two minutes after flecainide infusion ending, we observed a increase in the QRS duration (160 msec) with a coved ST-segment elevation of 4 mm, followed by a wide negative T wave (Brugada type 1 pattern) in V1-V2 positioned on both the second and fourth intercostal spaces.
The flecainide test was positive and, to better define the risk of SCD, we proposed the electrophysiological study but the patient denied consent to the procedure.

Conclusion: Testing with class 1 antiarrhythmic drug could be a simple and safe way to assess the pathogenetic role of genetic mutations supposed to be involved in Brugada Syndrome.

403 Uncommon extraction of subcutaneous cardioverter defibrillator lead in sportsman patients

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Case Report: A 23-year-old, sportsman patient with Brugada ECG pattern and inducible syncopal polymorphic TV at electrophysiological test, was implanted, according the intermuscolar two-incision technique, with a subcutaneous cardioverter defibrillator (Emblem S-ICD, Boston Scientific) in May 2015 for primary prevention. Alternative sensing vector was automatically selected by the device. In May 2018 a short episode of noise on the alternative vector was registered without any shock delivered and optimization was performed by automatically changing from alternative to primary vector, achieving correct recognition of the reproducible noise during abdominal isometric contraction.

In June 2018 during gym isometric exercise the patient received a single inappropriate shock due to myopotential noise related to muscular activity. A CXR scan showed lateral dislocation of the catheter at ring level. Due to low amplitude signal caused by the catheter displacement, SMART Pass algorithm automatically switch off, leading to wave-T oversensing and inappropriate ventricular fibrillation recognition. Considering the presence of noise on each vector and the patient's wish of continuing gym practice, we decide for implantation revision. A first incision in local anesthesia was made in the mid-axillary line at level of pocket device and the lead was disconnected. We still made a horizontal incision at the xiphoid process level where lead has been fixed with conventional suture. Here we found sleeve's fracture determining a lead dislocation and sleeve rubbing with ring sensing electrode. We hypothesized rubbing of the sensing electrode in this area could be responsible of the noise, then we decided to remove and replace the subcutaneous lead. Anyway, repeated attempts of manual pulling the lead away were unsuccessful. Finally, to remove such strong resistances, we decided to use dilation with progressive dilatators, conventionally used for transvenous lead extraction. Deep sedation was necessary for control of pain, due to ineffectiveness of local anesthesia. When the lead was extracted, fibrosis was discovered around and inside the defibrillation coil. A third 2 cm vertical incision was performed at level of fluoroscopically marked distal tip position at sternal-manubrium junction. Then the implantation was performed according the three-incision method. We strongly sutured the electrode at the distal tip to the underlying fascia and fixed the xiphoid incision with an anchoring sleeve.

Arrhythmia induction test was successful, alternative sensing vector was automatically selected, post-implant X-ray was normal and no noise was detected on discharge and after 11 months.

Conclusion: The S-ICD was developed as a safe and effective alternative therapy to transvenous system, but uncommon complications could occur. Strong gym isometric exercise could be the cause of sleeve's fracture and lead displacement, with consequent low amplitude signal, oversensing and inappropriate shock. Reprogramming the device didn't resolve the problem and surgical revision was necessary. Remarkable, not expected adherences were found during lead extraction, needing transvenous dilatator tools. A three-incision technique was performed to guarantee gym exercises. Our case highlights the uncommon effort removing subcutaneous defibrillator lead and the usefulness of a three-incision technique in sportsman patient.

461 Primary prevention: left atrial predictive role and icd shocks in idiopathic and ischaemic cardiomyopathy

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Introduction: Left atrial size is a known marker of cardiomyopathy severity. Left atrial volume index (LAVI) is a predictor of heart failure and mortality, irrespective of left ventricular (LV) systolic function. This could be explained by LA impact of in LV filling pressure, stiffness and myocardial stretch. In literature, data on the atrial role on predicting ventricular arrhythmias are lacking, especially in the implantable cardioverter defibrillator (ICD) carrier patients. Thus, we investigated the potential role of LAVI in predicting a higher incidence of ventricular arrhythmias treated by appropriate ICD shocks and therapies (shock and/or ATP) in primary prevention patients with idiopathic dilated cardiomyopathy (IDC) or coronary artery disease (CAD). Secondary endpoint was the association between LAVI, inappropriate shock and atrial fibrillation.

Methods: We included consecutive patients underwent ICD implantation for primary prevention between January 2010 and December 2016 in our centre with CAD or IDC. Appropriate and inappropriate shocks and therapies (shock and/or ATP) incidences

were assessed. Baseline demographic, clinical characteristics and six-monthly follow-up data were collected.

Results: A total of 352 patients (63% CAD; 37% IDC, 18% female, average age of 65 $\pm$ 10 years) were included in this study. During a mean follow-up of 48 ± 23 months, appropriate therapies occurred in 24% of the total population, appropriate shocks in 14.2% and inappropriate in 7.9%. Regarding the impact of atrial size, data were accurately recorded in 187 patients. Baseline characteristics did not significantly differ from those of the total population. Severe left atrial dilatation was defined as LAVI $\geq$ 48 ml/m^2 (57%; CAD vs IDC p = 0.52). Similar mean value of ejection fraction (27 ± 5.6) and the same rate of atrial fibrillation history (28%; p = 0, 99) between severe LA dilatation (SLAD) group and non-severely LA dilatation (NSLAD) group. Appropriate therapy incidence was 28% in SLAD group, while 14% in NSLAD. A statistically significant association between LAVI and appropriate therapies was found (HR 2.19, 95% CI 1.07-4.5; p = 0.02). Similarly, appropriate shocks (21% in SLAD group vs 9%; HR 2.76, 95% CI 1.2-6.8; p = 0.03). Regarding the secondary endpoint, the incidence of inappropriate shocks was statistically similar between groups (p = 0.28). History of atrial fibrillation was a predictive factor of inappropriate shocks (H.R. 2.7, 95% CI 1.14-6.47, p = 0.038). LAVI was correlated with atrial fibrillation: 63% of patients with LAVI $\geq$ 48 ml/m^2; 84% of patient with LAVI $\leq$ 48 ml/m).

Conclusion: The present study highlights the role of left atrial dilatation in primary prevention ICD carriers. LAVI is a predictive factor for higher incidence of appropriate therapies possibly due to its impact on LV filling pressure and stiffness. As far as we know, our study improves upon literature results by enrolling more patients with a longer follow-up period. Therefore, in patients with the same ejection fraction, severe left atrial dilatation could be considered an additional predictive factor to confirm ICD primary prevention implantation in CAD and IDC patients, without being discouraged by the risk of inappropriate shocks in the absence of atrial fibrillation.

879 Endo-epicardial substrate mapping and ablation in patients with Brugada syndrome: a single centre experience

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Introduction: Brugada syndrome (BrS) is a genetic arrhythmic disease associated with an increased risk of sudden cardiac death. The primary BrS electrophysiological substrate is delayed depolarization over the anterior aspect of the RVOT epicardium and catheter ablation of this abnormal area is able to prevent VT/VF and normalize the ECG pattern. Study aim is to evaluate the results of RVOT endo-/epicardial mapping and ablation in consecutive BrS patients with various clinical presentation.

Methods: A total of 37 BrS patients were enrolled, of whom 28 male, with a mean age of 50 ± 9 years. Type I ECG pattern was documented spontaneously in 28 patients and only after ajmaline challenge in the remaining 9. Eighteen patients experienced symptoms: 1 out-of-hospital cardiac arrest, 5 VT/VF storm, 15 had syncope, 15 palpitations. ICDs were implanted in 5 while 6 patients had a loop-recorder. A baseline EP study was performed in all patients before the procedure and sustained VT/VF was inducible in 35 (95%) patients. After RV endocardial mapping and double epicardial access, a substrate electroanatomic RVOT epicardial map was obtained, before and after ajmaline, in order to identify areas of low voltage and tagging all the abnormal ventricular electrograms (AVE) inside. RF ablation was performed aiming to complete elimination of AVEs.

Results: Areas with AVEs were present in all patients (9.2 ± 5.2 cm^2 at baseline vs. 16.2 ± 7.7 cm2 after ajmaline infusion, p < 0.001). Ablation completely eliminated AVEs in all patients, with a mean ablation area of 21.5 ± 10.6 cm2. At the end of procedure, leading to ECG normalization in all patients but VT/VF still inducible in 4 (11%). No acute complications occurred, mild pericarditis was experienced by 15 (41%) patients, rapidly solved with NSAIDs and short-term colchicine. At a median follow-of 10 months, the ECG remained normal, even after ajmaline, in all but 4 patients (11%), while a repeated EPS was routinely performed and VT/VF noninducibility was maintained in all patients. No repeated procedures were performed in the study population.

Conclusions: Epicardial substrate elimination by RF ablation is associated with VT/VF noninducibility in all the patients and ECG normalization in the large majority of them. RF ablation set-up must be standardized in order to achieve durable and comparable results. Further studies are needed to understand the impact of this strategy in reducing the risk of SCD.

478 Cryptogenic stroke and hidden atrial fibrillation: role of left atrial function and prolonged monitoring with insertable cardiac monitor

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Background: Cryptogenic stroke (CS) is associated with high rate of recurrence and adverse outcome at long-term follow-up, especially because the unknown etiology is often associated with an uneffective secondary prevention. In such scene, hidden atrial fibrillation (AF) could play an important pathophysiological role.
Objectives: The aim of this study was to identify parameters of left atrial size and function that could correlate with the detection of hidden AF, documented at prolonged monitoring using insertable cardiac monitor (ICM) in patients with CS and divided into 2 groups: non-embolic cryptogenic stroke (non-ESUS), embolic cryptogenic stroke (ESUS).
Methods: This is a single-centre prospective cohort study. Patients with CS based on clinical and radiological findings, according to TOAST's criteria, were enrolled; all of them received an ICM and underwent a transtoracic echocardiogram with the assessment of left atrial parameters of size and function. All detected AF episodes (≥ 30 sec) were considered.
Results: We enrolled 47 patients (mean age 67.7 ± 11.5 years), 36 ESUS (76.6%) and 11 non-ESUS (23.4%). Prolonged ECG monitoring with ICM showed hidden AF in 14 patients (30%). Mean age was 68.4 ± 12.8 years for AF group and 66.5 ± 11.1 years for no AF group. In CS patients, univariate logistic regression analysis showed a significant association between different echocardiographic parameters of size and left atrial function and FA, particularly E/A ratio ($p = 0.0046$), Left Atrium End Systolic Area (LA ESArea, $p = 0.0067$), Left Ventricular Ejection Fraction % (LVEF%, $p = 0.038$) (Table 1). In the same group, in the multivariate logistic regression model, the echocardiographic parameters E/A ratio (values > 1) and LVEF $\leq 62\%$ emerged as independent predictors of FA. In ESUS group, univariate logistic regression analysis showed a significant association between different echocardiographic parameters of size and left atrial function and FA, particularly Pulmonary Vein Ar wave duration (PV Ar duration, $p = 0.033$), E/A ratio ($p = 0.0044$), LVEF % (0.0043), and VTI total atrial filling fraction (AFF, $p = 0.0011$) (Table 2).
Table 1

	N	Mean	SD	N	Mean	SD	p-value
		no FA			FA		
E/A	25	0.792	0.2660	11	1.127	0.3823	0.0046
LA D A-P max (mm)	25	34.200	4.5461	11	38.182	6.0686	0.0483
LA ESArea (cm2) 4c	25	20.528	4.2963	11	25.445	5.5637	0.0067
LA ESVI 4c (ml/m2)	25	32.920	10.4737	11	42.282	13.3189	0.0295
LA FE (derivata da LA A) 4c	25	0.300	0.07402	11	0.237	0.09951	0.0419
LVEF (%)	25	64.360	2.9704	11	59.545	6.4088	0.0038
TDI a' set(cm/s)	25	10.173	1.5895	11	8.847	1.8173	0.0341
VTI totale (%)	25	44.483	14.0169	11	35.366	8.6850	0.0551
		no FA			FA		
				ESUS			
Ar durata PV (ms)	18	174.000	26.4863	8	201.125	25.3458	0.0330
D picco(cm/s) PV	18	44.300	10.9813	9	66.887	17.1505	0.0374
E/A	18	0.772	0.2697	10	1.160	0.3864	0.0044
LA ESArea (mm)	18	19.944	4.4500	10	26.400	7.3060	0.0543
LA ESArea (cm2) 4c	18	20.322	4.4403	10	26.750	6.7972	0.0067
LA ESVI 4c (ml/m2)	18	31.039	11.2311	10	43.070	9.7663	0.0455
LAFEF (derivata da LA V) 4c	18	0.283	0.09803	10	0.194	0.1184	0.0421
LVEF (%)	18	64.778	3.0785	10	59.100	6.5735	0.0043
TDI a' set(cm/s)	18	10.351	1.9933	10	8.542	1.9807	0.0085
TDI E/e' lat	18	6.328	2.3905	10	11.293	4.4726	0.0343
VTI totale (AFF)	18	48.942	10.8484	10	34.383	8.4848	0.0011

Conclusions: This study showed that some echocardiographic parameters (LVEF, E/A ratio) are independent predictors of FA in all patients with CS, and different parameters of size and left atrial function are significantly associated with AF in this group of patients. Particularly, in ESUS patients a significant association emerged between different echocardiographic parameters and FA.

444 Effects of corticosteroid therapy on incidence of pacemaker implantation and conduction abnormalities after transfemoral aortic valve implantation

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Introduction: Transcatheter aortic valve replacement (TAVR) is a therapeutic option for the management of patients with symptomatic severe aortic stenosis who have high or intermediate surgical risk. Conduction abnormalities, especially bundle branch block and high-grade atrioventricular block (HAVB) requiring pacemaker (PPM), are the most common complications after TAVR. They are likely due to the atrioventricular and infranodal tissues local damage as a result of trauma, ischemia, Haemorrhage or oedema. Corticosteroids have a powerful anti-inflammatory role mediated through receptors that modulate inflammatory gene expression.
Aims: In this study we sought to assess whether the anti-inflammatory effect of post - procedural steroid treatment will reduce the incidence of conduction defects following TAVR.
Materials and Methods: This was a retrospective, single centre, observational study, which included 90 patients undergoing TAVR. 30 were affected by conditions requiring oral corticosteroids after intervention and received two oral doses of prednisone 25 mg for five days after TAVR; the control group included 60 patients who underwent TAVR without corticosteroid therapy. The primary endpoint was implantation of new

PPM during admission. The secondary endpoints were onset of new conduction defects, as left bundle brunch block (LBBB), right bundle brunch block (RBBB) and first degree atrioventricular block (AV block).
Results: The prednisone group consists of 12 males (40%) and mean age was 81 ± 7 years; heart rate at baseline was 70 ± 12 b.p.m., PR interval 187 ± 39 milliseconds and QRS 108 ± 24 milliseconds; 2 patients presented first degree AV block (7%), one presented RBBB (3%) and 4 presented LBBB (13%); 11 patients were on therapy with beta-blockers (37%). Similarly, control group consists of 31 males (52%, $p = 0.6$) and a mean age of 81 ± 7 years; heart rate at baseline was 70 ± 18 b.p.m., PR interval 197 ± 36 milliseconds and QRS 111 ± 27 milliseconds; first degree AV block was present in 14 patients (23%; $p = 0, 09$), RBBB in 7 patients (12%; $p = 0, 35$); LBBB in 10 patients (17%; $p = 0, 9$); 34 patients was on beta-blockers (57%; $p = 0, 12$). At the discharge, 4 patients had undergone to PPM implantation in prednisone group and 11 in control group (13% vs 18%; $p = 0, 76$). A new first degree AV block occurred in 3 and 4 patients in the two groups respectively (10% vs 7%; $p = 0, 89$); a new LBBB in 8 patients in prednisone group (27%) and in 13 patients in control group (22%; $p = 0, 79$) and a new RBBB in 1 and 3 patients respectively (3% vs 5%; $p = 0, 86$).
Conclusions: Corticosteroid therapy does not reduce risk of PPM implantation after TAVR during admission. This question needs further investigation to clarify if an anti-inflammatory therapy can have a role in the prevention of conduction system defects related to TAVR.

401 Transvenous vs. non-transvenous implantable cardioverter-defibrillator: a meta-analysis of comparative outcome studies in the pediatric and young adult population

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Background and Aims: Implantation of transvenous (TV)-implantable cardioverter defibrillator (ICD) systems in the pediatric population is challenging and associated with a relatively small but nontrivial rate of complications including infection, inappropriate ICD shocks and lead malfunction. Non-transvenous (NTV) systems has been proposed as an alternative therapeutic option, but comparative outcome data are hitherto scarce, especially in the pediatric and young adult population. To overcome this paucity in the current literature, we aimed to summarize and compare safety and efficacy outcomes between TV- and NTV-ICD systems in a meta-analysis of observational studies.
Methods: We performed a systematic review and meta-analysis of comparative outcome studies between TV- and NTV-ICD systems from January 2009 to May 2019. We assessed Mantel-Haenszel pooled estimates of relative risk (RR) and 95% confidence intervals (CIs) for all-cause death, lead complications, infections, implant site complications and inappropriate shocks for NTV-ICD vs. TV-ICD at the longest follow-up.
Results: We identified a total of 6 studies, including an overall population of 495 patients (mean age 16 ± 4 years), with a mean follow-up 40 months. Baseline characteristics were similar between the two groups. The incident risk of lead/device (RR 1.02, 95% CI 0.18-3.90) and implant site complications (RR 0.76, 95% CI 0.23-2.36), infections (RR 1.46, 95% CI 0.42-4.88), inappropriate shock (RR 0.71, 95% CI 0.35-1.32) and all-cause death (RR 0.62, 95% CI 0.28-1.37) was similar between NTV- and TV-ICD systems.
Conclusions: No detectable difference was observed between NTV- and TV-ICD systems. This result supports the concept that NTV systems might be considered a safe and effective alternative to TV-ICD in the pediatric and young adult population. Large randomized studies are needed to achieve more comprehensive evidence and bolster clear guidelines on the selection of NTV- vs. TV-ICD systems.

694 Inadvertent implantation of a permanent pacemaker ventricular lead into the left ventricle: identification, management and implications

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Inadvertent malpositioning of a cardiac implantable electronic device lead into the left ventricle is a rare complication of transvenous pacing and defibrillation. Rapid identification of lead position is critical during implantation and just after the procedure, with immediate correction required if malpositioning is detected. Thromboembolic events are common and usually secondary to fibrosis or thrombus formation on or around the lead. Anticoagulation can prevent thromboembolic events. Percutaneous and surgical LV lead extractions have been performed successfully, but the risks of percutaneous lead removal are not well-defined.
We report a case of a 92-year-old female patient with an inadvertent transvenous permanent pacing lead into the left ventricle through an atrial-septum defect implanted for an incidental finding of complete atrioventricular block with a low

ventricular rate. The decision was made to leave the pacing lead in place and continue lifelong anticoagulation therapy.

While uncommon, inadvertent LV lead placement is a potentially devastating complication of pacemaker implantation. Appropriate analysis of the paced QRS pattern on ECG and post- implantation chest radiograph may reduce morbidity and mortality by promoting early recognition and treatment, and two-dimensional echocardiography can help to confirm left ventricular placement via an atrial septal defect, patent foramen ovale, or perforation of the interventricular septum.

559 Efficacy and safety of direct oral anticoagulants in patients with atrial fibrillation and high thromboembolic risk. A systematic review

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Background: The aim of the study was to evaluate the efficacy and safety of direct oral anticoagulants (DOACs) in a subgroup of patients with atrial fibrillation (AF), $CHADS_2$ score ≥ 3, advanced age, and heart failure (HF) coming from the main DOACs randomized clinical trials.
Methods: We searched MEDLINE, MEDLINE In-Process, and Other Non-Indexed Citations. EMBASE, PubMed, and the Cochrane Central Register of Controlled Trials. English-language articles published from 2002 to March 2019 dealing with DOACs for preventing thrombotic events in AF were considered. We did not conduct any statistical analyses as indirect comparison between DOACs represents hypothesis generators.
Results: This systematic review was restricted to the subgroup of patients with $CHADS_2$ score ≥ 3 (n = 31, 203), elderly (n = 24, 788), and with HF (n = 29, 297) derived from the pivotal trials. Risk index (RI) was calculated. The RI for stroke/systemic embolism was similar in all of the patients treated with DOACs or warfarin. The lowest RI was in rivaroxaban patients ($CHADS_2$ score ≥ 3: RI = 0.04; elderly: RI = 0.09; HF: RI = 0.05). The RIs for bleeding were higher in patients treated with dabigatran ($CHADS_2$ score ≥ 3: $RI_{110}=0.23$; elderly: $RI_{110}=0.22$; HF: $RI_{110}=0.16$. $CHADS_2$ score ≥ 3: $RI_{150}=0.30$; elderly: $RI_{150}=0.24$; HF: $RI_{150}=0.16$). The bleeding RIs were higher with apixaban ($CHADS_2$ score ≥ 3: RI = 0.23; elderly: RI = 0.25; HF: RI = 0.14) and dabigatran ($CHADS_2$ score ≥ 3: RI = 0.28; elderly: RI = 0.21; HF: RI = 0.19).
Conclusions: The use of DOACs is a reasonable alternative to vitamin-K antagonists in AF patients with $CHADS_2$ score ≥ 3, advanced age, and HF. The RI constitutes a useful, additional tool to facilitate clinicians in choosing DOACs or Warfarin in particular category of AF patients.

560 The impairment in kidney function in anticoagulation ERA. A pathophysiological insight

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The need for anticoagulation in patients with atrial fibrillation (AF) is fundamental to prevent thromboembolic events. Direct oral anticoagulants recently demonstrated to be superior, or at least equal to Warfarin in reducing the risk for stroke/systemic embolism and to prevent major bleeding and intracranial haemorrhages.

A great part of AF population suffers from chronic kidney disease (CKD). Indeed, the relationship between AF and renal function is bidirectional: AF can trigger kidney failure as well as the kidney impairment can promote alterations able to enhance AF. Nevertheless, there are concerns in prescription of anticoagulants to patients with AF and CKD.

The worsening in kidney function can be effectively due to anticoagulants administration. Warfarin has been recognized to promote acute kidney failure in case of excessive anticoagulation levels. Nevertheless, further mechanisms can induce the chronic worsening of renal function this leading to the decline of kidney function observed in post-hoc analysis of registration trials and dedicated observational studies.

By contrast, DOACs more protect kidneys from injuries with more efficiency with respect to Warfarin, although they still continue to play a role in promoting some kidney lesions. The exact mechanisms are still unknown.

This review is aimed to discuss the influence of anticoagulants on renal impairment as well as to overview potential physio-pathological mechanisms related to this clinical complication.

561 The electocardiographic changes associated with hypothermia: the Osborn wave

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A 93-year-old patient came to our observation for general malaise, sensory obnubilation, aphasia and dysphagia. He had arterial hypertension in drug treatment. At the first medical contact he presented hypothermia (body temperature: 28 ° C) and marked bradycardia. The ECG showed a non-evaluable atrial activity (likely atrial paralysis) with the presence of a junctional rhythm at the frequency of 37 b.p.m. Blood pressure was around 100/60 mmHg with preserved cardiovascular compensation, in the presence of a moderately depressed cardiac function. Furthermore, the presence of a positive deflection in the terminal part of the QRS complex with elevation of the point J, in the lateral precordial derivations V4-V6, and a terminal slowing of the QRS complex in the lower derivations, the so-called "wave of Osborn", were also observed figure 1.

Figure 1 The arrows indicate the positive deflection in the terminal part of the QRS with elevation of the point J, while the stars indicate a late delta wave in the terminal part of the QRS complex, both known as "Osborn wave".

For the reduction of the sensory and of the critical power, the patient was subjected to brain CT scan with finding of a thin hyperdense layer the right and left hemispheric convexity suggestive for subdural hematoma. After adequate warming and supportive therapy, a progressive increase in heart rate was observed with restoration of the sinus rhythm and disappearance of the Osborn wave, figure 2.

Figure 2 ECG showing a sinus rhythm interrupted by supraventricular extrasystoles with an average frequency of 75 b.p.m. Osborn's wave has disappeared.
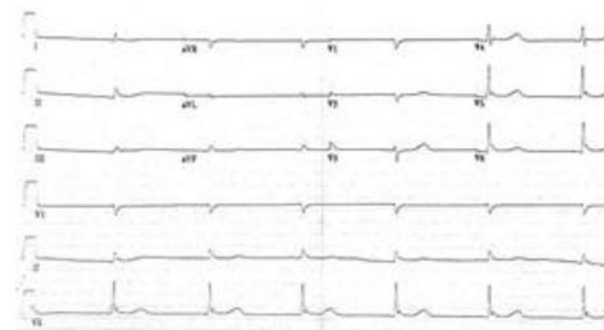
The Osborn wave is the most specific electrocardiographic sign of hypothermia.

It consists of an electrocardiographic deflection which is manifested as a late delta wave or as a small R 'wave following the QRS. It is the manifestation on the surface ECG of the electric gradient between a more prominent spike and dome action potential of epicardial cells than that of endocardial cells, an effect that is believed to be linked to a slowing down of the activation kinetics of K + channels Ito compared to calcium channels, associated with low temperature.

765 Inter-observer and intra-observer agreement in diagnosis of type 2 brugada pattern

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Introduction: Brugada syndrome (BrS) is a disorder characterized by increased risk of sudden death associated with definite ECG abnormalities (J wave, elevated ST segment) confined to the right precordial leads (V1 to V3), in the absence of structural heart disease. While type 1 BP diagnosis is often simple, differentiation of Type 2 BP from incomplete right bundle branch block (IRBBB) can be insidious. The aim of our study was to assess inter-observer and intra-observer agreement in the diagnosis of type 2 BP in a cohort of cardiologists with different skills.

Methods: We proposed these 14 ECGs to 42 partecipants belonging to Italian centers: 14 arrhythmologists, 14 general cardiologists and 14 electrophysiology (EP) fellows. Every ECG was showed with the standard 12 leads, accompanied by V1 and V2 recorded at the 3rd or 2nd intercostal spaces or both. Evaluators were asked to determine whether each ECG was a Type 2 BP, so needing further assessment with Class I drug test, or an IRBBB (no further assessment needed). No clinical data about the patient were revealed to the participants, to avoid any suggestions. The same 14 ECGs, with a different order, were proposed fifteen days later to the same cohort to assess intra-observer variability.

Statistical Analysis: Inter-observer results were calculated using a Fleiss K. Intra-observer results were calculated using Cohen's K. The strength of agreement was categorized according to Landis and Koch. A K value <0.00 was rated poor; 0.00-0.20, slight; 0.21-0.40, fair; 0.41-0.60, moderate; 0.61- 0.80, substantial; and 0.81-1.00, almost perfect.

Results: In all three groups k value was <0.20 assessing only a slight agreement between partecipants of any categories. Agreement between diagnosis of the first and the second round of the survey, respectively for 5 arrhythmologists, 5 general cardiologists and 5 EP fellows, was calculated. Totally, a wide variability in k values was found in all groups. Arrhythmologists showed an intra-observer agreement ranging from fair to almost perfect. It seems slight better than general cardiologists and EP fellows, showing widest variability, from poor to moderate for general cardiologists and from poor to almost perfect for EP fellows.

Discussion: Data demonstrated poor reliability of diagnosis of type 2 BP in a cohort of cardiologists with different skills. Nowadays, diagnosis of type 1 BP, although rare, is relatively simple and within the reach of all cardiologists. On the other hand, Cardiologists with different experience are daily facing the question Type 2 BP vs. IRBBB in ECGs recorded for preoperative or sports screening. Our study demonstrated, for the first time, a wide inter-observer variability in the diagnosis of type 2 BP in categories of cardiologists with different abilities. Even arrhythmologists showed low agreement. Considering 5 operators per class, intra-observer agreement is fair to moderate overall with a slight superiority of arrhythmologists.

Conclusion: Reproducibility of type 2 Brugada Pattern diagnostic criteria is low, even among experts. These findings raises serious questions about basic screening, not counting the influence of clinical factors in the diagnosis. An initial selection bias may influence data in literature also in terms of risk of arrhythmic events. The extension of the pharmacological test to all patients with a positive terminal wave in V1 V2 turns out to be not feasible in clinical practice and above all not consistent. Thus, new diagnostic criteria with validated reproducibility are probably needed.

770 How to safely manage delivery of a pregnant woman with congenital AV block?

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Introduction: The incidence of congenital atrioventricular block (CAVB) is between 1 in 15,000 and 1 in 20,000 births. Whenever encountered in a pregnant women, CAVB presents a challenge for gynecologists and calls for a multidisciplinary approach involving cardiologists and anesthesiologists.

Case Report: A 40-year-old pregnant female underwent routinary cardiologic clinical assessment. 8 years ago an ECG showed 2: 1 AV block (presumably congenital). The electrophysiological study showed nodal AV block with adequate rate increase after atropine administration. 8 years later an ECG was taken when her gestation period was 38 weeks. Physical examination, apart from the pregnancy and low heart rate, was normal. She had not experienced any dizziness or syncope. The ECG showed complete heart block with an escape junctional rhythm at 35 b.p.m. Transthoracic echocardiography showed a structurally normal heart, excluding cardiomyopathy or significative valvular disease. Our approach to manage this complex clinical scenario contemplated a multidisciplinary team involving interventional cardiologists, gynecologists, neonatologists and anestesiologists. We programmed cesarian delivery in order to reduce unknowns of a spontaneous labour and to permit the active presence of all specialists. Lowdose combined spinal and epidural anesthesia was performed. A right jugular venous access was obtained with echography guidance. A 5 F steerable electrophysiological catheter was advanced via superior vena cava until reaching right atrium and leaved there, in order to reduce the possibility of perforation due to positioning in the right ventricle and in case of sudden bradycardia, to rapidly pass throughout the tricuspid valve and stimulate the right ventricle. During cesarian delivery no changes in hemodynamics were observed with a constant heart rate of 35 b.p.m. The baby delivered had a normal Apgar score. The mother underwent ECG monitoring for the following 4 days in an intensive unit. After delivery the ECG of the patient showed again 2: 1 AV block. However, considering the age of the patient, we proposed permanent pacing. So, a dual chamber pacemaker was implanted on 5th postoperative day in DDD mode 50/160bpm. Patient was discharged in good health three days after.

Discussion: Thirty per cent of congenital AV blocks remain undiscovered until adulthood, and may present for the first time during pregnancy. Current ESC guidelines affirm isolated congenital complete heart block has a favorable outcome during pregnancy, especially when the escape rhythm has a narrow QRS complex. On the other side, the risks of permanent pacemaker implantation during pregnancy are generally low, especially if the fetus is beyond 8 weeks gestation. Moreover, ESC guidelines suggestes vaginal delivery carries no extra risks in a mother with congenital complete heart block. However vaginal delivery cannot permit to organize an adequate setting. In case of symptomatic bradycardia, transvenous pacing should be established as soon as possible. For these reasons, an adequate venous access should be obtained, before the delivery guarantees minimal x-ray exposure to the fetus. In conclusion CAVB in a pregnant woman is a challenge that requires multidisciplinary approach. Our approach, including jugular venous access in the setting of a cesarean delivery, guarantees a quick emergency transvenous pacing with low risks.

191 Epidemiologic analysis in patients with persistent atrial fibrillation and spontaneous restoration to sinus rhythm: a single centre evaluation

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Background: Atrial fibrillation (AF) is the most commonly encountered supraventricular arrhythmia in an elderly population representing one of the leading causes for stroke, heart failure and all-cause mortality in the world. Historically, electrical cardioversion (EC) has been regarded as a safe and effective procedure in sinus rhythm (SR) restoration in AF patients, especially when AF onset is clearly assessed. Conversely, in the absence of hemodynamic compromise and when AF duration may not be clearly evaluated, a 3-week anticoagulation regimen is mandatory or a trans-oesophageal echo (TEE) strategy may be considered, if available. Notwithstanding, in this clinical scenario, some patients may present with spontaneous conversion to SR as assessed during ECG screening before EC.

Aim: The aim of this study was to assess the prevalence of spontaneous restoration to SR in patients with history of persistent AF scheduled for EC. Moreover, specific clinical features have been evaluated in this group of patients.

Methods: From April 2017 to June 2019, 260 consecutive patients (164 M) with persistent AF undergoing a scheduled EC procedure have been considered. Before EC, a 12-lead ECG has been performed for each patient and the spontaneous restoration to SR has been evaluated in the whole number of patients. Nevertheless, clinical data were available for 78 patients only (56 M, mean age 69 ± 12 years) and were considered as follows: age, sex, antiarrhythmic drugs, anticoagulant drugs, prevalence of chronic kidney disease, mean CHA2DS2VASc score, left ventricular ejection fraction (>50%), and left atrial enlargement (indexed volume> 34 ml / m2). Moreover these clinical data were compared in patients with spontaneous SR restoration to the ones with persistent AF before scheduled EC.

Results: Spontaneous restoration to SR was found in 65 out of 260 patients (25%). Where clinical data were available, 21 patients out of 78 (27%, mean age 73 ± 7 years) showed spontaneous restoration to SR. In this latter group of 21 patients, the vast majority were older and with a higher CHA2DS2VASc score. As shown in Table 1, comparing all the other clinical data in patients w/wo spontaneous restoration to SR, no statistical significance has been found.

Table 1

	Spont. SR	EC	p value
AGE	73.4 ± 7.4	67.6 ± 13	0.015
SEX (M)	57%	79%	0.09
NOACs/NVKAs	NOACs 47%	NOACs 76%	0.035
ANTIARRHYTHMIC DRUGS	40% AMIOD.	40% AMIOD.	0.89
MEAN CHA2DS2-VASc SCORE	$3.2 +/- 1.3$	$2.3 +/- 1.5$	0, 02
FEVS > 50%	18 (85%)	47 (93%)	0.3
LA enlargement (vol. $> 34\,ml/m^2$)	18 (85%)	46 (79%)	0.75
CKD	14 (67%)	40 (69%)	0.94

Conclusions: Spontaneous restoration to SR occurs in a non negligible rate of patients (25%) with a history of persistent AF undergoing a scheduled EC. The very preliminary data of our study showed a trend towards a greater probability of spontaneous conversion to SR in patients with higher CHA2DS-VASc in an older population. To confirm these data further studies are required, increasing the number of patients considered.

322 A novel score using left atrial volume index, gender, and age to predict the presence of low voltage zones in patients with atrial fibrillation: the Zentralklinik Bad Berka and University of L'Aquila (ZAQ) score

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Background: Pulmonary vein isolation (PVI) is the most effective therapy for patients (pts) with paroxysmal atrial fibrillation (AF). However, in pts with advanced structural atrial changes (both paroxysmal and persistent AF), substrate modification may be required although the ideal ablation strategy is still debated. Therefore, it would be helpful to assess the presence of substrate in the left atrium (LA) before the ablation. We hypothesized that indexed LA volume (LAVI) is (1) associated with the presence of low voltage zones (LVZ) identified by EVM in the left atrium and (2) helpful in developing a score that predicts the need for additional substrate modification during ablation.
Methods: We defined the cut-off value of LAVI and age which had the best accuracy to detect LVZ in receiver operating characteristic curve (ROC). Clinical predictors for the presence of LVZ were identified with regression analysis. These parameters were used to build a risk score (ZAQ Score: female gender, age ≥ 65 years and LAVI ≥ 57 ml/m^2). The risk score was subsequently validated in our institution.
Results: 374 patients (age 63 [56-70] years, 149 female, 152 persistent AF, Echo LA diameter 40 [37-43] mm, CT LA volume 115 [95-138] ml and CT LAVI 57 [48-68] ml/m^2. In the derivation cohort, the ZAQ score correctly identified the 75 pts with LVZ (AUC 0.81; 95% CI 0.76-0.86; p<.001). In the validation cohort, the predictive value of the ZAQ score was confirmed (AUC 0.786; 95% CI 0.700-0.827; p<.001).
Conclusions: The ZAQ score is able to identify pts with and without LVZ and may be helpful in planning the ablation strategy (i.e. Cryo balloon PVI vs RF PVI + substrate modification).

636 Late or early Twiddler's syndrome, should pacemaker generator replacement reset the stopwatch?

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Background: Twiddler's syndrome is a rare but potentially serious mechanical complication of cardiac implantable electronic devices (CIED) implantation. Different variants and several mechanisms have been described. Recognized risk factors for twiddler's syndrome development include old age, cognitive decline or psychiatric illness, obesity, female gender and oversized device pocket.
Case Description: We report the case of a 95 years old woman with twiddler's syndrome occurred three months after generator replacement of a dual chamber pacemaker previously implanted for symptomatic complete atrioventricular block. Routine follow-up with device electronic interrogation revealed device dysfunction with failure of both ventricular pacing and sensing. Chest X-ray highlighted the occurrence of leads retraction and coiling around pacemaker generator. On query, the patient admitted that she had repeatedly manipulated the pacemaker generator in the skin pocket. The patient was hospitalized and underwent contralateral de

novo implantation because of trapped and damaged leads. Additional safety suture of pacemaker generator to fascia was also performed.
Discussion: Despite the majority of cases are diagnosed within the first year, twiddler's syndrome may occur at any time after device implantation. In the described case, CIED was implanted seven years earlier but the patient underwent generator replacement during pacemaker elective replacement interval (ERI) just three months before the evidence of twiddler's syndrome. Although our patient was at high risk to develop the syndrome because of cognitive decline, old age and female gender, it occurred only after pacemaker generator replacement suggesting the hypothesis that such procedure may represent an additional risk factor for leads dislodgement.
Conclusions: Twiddler's syndrome, although rare, is increasingly recognized as a cause of idiopathic leads migration. Generator replacement of transvenous CIED may represent the trigger for twiddler's syndrome development.

795 Ultrasound-guided axillary vein cannulation for cardiac implantable electronic devices leads insertion

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Objective: To assess safety and feasibility of ultrasound-guided axillary vein cannulation for cardiac implantable electronic devices (CIEDs) leads insertion.
Background: In recent years, the axillary vein has been increasingly used for CIEDs placement due to large vessel size, rapid access, and the absence of leads crush. The available venography technique for axillary vein cannulation requires both fluoroscopy and contrast medium administration. Ultrasonography is a well-recognized radiation-free aid to central venous catheterization for jugular, subclavian and axillary veins. However, the safety and feasibility of an ultrasound-guided axillary approach for leads placement is poorly investigated.
Methods: In a retrospective observational study, we evaluated the safety of ultrasound-guided axillary compared to blind subclavian vein catheterization for leads placement in a cohort of 81 consecutive patients referred to our centre for CIEDs implantation. The primary endpoint is the incidence of puncture-related complications. Secondary endpoints are fluoroscopy time, access time, and 30-day pocket or device complications.
Results: 23 patients underwent an ultrasound-guided axillary vein catheterization and 58 a blind subclavian vein catheterization. Puncture-related complications were significantly lower in the ultrasound-guided compared to blind technique group (p = 0.040), due to lower rates of arterial puncture. Access time was significantly shorter in the ultrasound-guided group. There were no differences in fluoroscopy time and in the 30-day incidence of pocket or device complications.
Conclusions: Ultrasound-guided axillary vein catheterization is a safe and effective technique for CIEDs leads insertion. This technique reduces the incidence of puncture-related complications and is associated with shorter access time compared to blind subclavian vein catheterization.

805 Coronary atherosclerotic disease as additional risk factor to modify HCM risk-SCD score

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Background: Hypertrophic cardiomyopathy (HCM) is the most common genetic cardiovascular disease, characterized by a very heterogeneous clinical presentation with arrhythmic sudden death, and progressive heart failure.
Myocardial ischemia is related to structural abnormalities of the vessels itself, to their intramural route, both associated with mismatch of myocardial oxygen supply; nevertheless, currently available reports show that up to 20% of patients with HCM have coronary artery disease (CAD) as coexistent risk factor. Nowadays, there is a gap in literature about the outcome of coronary artery disease in HCM patients; moreover, it is not known to what extent coronary artery disease can increase the risk of arrhythmias (either brady- or tachy-arrhythmias) and therefore have an impact on the risk score of HCM patients.
Methods: Our inherited arrhythmia clinics to date recruited 34 patients diagnosed with HCM. HCM Risk-SCD was calculated according to parameters indicated by current guidelines. Devices for cardiac rhythm management (implantable cardioverter/defibrillator, ICD; subcutaneous-ICD, S-ICD; pacemaker, PMK) were implanted when needed. The cohort presented with 14 patients with concomitant CAD requiring coronary angiography; such subgroup was investigated for the occurrence of arrhythmic burden.

Results: ICDs implanted were higher in HCM patients with concomitant CAD. HCM-CAD patients displayed a significantly higher HCM Risk-SCD Score compared to HCM and no CAD (5.9 ± 1.8 vs. 4.8 ± 1.3, $p < 0.05$). Occurrence of genetic mutations, on the contrary, was observed only in noCAD hypertrophic subjects (TNNI3, JUP, MYBPC3). In order to assess the arrhythmic burden, HCM-CAD patients were divided into 3 subgroups: a) device-treated cases (N = 4); b) standard medical therapy and arrhythmias (N = 3); c) no device and no arrhythmias (N = 7). Interestingly, the observed arrhythmias at follow-up included advanced atrio-ventricular blocks, atrial fibrillation and intraventricular conduction disturbances. During a mean follow-up of 4 ± 3 years, cardiovascular mortality was 7.14%. Univariate and multivariate analyses revealed that an intermediate/high HCM Risk-SCD in patients with HCM and concomitant coronary artery disease could be identified as an effective cut-off point which evaluates the higher arrhythmic burden.

Conclusions: We found that patients with HCM and concomitant epicardial coronary atherosclerotic disease have certainly a worse outcome due to cardiac arrhythmias. The current score does not take into account the important role of coronary artery disease that can impact on the prognosis in HCM.

605 Cryptogenic stroke and asymptomatic atrial fibrillation in a real-world population: an implantable cardiac monitor study

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Background: The incidence of atrial fibrillation (AF) in cryptogenic stroke (CS) patients has been studied in carefully controlled clinical trials, but real-world data are limited. Aim of this study was to investigated the incidence of AF in clinical practice among CS patients with an implantable cardiac monitor (ICM) placed for AF detection.

Methods: Patients with CS admitted to our Stroke Unit were included in the study; they received an ICM and were monitored for up to 2 years for AF detection (in-hospital clinic and remote monitoring). All detected AF episodes ($\geq$30 sec) were considered.

Results: From March 2016 to March 2019, 58 patients (mean age 68 ± 12 years, 67% male) received an ICM to detect AF after a CS. No patients were lost to follow-up.

AF was detected in 23 patients (40% overall; AF group mean age 72 ± 11 years; 65% male) after a mean time of 6 months from ICM implantation (ranging from 2 days to 2 years) and 8 months after CS (ranging from 1 month to 2 years) (detection rates over time are reported in the figure below).

In these AF patients anticoagulant treatment was prescribed and no further stroke.
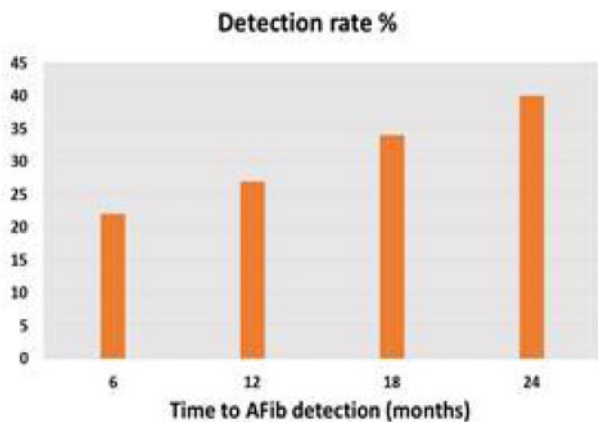
Conclusions: AF episodes were detected via continuous monitoring with ICMs in 40% of implanted CS patients. AF after CS was asymptomatic and thus unlikely to be detected by strategies based on intermittent short-term recordings. Therefore, ICMs should be considered as part of daily practice in the evaluation of CS patients.

835 Inadvertent S-ICD lead malpositioning in a familial type 1 Brugada syndrome

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Subcutaneous implantable cardioverter defibrillator (S-ICD) represents a valid alternative to traditional ICD in patients who do not require anti-bradycardia pacing. The implantation technique is easy and both the heart and the vessels are left untouched, thus avoiding lead complications.

Case report: A 21 years old man with familial type 1 Brugada Syndrome was referred to our emergency department for unexplained syncope and iterative unsustained ventricular tachycardia. Three first-degree relatives suffered a juvenile sudden cardiac death. According to guidelines, the patient was given the indication to ICD implantation. Given his young age and no need for anti-bradycardia pacing, we suggested an S-ICD system. The S-ICD was implanted according to the two-incision technique, with an intermuscular pocket. The lead was positioned vertically in the subcutaneous tissue, 2 cm sternal midline, left. The induction test was performed, but the S-ICD was not able to restore normal sinus rhythm by a 65-Joules biphasic shock (standard configuration) despite 64-Ohm shock impedance. An external shock of 270 Joules was required. Even the defibrillation test in the reverse polarity mode (65 Joules) failed to restore sinus rhythm (Fig. 1). Again, the shock impedance was 64 Ohms. The system position was reassessed by both postero-anterior and latero-lateral chest fluoroscopy. As a matter of facts, not all the coil lead was on the fascial plane. May be, during vertical tunnellization, the insertion tool was moved up and the tip of the lead was inadvertently positioned within the subcutaneous adipose tissue over the sternum (Fig. 2). The lead was then repositioned and checked in latero-lateral fluoroscopy (Fig. 3). During a new induction test, the S-ICD promptly restored sinus rhythm by a single biphasic 65-Joules shock (Fig. 4). The shock impedance decreased to 46 Ohms.
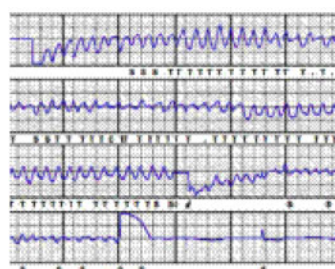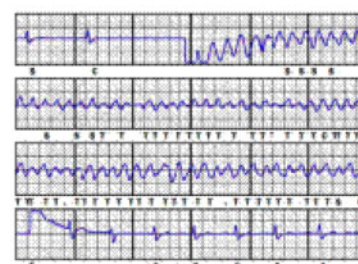

Figure 1

Figure 2

Figure 3

Figure 4

Discussion: The S-ICD system is easy and safe to implant, and long-term lead complications can be avoided. Some implanting cardiologists no longer perform induction test and simply consider shock impedance safely predictive for shock efficacy. In an S-ICD system, the can and the lead have to be positioned in contact with the fascial planes, since the adipose tissue between can or coil lead and chest wall significantly reduces shock efficacy, thus raising defibrillation threshold.

Conclusions: Shock impedance alone should not be considered as a safe predictor for shock efficacy of an S-ICD system. The absence of adipose tissue under the coil lead should be checked in a latero-lateral fluoroscopy before induction test or shock failure, and mostly, if induction test is not performed.

## 852 Sleep Apnea and association with atrial fibrillation in an unselected pacemaker population

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Background: Patients with atrial fibrillation (AF) often have sleep apnea (SA), but diagnosis of SA with polysomnography is rather expensive. SA monitoring is a

	Patients with severe sleep apnea	Patients without severe sleep apnea	Difference [95% CI]; p-value
Main analysis - First co-primary endpoint (FAS)	N=172	N=381	
Significant AF at 12 months, % (n)	25.0% (43)	13.9% (53)	11.1% [3.7;18.4]; p=0.002
Sensitivity analysis - First co-primary endpoint (mITT)*†	N=321	N=698	
Significant AF at 12 months, % (n)	24.9% (80)	13.2% (92)	11.7% [6.4;17.1]; p<0.001
Main analysis - Second co-primary endpoint (mITT)†	N=312	N=712	
Major serious adverse events at 18 months#, % (n)	8.7% (27)	5.9% (42)	2.8% [-0.8;6.3]; p=0.065‡
Death	5.1% (16)	2.4% (17)	2.7% [0.05; 5.4]; p=0.023‡
Myocardial infarction	0.6% (2)	0.4% (3)	0.2% [-0.8; 1.2]; p=0.33
Stroke	1.0% (3)	0.3% (2)	0.7% [-0.5; 1.8]; p=0.12
Re-intervention	2.6% (8)	2.8% (20)	-0.2% [-2.4; 1.9]; p=0.59

Abbreviations: AF, atrial fibrillation; FAS, full analysis set; mITT, modified intention-to-treat; NA, not applicable.
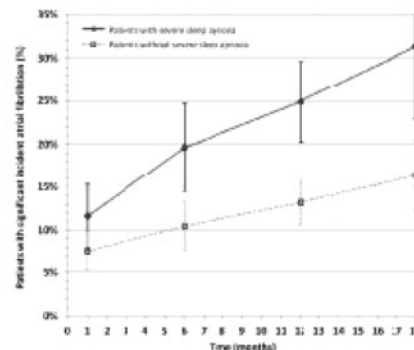
852 Figure

pacemaker algorithm that measures respiratory disturbance index, the extent of abnormal respiratory events divided by sleep duration.

Purpose: To evaluate the incidence and severity of SA and its association with AF in an unselected pacemaker population, the following multicenter study was performed.

Methods: RESPIRE (Registry of Sleep Apnea monitoring and Atrial Fibrillation in pacemaker patients) was an international, multicenter, observational, open-label study following adult subjects with an SA monitoring-enabled dual-chamber pacemaker for 18 months after implantation. Severe SA was defined as average respiratory disturbance index $\geq$ 20 from implantation to follow-up visit. The first co-primary Endpoint was the difference in significant AF (cumulative AF episodes lasting $\geq$ 24 hours over two consecutive days) between subjects with severe and those with nonsevere SA at 12 months in the full analysis set (N = 553). The second co-primary Endpoint was the rate of major serious adverse events at 18 months in the modified intention-to-treat set (N = 1024).

Results: Severe SA was detected in 31.1% (172 of 553, left Table). A higher incidence of significant AF was observed in patients with severe SA as compared to patients with nonsevere SA (25.0% vs 13.9%; difference 11.1%; 95% confidence interval 3.7% - 18.4%; $p = 0.002$). In both groups, significant AF increased over time, but a faster rate was observed in the severe SA group (right Table). No differences between the groups in the overall rate of major adverse events was observed ($p = $ NS).

Conclusions: SA screening over 12 months identified severe SA in almost one-third of unselected pacemaker patients. Severe SA was associated with a higher incidence of significant AF.

886 Etna-AF-Europe: first 1-year follow-up snapshot analysis of more than 12, 500 AF patients treated with edoxaban in routine clinical practice

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Introduction: Edoxaban has been approved for stroke prevention in patients with atrial fibrillation based on its comparable efficacy and superior safety compared to warfarin in the pivotal ENGAGE AF-TIMI 48 trial. Evidence from real-world studies has demonstrated the safety of different NOACs in routine care; moreover, real-world data are currently emerging for edoxaban and will complement the findings from the randomised trials. ETNA-AF Europe (NCT02944019) was initiated in agreement with the EMA to evaluate benefits and risks of edoxaban treatment in unselected patients in routine clinical practice.

Methods: ETNA-AF-Europe is a multinational, multicentre, observational, post-authorisation, safety study conducted in 825 sites in 10 European countries (Austria, Belgium, Germany, Ireland, Italy, The Netherlands, Portugal, Spain, Switzerland and United Kingdom). A total of 13, 980 patients were enrolled, and will be followed-up for 4 years. This snapshot analysis includes baseline and first outcome data of 12, 574 patients (89.9 % of all enrolled patients) that have completed their first 1-year follow-up visit (mean follow-up: 348 days). The ETNA-AF-Europe 1-year follow-up data are reported here and these data have been compared with data from European countries that participated in the ENGAGE AF-TIMI 48 trial.

Results: The average age of patients was 73.6 years, the mean weight was 81 kg. More than 50% of the patients were $\geq$75 years of age. Frequent comorbidities include hypertension (77%), valvular heart disease (17.9 %), and heart failure (6 %). Most patients (76.6%) received edoxaban 60 mg dose; patients receiving the 30 mg dose (23.4%) were older, had a lower creatinine clearance and had a higher risk for both stroke and bleeding.

Baseline characteristics for ETNA-AF Europe and the European cohort of ENGAGE-AF-TIMI 48 were broadly similar. In the ETNA-AF-Europe, patients were older, more frequently female, with lower weight and creatinine clearance.

Overall, the incidence of clinical events in ETNA-AF-Europe was low: major bleeding 1.05%/y, intracranial Haemorrhage 0.23%/y, any stroke or systemic embolic events 0.82 %/y, all-cause mortality: 3.55 %/y. Rates of intracranial Haemorrhage were low irrespective of the edoxaban dose.

Lower rates of major bleeding and stroke/SEE were observed in ETNA-AF Europe compared with the European cohort of ENGAGE AF-TIMI-48 (2, 12 %/y and 1, 56 %/y, respectively); all-cause mortality was slightly higher in patients receiving edoxaban 30 mg dose in ETNA-AF-Europe (7, 27 %/y) respect to the European cohort of ENGAGE-AF-TIMI 48 (5, 80 %/y), in line with the higher age of this patient group. Cardiovascular mortality was slightly lower in ETNA-AF-Europe compared with the European cohort of ENGAGE-AF-TIMI 48 (1, 67 %/y vs 2, 46 %/y).

Conclusions: We found low bleeding and stroke rates in 12, 574 unselected, mainly elderly AF patients treated with edoxaban in routine clinical practice. These findings were consistent across edoxaban doses and reinforce the effectiveness and safety of NOACs such as edoxaban in routine clinical care in Europe. Moreover, these findings confirm the results reported in randomized trials.

214 Short term impact of bilateral cardiac sympathetic denervation for ventricular arrhythmias on cardiac function

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Background: Bilateral Cardiac Sympathetic Denervation (BCSD) has been recently proposed for the treatment of refractory ventricular arrhythmias (VAs) in patients with structural heart disease (SHD). No major safety concerns have been reported so far; yet, the short-term impact of BCSD on cardiac function is poorly characterized. **Aim:** to assess short-term echocardiographic changes after BCSD in patients with SHD.

Methods: Patients with SHD undergoing BCSD for VAs were studied. Transthoracic echocardiographic assessment was performed within 48 hours before and 7 days after

BCSD. Pre and post procedural data were compared with Wilcoxon test.

Results: 13 patients (85% male, 54 ± 16 years, 69% with non-ischaemic cardiomyopathy) underwent thoracoscopic BCSD at one centre between 2016 and 2019. Mean LVEF at BCSD was $31 \pm 13\%$, 54% had mitral regurgitation (MR) $\geq$ moderate, 92% had an ICD, 31% a CRT-D, 69% presented with NYHA class $\geq$ 2. Indication for BCSD was elective in 54%, urgent in 31% and emergent (cardiac arrest) in 15%. Most (77%) required intraprocedural inotropic drugs infusion (dobutamine $\pm$ noradrenaline) starting from the induction of general anesthesia, but none had subsequent hemodynamic deterioration during single lung ventilation and/or sympathetic chain removal. Surgery was successful in all patients, with no major procedure-related complications. One patient died 12 days after BCSD because of septic shock. The remaining patients were all alive at last Follow-up (median 10 months, freedom from ICD shock 62%). Ongoing drugs at echocardiographic assessments were similar. No significant differences were observed in biventricular dimensions, traditional markers of systolic function (LVEF, TAPSE, FAC) and diastolic function (Deceleration time, E/A, E/e'), degree of MR and arterial pulmonary pressure indices. Additionally, 7 patients had available data on myocardial strain. Both left ventricular (LV) and right ventricular (RV) global longitudinal strain (GLS) were not significantly affected by BCSD [Figure 1a and 1b, respectively].
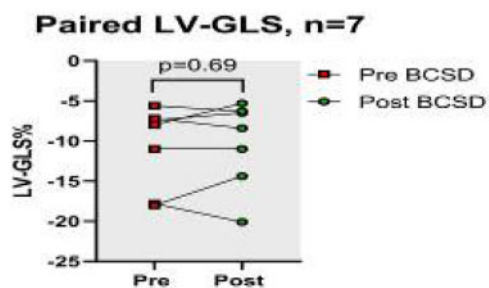

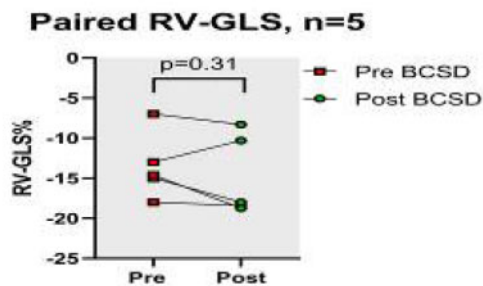
Figure 1a- Short-term changes in LV-GLS

Figure 1b- Short-term changes in RV-GLS

Conclusion: This is the first report about the short-term impact of bilateral cardiac sympathetic denervation (BCSD) on cardiac function in patients with systolic heart failure. Our case series, the largest reported in Europe, suggests that BCSD, despite almost completely depriving the heart of its extrinsic sympathetic innervation, has no detrimental effects on cardiac function at rest. Additionally, no major complications occurred, and long-term freedom from ICD shocks was remarkable. These data reinforce the strong rationale for BCSD, performed in expert centers, in the management of patients with cardiomyopathy and drug/ablation refractory ventricular arrhythmias.

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720 Axillary vein access using fluoroscopic landmarks or ultrasound-guided for permanent pacemaker and implantable cardioverter defibrillator implantation: this is the dilemma

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Introduction: Axillary vein access (AVA) using fluoroscopic landmarks is an effective approach for permanent pacemaker (PM) and implantable cardioverter defibrillator (ICD) implantation, and offers the potential to avoid complications usually observed with traditional subclavian vein approach. However, this approach may result in a higher radiation exposure for physician and patient. Recent results demonstrated that ultrasound-guided axillary access (UAA) is a safe and effective alternative technique to conventional subclavian access for device lead insertion. Studies comparing UAA and AVA using fluoroscopic landmarks are lacking.

Aim: to compare the safety, efficacy and radiation exposure data of the UAA approach to the AVA using fluoroscopic landmarks.

Methods: This randomized comparative study included 70 patients [60 % male with a median age 78 years, (IQR 70.2 -85 years)] referred for PM or ICD implantation between May 2019 and August 2019. Patients with cardiac resynchronization therapy indication were excluded. Clinical, lead/device characteristics and radiation exposure data [including median effective fluoroscopy time (sec.), pedal fluoroscopy time (sec.) and median dose-area product (DAP, Gy-cm^2)] were compared.

Results: 28 patients underwent the UAA and 42 patients underwent the AVA using fluoroscopic landmarks. The total implanted leads were 102 including 70 right ventricular leads and 32 right atrial leads. UAA was successful obtained in 27 (96 %) patients. In these cases AVA was obtained by using fluoroscopic landmarks. Median effective fluoroscopy time, pedal fluoroscopy time and median DAP were statistically significant shorter for UAA compared with AVA using fluoroscopic landmarks (7, 00 sec vs 21, 00 sec $p < 0.001$; 103.00 sec vs 264.00 sec $p < 0.001$; 2.72 Gy-cm^2 vs 9.89 Gy-cm^2 $p < 0.001$ respectively). There were no significant differences between the two groups in median implant procedure time [UAA 50 min (IQR 40 min - 67.5 min) vs AVA using fluoroscopic landmarks 60 min (IQR 50 min - 70 min); $p = 0.16$)].

No complications were observed among the two different approaches.

Conclusions: our preliminary results demonstrated that AVA ultrasound-guided is a safe and effective approach for PM and ICD implantation and offers the possibility to decrease the risk of radiation.

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234 What about quality of life in atrial fibrillation patients?

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Background: Patients with atrial fibrillation (AF) may experience an impairment in quality of life (QoL) and therefore, QoL represents an important therapeutic goal in patients' management, as well as a topic of great interest given the lack of information in this field.

Aim: To evaluate QoL through a specific questionnaire to better define the factors that can impact on patient's life.

Methods: Consecutive AF in- and outpatients presenting to our Cardiology Division between February 1st 2016 to June 30th 2017 were requested to complete a QoL questionnaire, after delivery of a written informed consent. Patients were enrolled in the study if: i) age > 18 years; ii) diagnostic ECG of AF has been made within one year before the date of screening. Actual presence of AF at the time of enrollment was not requested and AF not necessarily was the cause of admission. Patients with atrial flutter as the only arrhythmia documented were excluded. Clinical data, ECG tracings, echocardiogram reports and results of blood samples were collected. QoL and symptoms were evaluated by the administration of specific questionnaires (5Q-5L) at baseline, based on a scoring system (the lower the score, the better the status). Furthermore, we made the sum of the score and subdivided the cohort in 2 groups according to the median of the score related to AF status questionnaire (AFS). **Results:** Within the original cohort of 431 patients, 328 patients completed the questionnaire, mean age 72 ± 11, 197 (60.1%) males, mean CHA$_2$VA$_2$Sc score 3.39 ± 1.82, mean HASBLED score 1.40 ± 0.97, were enrolled. Ninety-three (28.4%) patients were not receiving anticoagulation, while 78 (23.8%) were on warfarin, 127 (38.7%) on a direct oral anticoagulant (DOAC) and 30 (9.1%) on heparin. The median value of AFS was 7. No significant differences were found in perception of well-being among different patterns of AF (total score for AFS for paroxysmal AF 8.93 ± 5.97 vs persistent AF 8.57 ± 5.88 vs permanent AF 8.40 ± 7.18 vs first detected AF 6.44 ± 5.22; $p = 0.189$) but the ability to deal with usual activities was more affected in permanent AF (paroxysmal AF 1.55 ± 1.41 vs persistent AF 1.27 ± 1.42 vs permanent AF 1.82 ± 1.5 vs first detected AF 1.16 ± 1.4; $p = 0.007$). Intolerance to drugs was worse for paroxysmal and persistent form (paroxysmal AF 0.43 ± 1.09 vs persistent AF 0.45 ± 1.07 vs permanent AF 0.15 ± 0.64 vs first detected AF 0.08 ± 0.4; $p = 0.011$). Patients with a worse QoL (AFS $\geq$ 7, overall $158 = 48.2\%$) were mostly females (83, 52.9%)(OR 2.97; 95%CI 1.88-4.70; $p < 0.001$), mean age 72 ± 13. Use of warfarin was associated with AFS $\geq$ 7 (OR 1.77: 95%CI 1.06-2.97; $p = 0.030$) while the same association was not found for DOAC therapy (OR 1.043; 95%CI 0.669-1.627; $p = 0.852$). The items of the QoL questionnaire more affected by VKA therapy were mobility restriction (no/slight 49 [20.4%] vs moderate/severe 29 [33%] OR 1.92; 95%CI 1.11-3.30; $p = 0.018$) and limitation in usual activities (no/slight 49 [20.1%] vs moderate/severe 29 [34.5%] OR 2.10; 95%CI 1.21-3.63; $p = 0.007$). At multivariable logistic regression female sex (OR 3.84; 95%CI 2.19-6.72; $p < 0.001$) and prior use of antiarrhythmic drugs (OR 2.77, 95%CI 1.01-7.65; $p = 0.049$) were independent predictors of AFS $\geq$ 7, while VKA use failed to reach statistical significance.

Conclusions: AF patterns affected QoL only in specific items regarding attendance of daily activities and intolerance to drugs. The type of anticoagulant has a role in worsening QoL but the independent predictors of a worse QoL were female sex ad use of antiarrhythmic drugs.

412   Amiodarone therapy for ICD intervention prevention. AN observational single centre cohort study

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Introduction and Aim: Medicine evolution, particularly in the Cardiology field, bring us longer survivals to acute coronary syndrome and cardiovascular diseases. Nonetheless, the other face of the medal is the increasing number of patients suffering from Heart Failure (HF) in its broad spectrum of manifestations, from acute HF to life-threatening arrhythmias. Implantable Cardioverter Defibrillators (ICDs) represent a clear answer to the latter clinical problem. However, even an appropriate ICD intervention has a huge impact on patients' life. For this reason, in our paper, we tried to assess whether Amiodarone could reduce ICD appropriate interventions.
Methods: This work represents an observational study of a cohort of consecutive patients from a single institution. The study was carried out according to the latest international guidelines and to the Declaration of Helsinki. We screened 4157 implantation procedures performed in our centre, identifying 637 consecutive patients who received an ICD in primary or secondary prevention, considering the period 2010-2016. Other inclusion criteria were: clinical follow-up at least every 6 months, assessing symptoms, recent medical history, medications and technical functioning of the device. Considering pre-implantation clinical and psychological screening and the prognosis evaluation, no exclusion criteria was applied. For patients who underwent heart transplantation, the follow-up was closed on that date. Clinical decision to prescribe or not amiodarone, was not influenced by the authors and was leaved to single physician choice. Every patient was on optimal medical therapy (OMT). Every ICD intervention was assessed through direct ICD interrogation, excluding those not confirmable. In every case, an experienced electrophysiologist was consulted for independent adjudication. Statistical analysis was performed applying SPSS 24.0. Continuous variables were compared with t-test. Categorical data were tested with chi-square test.
Results: 521 patients matched the inclusion criteria and were enrolled. The major indication for ICD implantation was Ischaemic Heart Disease (276 patients, 53%), followed by non-ischaemic Dilated Cardiomyopathy (DCM) (156 patients, 30%). 405 patients received ICD for primary prevention (Ip), while 116 for secondary prevention (IIp). Mean Left Ventricular Ejection Fraction (LVEF) was 27% ($+/-$ 6%) in Ip and 38% ($+/-$ 12.8%) in IIp. No statistically significant differences resulted between Ip and IIp considering QRS width and medical therapy. 19% of Ip and 41% of IIp were on amiodarone (A). After a mean follow-up of 67 months, in Ip patients, there were no differences in the rate of appropriate shock (15.3% A vs 13.7% nA, p = 0.699) and ATP intervention (16% A vs 15.2% nA, p = 0.965). These results were also confirmed for IIp patients (Shock 15.9% A vs 18% nA, p = 0.541; ATP 16% A vs 15.2% nA, p = 0.231).
Conclusion: In our study, amiodarone did not show a significant reduction of ICD intervention in primary and secondary prevention ICD patients. The observational nature of our work is an intrinsic limit of these findings and further randomized clinical trial are needed to confirm our results.

446   Brugada syndrome: a peculiar case of late diagnosis in a patient with resuscitated cardiac arrest

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Brugada syndrome is an inherited disorder characterized by increased risk of ventricular fibrillation and sudden cardiac death in patients with structurally normal heart. Diagnosis is based on a peculiar electrocardiographic pattern consisting of coved type ST-segment elevation $\geq$ 2 mm followed by a negative T-wave in one or more precordial leads from V1 to V3 positioned in the second, third, or fourth intercostal space (type 1 Brugada ECG pattern), occurring either spontaneously or after provocative drug test with intravenous administration of sodium channel blockers (typically ajmaline or flecainide).
A 22 year-old man, during a football game, had a cardiac arrest due to ventricular fibrillation effectively interrupted by one external DC shock. The patient had no familial history of sudden cardiac death and no other cardiovascular risk factors. On hospital admission, ECG showed sinus rhythm and no evidence of cardiac ischemia or channelopathy. Coronary angiography and laboratory tests were normal. Transthoracic echocardiography showed a mild mitral prolapse and no other structural abnormalities. Twenty-four hour Holter monitoring with 12 leads failed to show ventricular arrhythmias, but revealed isolated supraventricular premature beats; the QT interval was normal. During a treadmill test, supraventricular premature beats and one supraventricular tachycardia episode were recorded. Cardiac magnetic resonance imaging showed no heart abnormalities, and no late gadolinium enhancement was present. A flecainide challenge (2 mg/kg i.v. over 10 min), with the right

precordial leads positioned on the second, third, and fourth intercostal spaces did not reveal a type 1 Brugada ECG pattern. Genetic screening using a custom panel containing 47 genes associated with cardiomyopathies as well as to channelopathies was performed. Because of the resuscitated cardiac arrest with documented ventricular fibrillation, a subcutaneous implantable cardioverter defibrillator (S-ICD) was implanted. The patient was discharged diagnosed with idiopathic ventricular fibrillation and he received beta-blocker therapy. Two months later, S-ICD home monitoring system showed atrial flutter. Therefore, anticoagulant therapy was started and three weeks later, electrical cardioversion was successfully performed. A heterozygous variant of uncertain significance in the SCN5A gene was identified. Subsequently, ECG revealed a spontaneous occurrence of the type 1 Brugada pattern. Ajmaline test (0.7 mg/kg i.v.) was performed with positive result. Quinidine was prescribed at daily dose of 825 mg. S-ICD home monitoring system later revealed recurrence of the atrial flutter and atrial flutter ablation was performed. This clinical case shows that a negative flecainide challenge does not rule out Brugada syndrome even if the patient was resuscitated from cardiac arrest and that a spontaneous and intermittent type 1 Brugada ECG pattern suggests performing a long-term follow-up with repeated ECGs. The combination of a negative basal ECG and a negative flecainide test with the right precordial leads positioned in the second, third, and fourth intercostal spaces could lead to missing the diagnosis of Brugada syndrome, a crucial step for both patient management and family screening. In conclusion, a negative flecainide test after resuscitated cardiac arrest is not sufficient to exclude Brugada syndrome, and close long-term follow-up with repeated ECGs is necessary to detect the spontaneous type 1 Brugada ECG pattern. Moreover, an ajmaline challenge could be the test of choice in patients with suspected Brugada syndrome.

301   The wrong exam at the right time: a case of ventricular tachycardia induced by coronary vasospasm

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Introduction: Coronary vasospasm is an uncommon but important cause of myocardial ischemia and malignant ventricular arrhythmias.
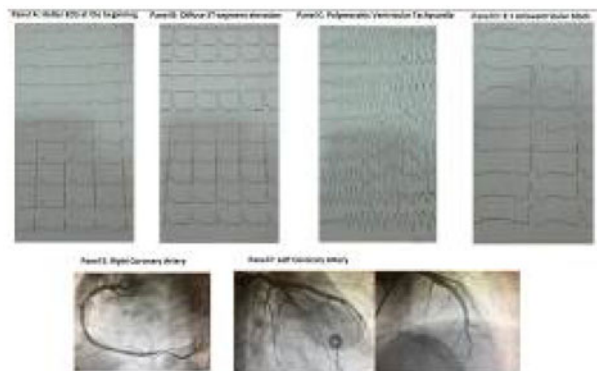
Case Presentation: In this case report, we present a striking example of vasospasm manifesting as ST-segment elevation and ventricular tachycardia on electrocardiographic (ECG) Holter monitoring effectively managed with calcium channel blockers. A 48-year-old man was referred to our outpatient clinic after a syncope which was preceded by constrictive chest pain irradiated to the neck. He described similar episodes of chest pain at rest in the last month, all self-limiting and lasting 10-15 minutes. The patient did not have any cardiovascular risk factor nor family history of sudden cardiac death. He did not take any medication and he did not have any allergy or medical problem in the past. Physical exam was completely normal. A 12-lead Holter ECG monitoring was suggested. During the test, the patient had another syncope preceded by the same symptoms that correlated with progressive ST-segment elevation in all the leads, except DI, aVL, aVR and V1, leading to episodes of self-terminating polymorphic ventricular tachycardia (Figure 1 A-C) and followed by a phase of 2: 1 atrioventricular block (Figure 1D). After this episode the patient was admitted to our hospital. The urgent coronary angiography (Figure 1 E-F) did not show the presence of significant coronary stenosis. The most likely diagnosis was coronary artery vasospasm. The patient was treated with oral calcium channel blockers (diltiazem 210 mg daily divided into three doses) that showed to be effective in managing symptoms and preventing recurrences.

Discussion: Contemporary guidelines on implantable cardioverter defibrillator (ICD) therapy do not specifically address recommendations for secondary prevention after life-threatening ventricular arrhythmias due to vasospasm. The arrhythmic risk of coronary vasospasm is variable, ranging from 2% to 17%. Risk stratification is important to effectively identify high-risk patients who may benefit from ICD implantation. A risk prediction score has been developed by the Japanese Coronary Spasm Association (JCSA) that includes: out of hospital cardiac arrest (4 points), smoking history, documented angina, significant coronary stenosis, or multi-vessel spasm (2 points each), ST-segment elevation or spasm while on beta blocker therapy (1 point each). Patients who score $\geq$6 are at the highest risk, with a predicted risk of major adverse cardiac events of 13%. However, this score was developed and validated in an East Asian population and there is no proof for its applicability to other ethnicities. In this case, the risk of malignant arrhythmia recurrence was considered to be low (2) according to the JCSA risk score and a reversible cause for the arrhythmia was identified and effectively treated making very low the probability of recurrence. Therefore, an implantable cardioverter defibrillator was not implanted. This clinical case highlights the importance of identifying the cause of an arrhythmic episode in order to introduce an effective therapy. Moreover, it underlines the importance of properly stratifying the arrhythmic risk before considering the implantation of an implantable cardioverter defibrillatoarg.

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749 Age-related differences in oral anticoagulant therapy between Italian and Western Europe countries patients with non-valvular atrial fibrillation. Insights from the GLORIA-AF registry

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Introduction: Atrial fibrillation (AF) is the most frequent sustained arrhythmia found in clinical practice. Despite the association of AF with thromboembolic (TE) events, and with dementia, the use of oral anticoagulant therapy (OAC) is still unsatisfactory. Non-Vitamin K oral anticoagulants (NOACs) could allow a wider use of OAC. The aim of this study was to compare the clinical characteristics of NVAF patients taking NOACs or Vitamin K antagonists (VKA) in Italy and in the other Western Europe Countries (OWE).
Methods: The Global Registry on Long-Term Antithrombotic Treatment in Patients with Atrial Fibrillation (GLORIA-AF) Registry Program is a large, global, prospective study, involving newly diagnosed AF patients with >1 stroke risk factors. The registry consists of three overlapping phases. Present analysis refer to the baseline characteristics in GLORIA-AF Phase III, including all eligible patients, independently of the prescribed OAC. Patients were also stratified into two age-groups (<75 and >75 years). Comparisons of baseline characteristics and antithrombotic therapy between Italy and OWE were based on standardized differences (SD; unbalanced distributions for values >0.10).
Results: Between 2014 and 2016, 9135 (43.0%) patients out of 21, 248 in Phase III were enrolled from Western European countries. Italian and OWE subjects were 1378 and 7757, respectively. Patients in the age group of >75 years were 47.8% (N = 659) and 44.8% (N = 3473) for Italy and OWE, respectively. No differences in age, gender and TE risk were noticed by area of origin both in the younger (Italy—age: 65 $\pm$ 8 years; men: 61.5%; CHA$_2$DS$_2$-VASc score: 2.4 $\pm$ 1.2 / OWE—age: 65 $\pm$ 7 years; men: 61.5%; CHA$_2$DS$_2$-VASc score: 2.5 $\pm$ 1.2) and in the older (Italy—age: 81 $\pm$ 5 years; men: 45.8%; CHA$_2$DS$_2$-VASc score: 4.2 $\pm$ 1.2 / OWE—age: 81 $\pm$ 5 years; men: 48.1%; CHA$_2$DS$_2$-VASc score: 4.3 $\pm$ 1.3) group. In the whole population, OAC was less adopted in Italy compared to OWE (84.0 vs. 90.6%, SD=-0.20). Regarding the <75 years group, OAC was prescribed less frequently in Italian than in OWE patients (80.4 vs. 90.2%; SD=-0.28). This was especially true for NOACs (49.8 vs. 67.6%; SD=-0.37). Also the use of antiplatelet therapy (9.0 vs. 4.6%) and the lack of any anti-thrombotic drug (10.6 vs. 5.2%) were more common in the younger Italian subjects. In the >75 years population, no differences existed between Italy and OWE in the prescription of oral anticoagulants (87.9 vs. 91.1%) and, especially, of NOACs (60.5 vs. 63.5%). The proportion of those taking antiplatelets did not differ between older Italian and OWE (6.4 vs. 4.9%) subjects; the same was true for those not receiving any drug (5.8 vs. 4.0%). On the whole, lower dosages of NOACs were more frequently found in Italian patients as compared to OWE patients, particularly in those treated with rivaroxaban 15 mg QD (29.8 vs. 16.6%; SD = 0.32) and apixaban 2.5 mg BID (28.6 vs. 20.2%; SD = 0.20). Small differences were observed for dabigatran 110 mg (47.2 vs. 40.7%; SD = 0.13). These findings can be explained by a more frequent use of the lower NOACs doses in >75 years Italian patients. Proton pump inhibitors (PPI) for gastric protection were more often chosen in Italy than in OWE (43.0 vs. 29.0%; SD = 0.30) independently of age and OAC.
Conclusions: GLORIA-AF Phase III results show the existence of relevant differences in OAC use between Italy and other Western European Countries. Older Italian NOACs users more often receive the lower dosages of the drugs. The prevalence of those not taking anticoagulants is still high, highlighting the importance of a better AF management in routine clinical practice.

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845 Preventing sudden cardiac death (SCD) with subcutaneous ICD (S-ICD): a single-centre experience

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Introduction: Despite the evolution of transvenous implantable cardioverter defibrillator (ICD) during the last 30 years, associated short- and long-term risks (e.g. surgical complications, lead malfunctions and infections) remain unacceptably high. In the attempt to overcome such limitations, subcutaneous implantable cardioverter defibrillator (s-ICD) became available for clinical use since 2009 providing a valuable alternative to transvenous ICDs in patients without pacing needs.
Aim of the Study: To study the efficacy and safety of s-ICD in real world cohort of patients consecutively implanted at a single high-volume Institution.
Results: 62 patients (female = 8, 12.9%) underwent s-ICDs implantation between 2014 and 2019. Mean age at implant was 53 yrs ($\pm$14yrs) and primary prevention of SCD was the main indication (40 patients, 64.5%). Underlying aetiology of cardiac disease was mostly ischaemic (27 patients, 43.5%) followed by non-ischaemic cardiomyopathy (17 patients, 27.4%). Patients with channelopathies and genetic cardiac disease were implanted less frequently (e.g. Brugada syndrome in 7 [11.3%] patients, hypertrophic cardiomyopathy in 3 [4.8%] patients) Idiopathic ventricular fibrillation was the indication to s-ICD implantation in 4 patients (6.5%). In 6 patients, a permanent transvenous device was already in place and required extraction and replacement with a s-ICD for infective causes in 4 cases (6.4%). Mean left ventricular ejection fraction (LVEF) at the time of implant was moderately reduced (LVEF = 38$\pm$15%). Background medical therapy was overall well balanced (beta-blockers, ACE-I/ARB, MRA used respectively in 80.9%, 67.7% and 53.2% of patients). During defibrillation threshold test, sinus rhythm was successfully restored after first shock in all but three cases in which the opposite polarity defibrillation was used. Overall, mean time to sinus rhythm restoration was 16 seconds ($\pm$4 seconds). In two patients (3.2%) induction test was not performed based on clinical decision (i.e. intraventricular thrombus, recent ab-ingestis pneumonia), while in 9 (14.5%) patients the standard protocol did not induce sustained arrhythmias. At median follow-up of 12 months [25°-75° IQR, 3 months-27 months], 8 (9.6%) patients received an appropriate shock (6 for sustained VT, 2 for VF) with 100% restoration of sinus rhythm after single shock whereas 3 (4.8%) patients underwent inappropriate shocks (two caused by myopotentials oversensing). During follow-up, two patients died (one for cardiovascular cause – pump failure), while 19 were admitted for cardiovascular causes (mainly for hearth failure decompensation). Only 4 patients (6.4%) suffered from minor complications linked to s-ICD implant: one subxiphoid keloid (surgically treated), one iatrogenic lead damage during cardiac surgery (requiring new lead implantation), one lead dislodgement (surgically treated) and one mild hematoma (treated conservatively). Duration of s-ICD implantation became significantly shorter with time (mean procedural time during the first three years = 102 minutes vs. mean procedural time during the second three years = 82 minutes) and preference for inframuscular instead of subcutaneous implantation was observed.
Conclusions: Based on our experience, the use of s-ICD for SCD prevention (both in primary and secondary setting) is effective, with very low complication rates at medium term follow-up. The implantation learning curve is relatively steep: short procedural times, minimal surgical incisions, excellent cosmetic results are achievable after a limited number of procedures.

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676 Cardiac resynchronization therapy in patients with permanent atrial fibrillation

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Introduction: The benefits of cardiac resynchronization therapy with defibrillator (CRT-D) in heart failure are well established. However, a gap of evidence is still present for patients with permanent atrial fibrillation (perm-AF).

Methods: We used the Home Monitoring Expert Alliance database, a nationwide data repository of remote monitoring transmissions, to investigate outcomes of CRT-D patients with perm-AF in terms of appropriate shock for ventricular arrhythmia and all-cause mortality in a long-term time horizon. The episodes with delivered shock were adjudicated by a board of 3 electrophysiologists.

Results: Among 1226 CRT-D patients (mean age 71.2 ± 10.0 years; 75.5% males), 276 (22.5%) had perm-AF at device implantation. These patients had more frequently rate responsive function (19.7% vs 64.1%) and higher basic rate (median value 60 b.p.m. vs 70 b.p.m.) as compared to all other patients ($p < 0.001$). The CRT pacing percentage calculated over the first 2 months was slightly lower for perm-AF patients (median value 96.0% vs 98.8%, $p < 0.001$).

At 5-year appropriate shock incidence was 34.2% (95% confidence interval [CI], 25.1%-45.3%) for perm-AF and 19.9% (15.6%-25.1%) for all other patients. All-cause mortality was 27.7% (17.7%-41.8%) for perm-AF and 15.6% (12.2%-19.9%) for all other patients.

The age- and sex-adjusted hazard ratio between perm-AF and all other patients was 1.81 (95% CI: 1.25-2.64, $p = 0.002$) for appropriate shock and 0.92 (95% CI: 0.57-1.50, $p = 0.748$) for all-cause mortality.

Conclusions: Although a higher incidence of appropriate shock, perm-AF at the time of CRT-D implantation was not associated with increased long-term mortality.
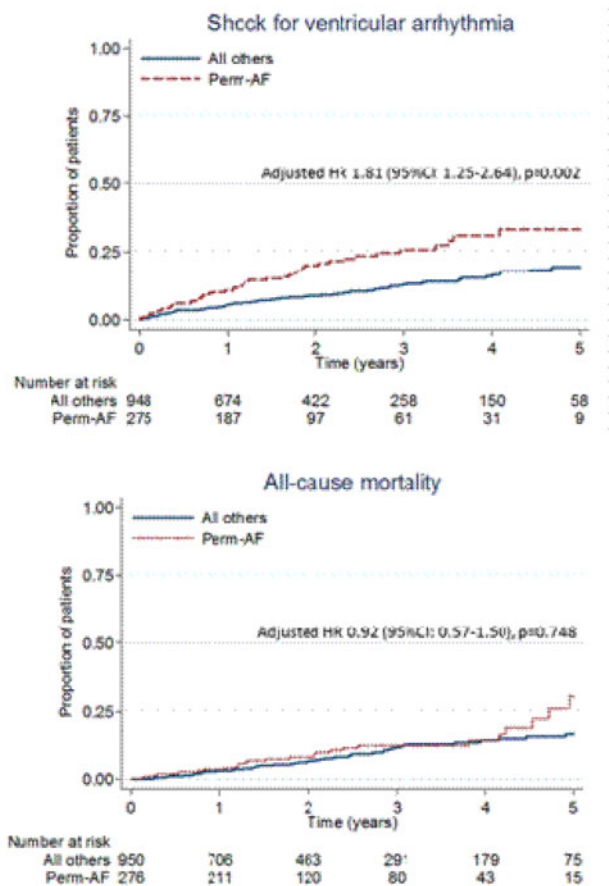
693 Coexistence of typical atrial flutter and focal atrial tachycardia in a postsurgical patient for tetralogy of Fallot

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Initial Presentation: A 51-year-old woman presented to the Emergency Department with dyspnoea and peripheral oedema. Her medical history was notable for surgically repaired Tetralogy of Fallot with residual pulmonary stenosis and for hypothyroidism after thyroidectomy. Supraventricular and ventricular ectopic beats were observed in the past. The first 12 lead-ECG showed very fast atrial arrhythmia with right bundle branch block and left anterior hemiblock and non-discernible P waves. Adequate medical therapy was started.

Diagnosis and Management: In the Cardiology ward, upon improvement her clinical conditions, the surface ECG showed clearly a counter clockwise typical atrial flutter

(*Figure 1*). Transthoracic echocardiography showed left ventricle ejection fraction of 50%, right ventricular hypokinesia (TAPSE of 11 mm), paradox movement of the septum, moderate to severe tricuspid regurgitation, right atrial enlargement (area $35cm^2$), pulmonary valve stenosis with a mean gradient of 25 mmHg, mild mitral insufficiency, and no residual shunt across the ventricular septal patch. It was then decided to perform an electrophysiology procedure, which confirmed the presence of an isthmus-dependent typical atrial flutter with a longer cycle length of 370 ms with diffuse scar in the right atrium as grey areas in the electroanatomic map (*Figure 2*). Interestingly, during this macro-re-entrant arrhythmia, the higher region of the lateral right atrium activated earlier than the activation consistent with the atrial flutter circuit, producing a small area of relatively early activation (black arrow in *Figure 2*) that, however, did not modified substantially the course of the re-entry circuit around the tricuspid annulus (white arrows in Figure 2). Ablation initially reversed the right atrial activation, which became consistent with a clockwise typical atrial flutter and, upon block of the cavo-tricuspid isthmus conduction, eventually transformed the arrhythmia in a focal form with a cycle length of 360 ms (Figure 3). This originated in the same site where a relatively early activation was noted before (black arrow in Figure 3), confirming that this arrhythmia was present also before during typical atrial flutter. Adjunctive focal ablation in the earliest activated site suppressed also this arrhythmia and restored stable sinus rhythm. The procedure was without complications and sinus rhythm persisted in the subsequent follow-up.

Conclusions: This case shows how, in a postsurgical patient with a congenital heart disease, a macro-re-entrant form of atrial tachycardia may coexist simultaneously with a focal one originating a peculiar activation pattern. Ablation may suppress these complex arrhythmias if correctly diagnosed by electroanatomic mapping and accurately targeted by ablation.

Figure 1   Figure 2

Figure 3
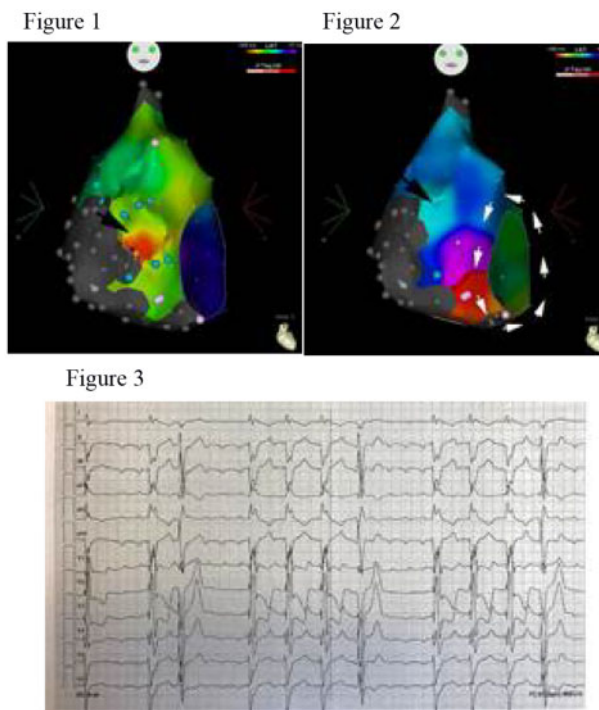
771 Transvenous lead extraction: efficacy and safety of the procedure in octogenarian patients

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Aims: The management of patients with infection or malfunction of a cardiac implantable electronic device (CIED) may be challenging. The aim of the study is to evaluate the safety and efficacy of transvenous lead extraction (TLE) in elderly patients.

Methods: A retrospective analysis of patients who underwent to TLE in our centre was performed. Patients were divided in two groups: 1) patients 80 years of age or older, 2) patients younger than 80 years. All patients were treated with manual traction or mechanical dilatation.

Results: Our analysis included 1316 patients, with a total of 2513 leads extracted. Group 1 ($\geq$80 years) counted 202 patients and group 2 (<80 years) 1114 patients. The group of elderly patients presented more comorbidities, as hypertension, chronic kidney disease, atrial fibrillation and pulmonary disease. Patients 80 years of age or older had more pacemakers than ICDs, whereas the dwelling time of the oldest lead, the number of leads and the presence of abandoned leads was similar despite patients age. In group 1 the rate of radiological success for lead was higher than in group 2 (99.0% vs 95.9%; $P < 0.001$). The clinical success was obtained in 1273 patients (96.7%), without significative differences between groups (98.0% vs 96.4%; $P = 0.36$). Major complications occurred in 10 patients (0.7%), without significative differences (1.5% vs 0.6%; $P = 0.24$).

Conclusion: TLE in elderly patients is a safe and effective procedure. In patients older than 80 years there are not more major complications than in younger patients, and the efficacy of the procedure seems to be superior.

143 Prevalence of patients with atrial fibrillation at risk for obstructive sleep Apnea syndrome: preliminary results using two specific clinical score

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Introduction: The prevalence of Obstructive Sleep Apnea Syndrome (OSAS) is about 5-7% in the general population, while it is significant higher in patients (pts) with atrial fibrillation (AF). Several studies attributed this association to a higher prevalence of traditional risk factors for AF among OSAS pts, while others support OSAS as an independent risk factor for AF. Even though several studies have focused on the risk of AF in patients with OSAS, few of them have highlighted the prevalence of OSAS in outpatients with AF and a careful screening test.

Aim: The aim of this study was to estimate the prevalence of pts at risk for sleep-related disorders in an outpatient population with AF and to evaluate the impact of the STOP-BANG questionnaire and of the Epworth Scale.

Methods: Consecutive pts followed in our arrhythmia outpatient clinic, of both sexes, > 18 years, with diagnosis of atrial fibrillation were screened. Patients aged <18 years or > 80 years and with a history of OSAS or otorhinolaryngological pathologies were excluded from the study. The enrolled patients were subsequently evaluated through the STOP-BANG questionnaire (which includes questions related to Snoring, Tiredness, Observed Apnea, Pressure, BMI, Age, Neck Circumference and Gender) and the Epworth scale (which evaluates the subject's daytime sleepiness during different daily activities). Patients with a STOP-BANG score $\geq$5 and/or with an Epworth scale score $\geq$10 were at high risk of OSAS and then referred to further evaluation.

Results: Ninety-eight patients were screened and 24 of them (24%, 19 males/5 females, mean age 63, 4 ± 11 years; 46% with paroxysmal form, 54% with persistent form) were found to have a STOP-BANG score $\geq$5 (mean 5, 3 ± 0.8); 7 of them had also an Epworth scale score $\geq$10 (mean 13, 1 ± 4.1). Main characteristics of the pts are summarized in the Table. Most of them were obese (10/24, 42%), hypertensive (18/24, 75%), dyslipidemic (14/24, 58%), and between the two group of pts there was no statistically significant difference in each of the considered clinical variable except for dyslipidaemia (p = 0, 02).

Conclusions: Our study showed that the risk of OSAS (assessed by the two type of scores) is almost one fourth in outpatients with AF and that obesity, hypertension and dyslipidaemia are the most common risk factors. The routine use of these simple and inexpensive screening tools should be promoted in order to offer the best management in this patient population.

Table Main characteristics of the pts.

	74 pts with STOP-BANG < 5 and/or Epworth scale < 10	24 pts with STOP-BANG $\geq$ 5 and/or Epworth scale $\geq$ 10	P value
Age (mean $\pm$ SD, y.o.):	68, 7 $\pm$ 11	63, 4 $\pm$ 11	0, 19
Sex (M/F):	41/33	19/5	0, 05
BMI (kg/m^2):	26, 3 $\pm$ 4, 0	29, 9 $\pm$ 5, 1	0, 39
Hypertension n (%):	46 (62%)	18 (75%)	0, 25
Obesity n (%):	16 (22%)	10 (42%)	0, 053
Smoke (past/current) n (%):	16 (22%)/2 (3%)	5 (21%)/1 (4%)	1/1
Diabetes n (%):	6 (8%)	2 (8%)	1
Dyslipidaemia n (%):	24 (32%)	14 (58%)	0, 02
Type AF (paroxysmal/ persistent)	33 (45%) /41 (55%)	11 (46%) /13 (54%)	1/1

Pts: patients; SD: standard deviation; BMI: body mass index; AF: atrial fibrillation

729 Lesion transmurality in AF ablation as a gold standard for PV isolation: comparison between ablation index and lesion index

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Purpose: Introduction of contact force-sensing catheters technology has improved outcomes in pulmonary vein isolation (PVI) for atrial fibrillation (AF) ablation. In order to better achieve lesion transmurality and standardize procedure, Ablation Index (AI, CARTO3, Biosense) and Lesion Index (LSI, TactiCath^{TM}, Abbott) which include force, time and power, have been recently developed. Previous studies have shown that AI- and LSI-guided pulmonary vein isolation (PVI) could improve efficacy of AF ablation by reducing the incidence of PV reconnection.
The purpose of this study was to explore AI- and LSI- guided PVI relative performance in terms of AF recurrences.

Methods: We retrospectively enrolled 24 patients with paroxysmal atrial fibrillation who underwent Ablation index- or Lesion Index-guided RF ablation procedure with an electro-anatomical mapping system. Redo AF ablations were excluded. As compared to LSI group, procedures in the AI group were performed by less experienced operators. AF recurrences were evaluated at 6 months after PVI procedure.

Results: A total of 14 patients with AI-guided PVI and 10 patients with LSI-guided PVI were included in the study (mean age 58 years, 21 males). Mean Ablation Index was 360 at posterior wall and 470 at anterior wall. Mean overall Lesion Index was 5.4. Short term procedural success rates were 86% and 90% in the AI- and LSI-guided group respectively.

Conclusions: Our exploratory data analysis suggested a low incidence of AF recurrences both with AI- and LSI-guided PVI. Furthermore, although AI targets lower than 400 have been reached in the posterior wall, this could be reasonably acceptable as a compromise between safety and good clinical outcomes.

349 Efficacy and safety of oral anticoagulant vs. antiplatelet therapy for secondary prevention of cardiovascular disease in patient without atrial fibrillation: a systematic review and meta-analysis of phase iii randomized controlled trial

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Background: Anticoagulation is the mainstay of prevention of arterial thromboembolism in patients with atrial fibrillation, but it could be effective also in secondary prevention of patients who are in sinus rhythm.

Purpose: We performed this meta-analysis to determine relative efficacy and safety of oral anticoagulant therapy (OAC) as compared with antiplatelet therapy (APT) in patients with prevalent cerebro-cardiovascular disease without atrial fibrillation.

Methods: Our systematic review of the literature published through January 31st, 2019 sought all phase III randomized controlled trials which compare OAC with APT in patients with sinus rhythm and previous cerebro-cardiovascular disease report at least one of the following outcomes: ischaemic stroke, death, myocardial infarction, and major bleeding, assessed at the longest available follow-up. We used random-effects models to estimate summary relative risk reduction (RRR) and 95% confidence intervals (95% CI).

Results: We identified a total of 9 randomized controlled trials including a total of 34, 912 patients (ASA, n = 17, 726; adjusted-dose warfarin, n = 4, 460; rivaroxaban, n = 12726), with a mean follow-up of 2.2 years. When compared with antiplatelet therapy, OAC was associated with reduced risk of ischaemic stroke (RRR 38%, 95%CI: 1, 47; P = 0·04; I^2=72%) and myocardial infarction (RRR 13%, 95%CI: 0, 23; P = 0·05, I^2=0%), but increased risk of major bleeding (RRR -52%, 95%CI: -129,-1; P = 0·04; I^2=76%). Compared to antiplatelet treatment, OAC did not significantly affect the risk of all-cause death (RRR 1%, 95%CI: -9, 10; P = 0·86; I^2=12%).

Conclusions: In sinus rhythm patients with prevalent cerebro-cardiovascular disease, OAC compared to APT reduces risk of ischaemic stroke and myocardial infarction, but significantly increases risk of major bleeding. The choice of antithrombotic treatment does not appear to influence all-cause mortality.

104 Clinical, genetic, functional and pharmacological characterization of two novel mutations in the nav1.5 sodium channel underlying Brugada syndrome in Italian patients

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Brugada syndrome (BrS) is a dominantly inherited arrhythmia characterized by a coved ST-segment elevation at ECG in the right precordial leads, high susceptibility to ventricular arrhythmia and a family history of sudden cardiac death (SCD). Typical ECG pattern may be spontaneous or be unmasked by a provocative drug test. Arrhythmia typically occurs at rest, while sleeping, after heavy meals or during fever and is more frequent in males. Most BrS patients are asymptomatic and risk stratification is an unsolved issue. Among more than 20 genes associated with BrS, the SCN5A gene, encoding for the cardiac voltage-gated sodium channel Nav1.5, accounts for $\sim$ 30% of BrS cases and is the unique considered as with clinical validity. Implantable cardioverter defibrillator (ICD), quinidine, ablation of the right ventricular outflow tract are existing therapeutic strategies to prevent the risk of SCD in BrS patients (Mazzanti et al., 2017; Gualandi et al., 2017).

We identified two novel SCN5A mutations in Italian BrS patients. The missense variant P1310L, was identified in a 64 years-old man who presented a typical ECG pattern at the age of 56 and received an ICD in primary prevention. During Follow-up, after an arrhythmic storm, he underwent a successful epicardial radiofrequency ablation. The proband's brother died for SCD at 51 years of age. The p.Gly1686_Ile1687insGlyArg insertion was identified in a 57 years-old female with a typical ECG pattern and who received an ICD in secondary prevention after an arrhythmic event. The proband's mother died suddenly at the age of 38 years. The mutation segregates in the 36 years-old asymptomatic son showing a spontaneous type 1 BrS pattern and implanted with an ICD.

We have functionally characterized both SCN5A mutations in order to prove their pathogenic role and to explore genotype-phenotype correlations. Nav1.5 WT and mutant cDNAs were transfected in HEK 293 cells and sodium currents were recorded through the patch-clamp technique.

P1310L mutation, at S4 DIII of the Nav1.5, significantly reduced sodium current density at -30mV more than 4-fold compared with Nav1.5 WT. In addition, the voltage dependence of activation of P1310L channels was shifted by $\sim$ 15 mV toward positive potentials with respect to WT, suggesting reduced sodium channel opening at physiological voltages. Conversely, the steady-state inactivation curve was shifted by $\sim$ 6 mV toward positive voltages and recovery from fast inactivation was slightly faster for P1310L compared to WT. Furthermore, to correlate patients' genotype to the susceptibility to drug-induced arrhythmia, we are estimating the tonic and use-dependent block of P1310L channels by flecainide. The p.Gly1686_Ile1687insGlyArg insertion, in the S5-P extracellular loop of DIV of the channel, caused a complete loss of sodium channel function decreasing current density by 20-fold at -30mV.

The identified novel SCN5A mutations cause a loss of function of Nav1.5 channels as the molecular mechanism underlying BrS in the affected patients. The different degree of biophysical alterations shown by the two Nav1.5 mutant channels correlates with the aggressiveness of the clinical phenotype (Chen et al., 2019). At present, the main impact of genetic testing in BrS relies on the identification of at risk asymptomatic subjects among proband's family members. Overall, our results provide evidence that the genetic testing and the functional characterization of mutant Nav1.5 channels may contribute to risk stratification of patients and to address lifestyle modifications including sodium channels blocking drugs and fever avoidance.

501 Ventricular arrhythmic risk in patients with biopsy-proven myocarditis and replacement myocardial fibrosis: focus on the grey zone

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Background: Myocarditis represent a major cause of sudden death in adults < 40 years age. In these patients, a complete diagnostic work-up including three-dimensional electroanatomic mapping (3 D-EAM) and 3 D-EAM-guided endomyocardial biopsy (EMB) for etiological diagnosis has not been assessed.
Objectives: We aimed to characterize baseline electroanatomical substrate in patients with complex VA and clinical criteria of myocarditis, using 3 D-EAM and 3 D-EAM-guided EMB. Subsequently, we aimed to evaluate predictors of VA occurrence at long-term follow-up.
Methods: We prospectively enrolled patients admitted to our hospital with VA (sustained ventricular tachycardia (VT) or fibrillation (VF) or premature ventricular contractions (PVC)$\geq$25% recorded by 24 h-Holter ECG) and at least one of the following: 3a. impaired global or regional left ventricular systolic function 3 b. increased serum concentrations of troponin I, 3c. pericardial effusion 3d. clinical suspected myocarditis as for previous infection of the bronchial tree, the gut, or the urinary tract within

the last 6 months before admission. Patients underwent 2 D echo, stress test, cardiac magnetic resonance (CMR), coronary angiography, 3 D-electroanatomic mapping (3 D-EAM) and 3 D-EAM guided endomyocardial biopsy (EMB). Clinical follow-up was performed by 24 h ECG Holter monitoring or by ICD/loop recorder interrogation.
Results: From 2008 to 2016 54 patients were included (mean age was 41 years ±14, 60% male). in 31 patients (57%) histological diagnosis was myocarditis (M group), in 14 (26%) patients histological diagnosis was focal replacement myocardial fibrosis (FRMF group) and in 9 (17%) patients inadequate myocardial specimens. Clinical presentation and imaging baseline data were similar in the two histological groups. Left ventricular bipolar scar was significantly greater in M group compared to FRMF group (13 $\pm$ 5 vs 4 $\pm$ 2.7 cm2, p = 0.02, also considering LV bipolar scar percentage (8 $\pm$ 4 vs 2 $\pm$ 2 %, p = 0.05). Right ventricular bipolar scar area was significantly greater in M group compared to FRMF group (22 $\pm$ 16 vs 3 $\pm$ 2.6 cm2, p = 0.02), also considering RV bipolar scar percentage (13 $\pm$ 11 vs 2 $\pm$ 2%, p = 0.03). The survival freedom from VA in M group was 42% (13 patients out of 31) vs. (12 out of 14 patients, 86%) in FRMF group at 40 months of follow-up (log-rank p = 0.008). Cox regression univariate analysis identified three variables as statistically significant predictors of VA occurrence: histological diagnosis of myocarditis (HR 5.5, 95% confidence interval [CI] 1.13-24 p = 0.02); scar areas at RV bipolar mapping (scar area cm2 HR 1.07, 95% CI 1.02—1.12, p = 0.008; scar area % HR 1.12 , 95% CI 1.03—1.21, p = 0.005) and at RV unipolar mapping (scar area cm2 HR 1.03, 95% CI 1.01-1.05, p = 0.02; scar area % HR 1.06 , 95% CI 1.01-1.11, p = 0.02).
At multivariate analysis, there was a trend for the presence of RV bipolar scar area as predictor of VA in overall population (RV bipolar scar % HR 1.05, 95% CI 1.01-1.11, p = 0.08).
Conclusion: Up to date myocarditis represents a major cause of sudden cardiac death among young patients. Our study defines the additional role of 3 D-EAM guided EMB in diagnostic work-up of patients with complex VA and clinical criteria of myocarditis and identifies myocardial inflammation and electronatomic scar detection as possible predictors of VA occurrence in the long-term follow-up.

276 Efficacy and safety of catheter ablation of post-incisional atrial tachycardias in patients with prior history of mitral valve surgery: a meta-analysis

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Introduction: Data regarding catheter ablation (CA) of post-incisional atrial tachycardias (AT) are scarce in literature, especially in patients with prior history of mitral valve surgery (MVS) where mechanical protheses and thick fibrosis around the MV anulus may pose a challenge for a safe and effective procedure. Aim of this study is to assess the efficacy and safety of CA of post-incisional AT in these patients and to investigate specific features of these arrhythmias through a systematic review of the literature.
Methods: A systematic search on PubMed/MEDLINE, EMBASE, and Web of Science was performed. An adult population undergoing radiofrequency CA procedure for post-incisional AT with prior history of MVS and with/without concomitant Maze procedure was considered. Articles published before 2000 were excluded because the use of 3 D electro-anatomic mapping systems was not well established yet. The haemorrhagic, thromboembolic complications and deaths were recorded. The periprocedural success rate (i.e. restoration to sinus rhythm due to radiofrequency delivery during CA procedure) and mid-long term outcome (i.e. persistence of sinus rhythm after single/multiple procedures on/off antiarrhythmic drugs) were carefully looked for. Finally, the most frequent pathophysiologic mechanism (focal vs. macro-reentrant), site of origin of the ablated AT (left atrium vs. right atrium) and association of the surgical scar location with specific AT morphologies were investigated.
Results: After systematic review, 8 studies were regarded as eligible for the analysis. One-hundred seventy-three patients without severely impaired FEVS (42-72.1%) and with mild-to-severe atrial dilatation (37-63 mm) were considered with prior history of MV replacement (59.5%) or valvuloplasty (40.5%) and concomitant Maze procedure (56%). All the patients underwent 239 CA procedures (1.4 procedure/patient) and in all cases a 3 D electro-anatomic mapping system was used. Major complications were recorded in 3/173 cases (1.7%) with 2 retroperitoneal haemorrhages (1.2%), 1 intra-cranial haemorrhage leading to death (0.06%). Acute success rate was achieved in 167/173 patients (95.6%) and 112/173 patients (65%) were in sinus rhythm at follow-up (2.1-60 months). In 97% of patients the whole number of AT morphologies were specified: 272 AT (92.2%) were macro-reentrant and 23 (7.8%) were focal in origin. In the macro-reentrant AT group, CA was performed in the right atrium in 144 morphologies (53%) and in most of these cases ablation was performed at the cavo-tricuspid isthmus (CTI) (63%). When CA was performed in the left atrium (47% of cases), mitral isthmus was the main target for ablation (55%). Type of surgical incision was reported in 112 patients (65%). In these patients, most of the AT were found in the right atrium (133/215 morphologies – 62%) with involvement of CTI in 55% of cases. In these patients a trans-septal approach was very frequently encountered (52%) either as superior trans-septal one or via a lateral free wall incision in the right atrium.

Conclusions: After a systematic literature review, CA of post-incisional AT in patients with prior MVS should be regarded as a safe and effective procedure. A trans-septal surgical incision is the main surgical approach in this population associated with late-onset macro-reentrant AT most frequently and quite surprisingly located in the right atrial chamber with involvement, in many cases, of the CTI.

515 Development and validation of an ECG algorithm for predicting the site of origin of idiopathic right ventricular outflow tract arrhythmias

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Background and Aims: Pre-operative identification of the site of origin of idiopathic right outflow tract ventricular arrhythmias (RVOT-VAs) is important to predict the site of successful ablation, particularly when the VAs are not inducible at the time of the procedure. We hypothesized that the ratio of Q wave amplitude in the unipolar leads aVL / aVR can be used to indicate anterior vs. posterior origin of the VA in the RVOT region, and that the ratio between R wave amplitude in lead II and VA-QRS duration may be helpful to distinguish septal vs. lateral origin.
Methods: Standard 12-lead ECGs were recorded and analyzed in a development cohort of patients undergoing successful RVOT-VAs ablation as guided by 3 D electro-anatomical mapping at a single centre. Patients with coronary artery disease, structural heart disease, preexisting bundle branch block and paced rhythm were excluded. The RVOT was divided into six sites: anterior, middle, and posterior septal sites and anterior, middle and posterior free wall sites. A novel localization algorithm based on the Q wave ratio in aVL/aVR and the ratio between R wave amplitude in lead II and QRS duration was derived from a consecutive series of 44 patients, and prospectively validated in 30 patients.
Results: In the development cohort ($N = 44$, 28 female; mean age 43, 7 ± 12, 9 years; mean ejection fraction 53 ± 7, 9 %) the successful ablation sites were RVOT septum ($n = 33$; 75 %), RVOT free wall ($n = 11$; 25%), RVOT anterior site ($n = 24$; 55%), RVOT middle site ($n = 15$; 34%) and RVOT posterior site ($n = 5$; 11%). The aVL/aVR ratio was significantly larger for anterior sites (1, 36 ± 0, 29) compared with middle (0, 94 ± 0, 14, $p = 0$, 000) and posterior sites (0, 62 ± 0, 13, $p = 0$, 000). An aVL/aVR index > 1, 12 predicted an RVOT anterior origin with 79% sensitivity and 93% specificity (AUC 0, 899), whereas when the aVL/aVR ratio was > 0, 77, a posterior origin could be excluded with 100% sensitivity and 100% specificity (AUC 1). The RVOT free wall sites presented significantly smaller R-wave amplitudes in lead DII (1, 21 ± 0, 32 mV) compared to septal sites (1, 87 ± 0, 4 mV, $p = 0.000$), and significantly wider QRS duration (159 ± 18 ms) in comparison to septal sites (135 ± 8, 7 ms, $p = 0$, 001). The DIIR-wave amplitude/VA-QRS duration ratio was significantly lower in free wall sites (8, 55 ± 4, 5 mV/s) compared to septal sites (13, 9 ± 3, 1 mV/s, $p = 0$, 000) and a value >10 predicted a septal origin with 97% sensitivity and 91 % specificity (AUC 0, 904). In the validation cohort ($N = 30$, 18 female; mean age 46, 9 ± 13, 3 years; mean ejection fraction 49, 9 ± 10, 7 %) the aVL/aVR ratio correctly identified anterior, middle and posterior locations in 25/30 patients (83 %), and the DIIR-wave amplitude/PVC-QRS duration ratio correctly predicted septal vs free wall locations in 29/30 patients (97%).
Conclusions: A simplified ECG algorithm based on aVL/aVR ratio and DIIR-wave amplitude/PVC-QRS duration ratio is a reliable and accurate tool in predicting the RVOT-VAs site of origin.

675 A refined risk stratification scheme for patients with type 1 long QT syndrom

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Background: Type 1 Long QT Syndrome (LQT1) is an inheritable arrhythmogenic disorder that confers susceptibility to life-threatening arrhythmias (LAE) and is secondary to autosomal dominant loss-of-function mutations in the *KCNQ1* gene, encoding the alpha-subunit of potassium channel Kv7.1.
In this work we assess whether the localization of different mutations over different regions of the *KCNQ1* gene influences the duration of the QT interval and the occurrence of arrhythmic events (LAE and syncopal spells).
Methods: We gathered data on 963 patients with the diagnosis of LQT1 and divided the KCNQ1 protein into 5 functional regions: the N-terminus (NT), the voltage sensor (VS, including transmembrane segments S1 to S4), the cytoplasmic loops (CL), the pore (PO, including the transmembrane segments S5 and S6 and the S5-S6 extracellular linker), the C-terminus (CT).
Results: The study population included 963 LQT1 patients: 518 (54%) females; average age 20 ± 17 years; mean QTc at baseline ECG 465 ± 38ms. The average follow-up was 8 ± 7 years. During their life, 172 (18%) patients experienced arrhythmic

manifestations typical of LQT1: 31 (3%) experienced one or more LAEs, while 141 (15%) experienced one or more syncopal spells. We identified 188 different mutations in the *KCNQ1* gene. The distribution of the mutations was as follows: 15 (8%) in the NT, 33 (18%) in the VS, 27 (14%) in the CL, 43 (23%) in the PO, 70 (37%) in the CT. The frequency of pathogenic variants per number of amino acids (a.a.) was higher in the CL region, as compared to the other domains (1 mutation every 1.44 a.a.). The duration of QTc interval was significantly longer for patients with mutations in the PO region (473 ± 40 ms) and in the CL region (468 ± 38 ms) as compared to the other regions ($p < 0.01$). Furthermore, patients with PO and CL mutations also had a significantly higher probability of showing QTc values above 500 ms, as compared to others (PO 18%, CL 16% vs 8% all the others, $p < 0.001$).
Patients with mutations in the PO and the CL regions had a higher risk of LAE and syncopal spells (HR 2.89, 95% CI 1.95-4.29, $p = 0.019$ and HR 1.61, 95% CI 1.0-2.49, $p = 0.05$, respectively). Among 272 patients with mutations in the PO region, we found that those with mutations in the GYGD sequence (that is responsible for the channel selectivity) showed a higher risk of experiencing LAE (HR 19.32, 95% CI 1.02-365, $p = 0.048$). Interestingly, the risk was independent from the duration of the QT interval and gender.
Conclusion: We found that *KCNQ1* loss-of-function mutations affecting the PO and the CL of the Kv7.1 potassium channel are associated with more severe form of LQT1. Among PO mutations, those affecting the GYGD sequence were associated with the most significant arrhythmic risk. Our findings provide a site-specific risk profile for the mutations responsible for Type 1 Long QT Syndrome.

796 Novel perspectives on natural history and risk stratification for patients with Andersen Tawil syndrome type 1

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Background: Andersen-Tawil Syndrome type 1 (ATS1) is an ultra-rare arrhythmogenic disorder, caused by loss-of-function mutations in the *KCNJ2* gene. We present here the largest cohort of ATS1 patients with outcome data reported.
Objectives: Define the risk of life-threatening arrhythmic events (LAE), identify predictors of such events, and define the efficacy of antiarrhythmic therapy in ATS1 patients.
Methods: Clinical and genetic data from consecutive ATS1 patients from 23 centers were entered in a database implemented at ICS Maugeri in Pavia, Italy, and pooled for analysis.
Results: We enrolled 118 ATS1 patients from 57 families (23 ± 17 years at enrolment). Over a median follow-up of 6.2 years (IQR 2.7-16.5 years), 17 patients experienced a first LAE, with a cumulative probability of 7.9% at five years. An increased risk of LAE was associated with a history of syncope (HR 4.54, $p = 0.02$), with the documentation of sustained ventricular tachycardia (HR 9.34, $p = 0.001$) and with the administration of amiodarone (HR 268, $p < 0.001$). The rate of LAE without therapy (1.24 per 100 person-years, py) was not reduced by beta-blockers alone (1.37 per 100 py; p=ns), or in combination with class Ic antiarrhythmic drugs (1.46 per 100 py, p=ns).
Conclusions: In a sharp departure from previous reports, we suggest that the clinical course of patients with ATS1 shows a high rate of LAE. A history of syncope or of documented sustained ventricular tachycardia are associated with a higher risk of LAE. Amiodarone is proarrhythmic and should be avoided in ATS1 patients.

484 Implantable cardioverter-defibrillator VDD VS VVI

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Background and objective: implantable cardioverter defibrillator (ICD) reduces the risk of sudden death in patients at risk. The use of a single-chamber ICD (VVI) compared to a dual-chamber ICD has the advantage of fewer complications, but less discrimination of supraventricular arrhythmias and risk of a greater number of inappropriate shocks. Single lead with a floating atrial dipole (VDD) is a system including the advantages of single lead invasiveness and dual chamber discrimination. This study aimed to compare electrical performance, rates of inappropriate interventions, complications, clinical outcomes between VVI and VDD ICDs.
Methods: Patients who underwent VDD ICD implantation between January 2010 and May 2018 at "Città della Salute e della Scienza Hospital" were compared with patients who underwent VVI ICD implantation selected by propensity matching based on relevant clinical features. Occurrence of death and hospitalizations during follow-up were recorded as well as complications including pneumothorax, cardiac

perforation, lead dislodgement requiring intervention, sensing deficit, haematoma, local infection.

Results: we enrolled 48 patients who underwent VDD ICD implantation compared with 48 patients underwent VVI ICD implantation; follow-up median duration was 39 months (IQR 13; 61). There were no significant differences in baseline clinical features between patients receiving VDD ICD and those implanted with VVI ICD. There was a trend of less inappropriate interventions in VDD group, mostly shocks (VDD vs VVI: ATPs/shocks, 2% vs 13%, $p = 0.11$; ATPs, 2% vs 10%, $p = 0.20$; shocks, 0% vs 8%, $p = 0.12$). There were no significant differences in any kind of complications (patients with one or more complications VDD vs VVI: 13% vs 13%; $p = 0.99$) neither in all-cause death (VDD vs VVI: 25% vs 33%, $p = 0.50$) neither in cardiovascular death (VDD vs VVI: 15% vs 21%, $p = 0.59$). There were significantly more hospitalizations in VVI group (VDD vs VVI: 27% vs 53%; $p = 0.012$), with a significant difference in heart failure re-hospitalizations (VDD vs VVI: 10% vs 39%, $p < 0.001$). Atrial sensing in VDD ICDs was stable (before discharge vs 36 months: 5.26 +/- 2.61 mV vs 5.50 +/- 2.65 mV; $p = 0.533$).

Conclusions: patients with single-chamber ICD, compared with patients with single lead and floating atrial dipole, showed a lower trend for inappropriate interventions. Complications and mortality rates were similar in patients receiving a VVI vs VDD ICDs. Patients undergoing VVI ICD implantation experienced more hospitalizations (both total and due to heart failure) compared with those receiving a VDD ICD. Atrial sensing by floating dipole in VDD ICDs remained stable during follow-up.

Figure 1

Figure 2

Figure 3

520 Prognostic role of atrial high rate episodes in patients with pacemaker: is oral anticoagulant therapy always mandatory?

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Background: Subclinical atrial fibrillation is playing an emerging role in assessment of cardiovascular and cerebrovascular risk of patients with cardiac implantable electronic devices (CIED). The MOST and the ASSERT study first tried to understand the predictive role of atrial high rate episodes (AHRE) in patients with cerebrovascular events but, despite the presence of many data, it is not already clear if and when anticoagulant therapy is required in such subjects. The aim of our study is to evaluate clinical and prognostic impact of AHREs in terms of stroke, mortality and MACE in a population with CIEDs to better understand if oral anticoagulant therapy (OAT) is always mandatory in these cases.

Materials and Methods: We evaluated 1683 patients with pacemaker, implanted since 2004 at our cardiac pacing laboratory. We divided our population into three arms so composed: patients with permanent atrial fibrillation; patients with AHRE and patients without AHRE at follow-up. Patients were annually followed with outpatient visits and OAT was prescribed when necessary, according to European Guidelines, based on CHA2DS2VASc and HAS-BLED values.

Results: Four hundred and twenty-two patients had permanent atrial fibrillation at the time of implantation. During follow-up (mean duration 4 years) 1343 AHRE episodes were recorded in 342 patients. The remaining 919 patients did not present any episode of AHRE. The outcome occurred in 113 patients while 57 suffered a stroke/TIA episode. Forty-nine patients, on the contrary, presented an acute myocardial infarction during the observation period. On univariate analysis, the presence of AHRE was correlated with the percentage of atrial stimulation ($p = 0.02$), virtual CHA2DS2VASc ($p < 0.001$) and sick sinus syndrome as pacing indication ($p = 0.02$). Kaplan Mayer curves showed that patients with AHRE had a survival rate similar to patients with permanent AF (Figure 1). Patients without AHRE had a better prognosis than other two arms (overall p value <0.001). The stroke incidence in patients with AHRE was lower than in patients with permanent or clinical AF during follow-up (Figure 2). In the specific setting of patients with AHRE and stroke, there wasn't any statistically significant difference between patients who practiced OAT and those who did not take any anticoagulant therapy (Figure 3).

Conclusion: AHREs have a significant impact on mortality in patients with PM. These episodes seems to represent a "marker of disease" more than primary cause of cerebrovascular events, considering that anticoagulant therapy does not impact on the onset of these adverse events. Moreover we believe that identification of AHRE at Follow-up provides useful information for identification of patients at greater risk of adverse events and therefore should be taken always into consideration, regardless of OAT.
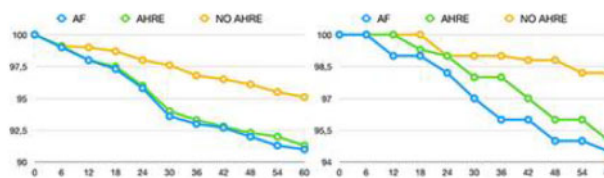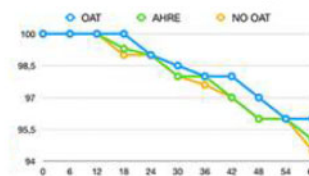
529 Local gentamicin-collagen sponge reduces cardiovascular implantable electronic device infections and pocket hematoma

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Background: Implantation or replacement of permanent pacemaker (PPM) and implantable cardioverter-defibrillator (ICD), may be associated with serious complications such as bleeding, pocket hematoma and infection. Using COLLATAMP® EG during surgery, a lyophilized collagen impact impregnated with the aminoglycoside antibiotic Gentamicin, significantly reduces the incidence of infectious complications and improves wounds healing.

Methods: We conducted a retrospective study between June 2007 and November 2018 and we collected data of implantation or replacement of Cardiovascular Implantable Electronic Device (CIED). 1537 subjects with a mean age of 77, 45 ($\pm$9, 83) years were evaluated. We matched 561 patients with COLLATAMP® EG (group I) with 976 patients who did not receive COLLATAMP® EG (group II). The primary endpoint was the reduction of infectious complications and pocket hematoma within a 1 year postoperatively.

Results: Infective complications and/or pocket hematoma occurred in 164 of 1537 patients (10, 67%); only 12 (0, 78%, p < 0, 05) belonged to group I. The study also states a statistically significant higher incidence (p $<$0, 05) of infective complications in patients undergoing ICD implant or replacement (20 of 369 patients, 5, 59%) compared to PPM implant or replacement (17 of 903 patients, 1, 5%), probably due to larger size of hardware and to the lifetime of devices. Not statistically significant was the incidence of pocket hematoma within the subgroups mentioned above (p $>$0, 05). Moreover, we considered the impact of risk factors; regarding infective complications, we considered as risk factors old age, diabetes mellitus (DM) and chronic kidney disease (CKD). Within the population of 32 patients that developed an infectious event, just 12 of 32 patients (37, 5%) showed no comorbidities (p $<$0, 05).

Conclusions: COLLATAMP® EG is a medical device which can be used in addition to local hemostasis and prophylactic doses of systemic antibiotics, with the aim of reducing infective complications and pocket hematoma after permanent CIED implantation or replacement.

822 Acute coronary syndrome in a patient with a residual aortic dissection flap after supracoronary aortic replacement: the IVUS role

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Background: Acute chest pain caused by aortic dissection (AD) or acute myocardial infarction (AMI) is one of the most serious medical emergencies and requires a very quick differential diagnosis to choose the best timing for treatment. AD and AMI are often manifested with similar symptoms, making it difficult to differentially diagnose these two conditions. After supracoronary aortic repair (SCAR) for type A AD, small intimal flap could remain in the anastomoses area. Aortic intramural hematoma could extend to the coronary ostia causing an extrinsic compression. Intravascular ultrasound (IVUS) is a safe and effective methodology to distinguish an atherosclerotic plaque from an extrinsic compression. We present the case of a 68 years old man, with a recent surgical correction of a Type A aortic dissection referring to our emergency department for an acute coronary syndrome.

Case Report: A hypertensive 68-years-old man presented to our emergency department, at 2: 00 a.m., complaining acute chest pain radiated to the arms and posteriorly to the interscapular area. The patient had a past medical history of a recent (9 months before) Stanford type A aortic dissection corrected, in another hospital, with an urgent SCAR. The electrocardiogram revealed ST-segment elevation in aVR and a diffuse ST-segment depression (Fig 1). His initial vital signs were as follows: heart rate 105 beats/min, blood pressure 150/80 mm Hg, respiratory rate 18 breaths/min, oxygen saturation 94% without oxygen supplementation. While the patient was being prepared for the cardiac catheterization, a transthoracic echocardiography (TTE) was performed showing left ventricle anterior, septal, and apical walls akinesia and a dubious image of small intimal flap in the Valsalva sinus without significant aortic regurgitation. An urgent computed tomography (CT) scan confirmed the presence of a small intimal flap near to the non-coronary cups, proximal to the vascular graft anastomoses (Fig. 2C, 2D). So, we planned an urgent coronary angiography. By the right radial approach, initial angiography showed an isolated subocclusive left main (LM) ostial stenosis (Fig 3A). Intraoperative transesophageal echocardiogram (TEE) was executed to evaluate a dynamic extrinsic compression (Fig. 2A, 2B). Notwithstanding, both angio CT scan and TEE did not allow a definitive diagnosis regarding the AMI etiology. After a gently 2.0 mm semi-compliant balloon inflation in the LM, urgent intravascular ultrasound (a 20-MHz, 2.9 F IVUS system, Eagle Eye, Volcano Corp) was performed to exclude any extrinsic compression such as intramural hematoma: it documented a severe concentric atherosclerotic plaque with a ostial minimal lumen area of 4.2 mm^2 (Fig. 3B). Finally, we performed percutaneous coronary intervention (PCI): a 4.0/18 mm drug eluting stent from ostial LM to the proximal left anterior descending artery (LAD) was implanted and a proximal optimization technique with a 4.5/15 mm non-compliant balloon was performed. Final angiography and IVUS confirmed the good procedural result with a LM minimal stent area of 15.6 mm^2 (Fig 4A, 4B) After PCI, ST-segment alterations on ECG disappeared and chest pain improved. The patient was discharged on the third day.

Discussion: Acute myocardial infarction caused by aortic dissection (AD) is relatively rare, and the reported incidence of myocardial infarction with AD ranges from 3 to 7% in AD patients (1).

Typically, myocardial infarction develops more frequently than an AD in a clinical setting. Therefore, when AD is complicated by acute myocardial infarction, the correct diagnosis of dissection can be elusive and these patients might instead be treated with primary percutaneous coronary intervention (PCI). In these cases, the outcome can be catastrophic (2).

The dissection flap could extend into the ostium of the coronary artery, with consequent risk of acute occlusion and ST segment elevation myocardial infarction. However, evidences from literature regarding patients recently treated for AD and presenting with AMI are scarce. In patients with AD, while the right coronary is more frequently affected, the left main coronary artery can also be compressed (3). Neri et al described three major types of coronary malperfusion due to AD.(4)

Hori et al described a case of acute coronary malperfusion some hours after SCAR due to a LM dissection recognized by the IVUS and successfully treated with PCI.(5) However, the largest series reporting the outcome of patients treated for type A aortic dissection show a low risk of myocardial infarction at follow-up (6) and only anecdotal cases of flap or hematoma extension to right or left coronary cusps.(7)

Our patient presented with a probably high risk non ST-segment elevation myocardial infarction (GRACE score: 140). During the night-time setting, awaiting the activation of the interventional cardiology team, on the basis of the clinical history we performed a TTE and an angio CT scan. Unfortunately, both methods confirmed the presence of a dissection flap extended to the non-coronary cusp, but neither method was able to clarify with certainty the etiology of myocardial infarction.

Coronary angiography showed a coronary tree relatively free of atherosclerosis with an ostial subocclusive stenosis of the left main in a patient with an intermediate risk of ischaemic heart disease who had undergone a cardiac surgery operation with no events a few months earlier; our major doubt was that we were faced with a retrograde dissection or an intramural aortic hematoma with extrinsic compression of the left main.

Conclusion: In this case, only IVUS allowed us to distinguish with certainty between an atherosclerotic etiology and a coronary extrinsic compression. Although there was some suspicion for residual intimal aortic flap based on the history, there were no information about the surgical intervention. Given the clear image of atherosclerotic plaque in the LM, we considered type 1 AMI as the most likely diagnosis treating him with successful primary PCI.

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642   Additive predictive power of the CHA$_2$DS$_2$-VASc and has bled scores for mortality in patients with atrial fibrillation

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Background and Objectives: Atrial fibrillation (AF) is associated with increased mortality, which may derive from both ischaemic and bleeding events due to enacted therapies. Mortality predictors in AF are poorly characterized. We therefore investigated the predictive power of the CHA$_2$DS$_2$-VASc score, used to assess the risk of stroke in comparison with the HAS-BLED score, currently used to predict bleeding, for mortality in patients with AF in a large contemporary registry.

Methods: Individual patient data were pooled from the PREvention oF thromboembolic events-European Registry in Atrial Fibrillation (PREFER AF), a prospective real-world registry with a 12-month follow-up, with a total of 7243 patients enrolled from 461 hospitals and 7 European countries (Austria, France, Germany, Italy, Spain, Switzerland, and United Kingdom) conducted. Categorical variables are expressed as frequency and percentages (n, %), continuous variables are expressed as means and standard deviations (SDs). Logistic regression was here used to analyze the relationship between the CHA$_2$DS$_2$-VASc and HAS-BLED scores and outcome events, including mortality, at one year. The predictive ability of the scores was analyzed by comparing c-statistics.

Results: The study sample consisted of 5, 209 AF patients with complete information on both scores. Mean age was 71.8 ± 10.46 years; 3145 subjects (60.4%) were male. The average 1-year mortality was 3.1%. We found strong gradients between all examined outcomes (mortality, stroke and systemic embolic events (SSE) and major bleeding) for both the CHA$_2$DS$_2$-VASc and the HAS-BLED risk scores. Both scores had broadly similar c-statistics; for CHA$_2$DS$_2$-VASc: 0.637, 0.656 and 0.616 for models predicting mortality, SSE and major bleeding, respectively; for HAS-BLED: 0.620, 0.647, and 0.627, respectively. When including the individual components of both scores separately, c-statistics increased to 0.715, 0.694 and 0.636 with CHA$_2$DS$_2$-VASc, and to 0.681, 0.697 and 0.680 with HAS-BLED. The predictive power with both scores combined, removing overlapping components, was higher, with a c-statistic of 0.74, 0.73 and 0.70 for mortality, SSE and major bleeding, respectively.

Conclusion: Both the CHA$_2$DS$_2$-VASc and the HAS-BLED score predict mortality similarly in AF, and a combination of all the components of the scores increases prediction significantly. Such combination may thus be clinically useful.

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335   LA mexiletina nel trattamento delle aritmie ventricolari recidivanti E refrattarie a terapia farmacologica convenzionale

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The antiarrhythmic therapy of recurrent ventricular arrhythmias in patients having undergone catheter ablation and in whom amiodarone or beta blockers were ineffective or contraindicated, is an important issue. The present study sought to evaluate the efficacy and tolerability of mexiletine in a relatively small sample of patients with recurrent ventricular arrhythmias, when the standard therapy strategy failed.

All patients treated with mexiletine for recurrent ventricular tachycardia (VT) or ventricular fibrillation (VF) in our institution between January 2010 and May 2019 were enrolled. The primary endpoint was the total number of VT/VF episodes after the start of mexiletine therapy. Secondary endpoints were total number of ICD therapies and discontinuation of therapy. The events occurring during mexiletine treatment were compared with a matched duration period before the start of mexiletine therapy. Patients served as self-controls.

A total of 29 consecutive patients (23 males, 79.3%; mean age 66.0 ± 16.3 years) were included in our retrospective analysis. The mean time of mexiletine treatment was 17.8 ± 22.3 months (median 13 months; interquartile range [IR]: 3-23.5 months). Mexiletine therapy significantly decreased VT/VF episodes (65 vs 8 episodes; median and IR: 2 [1-3] vs 0 [0-0]; p < 0.0001) and ICD interventions (112 vs 16 interventions; median and IR: 1 [0-3.5] vs 0 [0-0]; p = 0.006) in comparison with a matched period before mexiletine treatment. Only 4 patients (13.8%) presented severe side effects requiring discontinuation of therapy.

Mexiletine was associated with a significant decrease of ventricular arrhythmias and ICD therapies showing a good profile of tolerability.

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417   Neonatal persistence of Foetal arrythmia: a case of pharmacological therapy failure

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Introduction: Atrial flutter (AF) occurs in 25% of all Foetal tachyarrhythmias (FT). Echocardiography is the most valuable tool for FT diagnosis. There is no consensus on the best treatment of FT. After birth spontaneous restoration of sinus rhythm usually occurs after 24-48 hours. In case of persistence of tachyarrhythmia, pharmacological treatment with Amiodarone is suggested. Electrical cardioversion (CVE) is indicated in case of unsuccessful pharmacological therapy.

Case Report: A 35-year-old woman at 28 weeks of gestation, was addressed to our department for FT detected during a routine ultrasound. Fetal echocardiography revealed a tachyarrhythmia with a Foetal HR of 250 b.p.m. and initial signs of heart failure. Maternal oral therapy with Digoxin and Flecainide was introduced with a stable reduction of Foetal HR (200 b.p.m.) and an improvement of cardiac features. An elective caesarian delivery was successfully performed at 38 weeks. At birth ECG

revealed AF with 2: 1 atrioventricular conduction and a HR of 187 b.p.m. Echocardiography confirmed no structural heart disease. Therapy with Amiodarone e.v. was started. After three days Propranolol was added. Due to persistent tachicardia, synchronized CVE was performed. Therapy with Propanolol the day before and Amiodarone the same day was stopped. Sinus rhythm with 130 b.p.m. HR was restored after a third shock with a voltage of 2, 28 J/kg. After the procedure, the patient was hemodynamically stable. During the following hours short AF episodes with spontaneous restore of sinus rhythm were detected. Therefore Amiodarone and Propranolol were reintroduced and stable sinus rhythm was achieved. Afterwards clinical conditions were preserved with a normal growth and developmental milestones.

Discussion: We have reported a case of Foetal AF with unsuccessful intrauterine farmacological cardioversion. Flecainide, Sotalol and Digoxin are the most diffused therapeutic strategies. If the fetus is near term with persistent tachicardia, delivery and treatment after birth may be the best option. Due to the particular clinical presentation of AF in our case, with persistent tachyarrhythmia a prophylaxis for one year was established, although it is not usually necessary. A standard treatment protocol, based on randomized trials, should be established to achieve worldwide management of tachyarrhythmias.

818 Serum cardiac-specific biomarkers and atrial fibrillation in myotonic dystrophy type 1

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Introduction: The aim of the present study was to evaluate the role of high-sensitivity cardiac troponin I (hs-CTnI), N terminal pro-B-type natriuretic peptide (NT-proBNP), creatine kinase-MB mass concentration (CK-MB mass) and copeptin (CP) in predicting incident atrial fibrillation (AF) in myotonic dystrophy type 1 (DM1) patients. Materials and Methods: The study enrolled 60 consecutive DM1 patients (age 50.3 ± 7.3 years, 34 male) who underwent pacemaker implantation for cardiac rhythm abnormalities and 60 PM recipients whose age and sex matched served as control group. All DM1 patients underwent 12-lead electrocardiogram, 2 D color Doppler echocardiogram, biomarkers measurements and device interrogation at implantation, one month after and every six months thereafter for a minimum of 2-year follow-up. Results: The study population was divided into 2 groups according to the presence of AF (AF Group vs non- AF Group). The AF group was older (47.3 ± 8 vs 38.6 ± 7 years, P = 0.03) and showed higher serum levels of NT-proBNP (151 ± 38.4 vs 107.3 ± 24.2 pg/mL, P < 0.001) and CP (18.9 ± 4.5 vs 7 ± 2.3 P < 0.001) than non-AF Group. NT-proBNP (P < 0.001) and CP (P < 0.001) were found to be independent predictor of AF. Based on the ROC curve analysis, the cut-off value for NT-Pro BNP that best predicted AF event in DM1 patients was 123 pg/ml (sensitivity of 83.3 % and specificity of 86.5%); the cut-off value for CP that best predicted AF event in DM1 patients was 9 pmol/L (sensitivity of 89% and specificity of 87%). Conclusions: NT-proBNP and Copeptin represent two independent predictors of AF onset in DM1 population with conduction disturbances underwent PM implantation.

838 Fluoroscopy usage in contemporary interventional electrophysiology: insights from a European registry

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Background: Fluoroscopy has been an essential part of every electrophysiological procedure since its inception. However, insights in radiation-induced damage and technology to avoid exposure have evolved substantially over the past two decades. The aim of this Europe-wide multicenter, prospective registry is to assess current norms and identify quality markers required for optimal clinical routine.
Methods: Participating centers were requested to provide characteristics of the centre, operators, technical equipment as well as procedural settings of consecutive cases. In order to prevent bias from high volume centers and operators a limit of 5 operators per centre and 20 cases per operator has been set.

Results: 25 centers (72% university clinics, with a mean volume of 526 ± 348 procedures yearly) from 14 European countries provided data on 1788 cases [9% diagnostic procedures (DP), 38% atrial fibrillation (AF) ablations, 44% other supraventricular (SVT) ablations, and 9% ventricular ablations (VT)] conducted by 95 operators (89% male, 41 ± 7 years old).
Mean dose area product (DAP) and time was 304 ± 608 cGy*cm2, 3.6 ± 4.8 min, 1937 ± 608 cGy*cm2, 15.3 ± 15.5 min, 805 ± 1442 cGy*cm2, 10.6 ± 10.7 min, 1277 ± 1931 cGy*cm2, 10.4 ± 12.3 min for DP, AF, SVT and VT ablations respectively. 7% of all procedures were conducted without any use of fluoroscopy.
Procedures in the lower quartile of DAP were performed more frequently by female operators (OR 1.707, 95%CI 1.257-2.318, p = 0.001), in higher-volume centre (OR 1.001 per one additional procedure, 95%CI 1.000-1.001, p = 0.002), with the use of 3 D-mapping system (OR 2.622, 95%CI 2.053-3.347, p < 0.001) and monoplane x-ray system (OR 2.945, 95%CI 2.149-4.037, p < 0.001).
Conclusions: Exposure to ionizing radiation varies widely in daily practice for all procedure. Significant opportunities for harmonization of exposure towards the lower range has been identified.

402 Feasibility and outcomes of micra pacemaker implant in the elderly

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Objectives: Rates of cardiac pacemaker implantation rise with age and populations worldwide are ageing. Meanwhile, elderly patients may be at great risk of complications, as pneumothorax, lead perforation, or pocket dehiscence.
The use of leadless pacing systems (Micra Transcatheter Pacing System, M-TPS) could overcome peri- and post-procedural complications related to the presence of transvenous leads and the post-operative recovery, being a favorable option in elderly patients.
The study aimed to investigate feasibility and outcomes of M-TPS implant in a specific patient population, like the elderly, which represent a challenge for conventional cardiac pacing.
Methods: Between May 2014 and July 2019, 109 patients (83 males, 76.15%, mean age 77.71 ± 9.68) underwent M-TPS implantation in our Center, targeting a non-apical site of delivery when feasible. A subgroup of 46 patients (34 males, 73.91%) were 80 years old or older. All patients fulfilled standard criteria for pacemaker implantation with specific indication to receive VVI pacing. Study population was divided into two groups according to age (group 1 < 79 years vs group 2 ≥ 80 years). The outcome evaluation included electrical performance (capture threshold, pacing impedance, R wave amplitude) before hospital discharge and then followed at 1, 6, and 12 months and then annually. Major complications were defined as life-threatening events, required surgical intervention or any event causing significant hemodynamic instability or resulting in death.
Results: In 46/109 cases (34 males, 73.91%) M-TPS was implanted in patients 80 years old or older. There were no statistically significant differences between groups for demographics characteristics, except for age, and PM implant indications. The implant procedure was successful and no vascular complication occurred. No device-related events were registered during follow-up. In particular, no device infection and/or malfunction were reported. Patients were followed-up for an average of 18 months (median 12 months). No differences were observed between groups in procedure duration, single device delivery (group 1 vs group 2: 57.38% vs 69.05%, p = 0.27), fluoroscopy time (group 1 vs group 2: 12.98 ± 8.24 vs 13.53 ± 8.43 minutes, p = 0.65), electrical performance at implant (group 1 vs group 2: pacing threshold 0.57 ± 0.39 V/0.24 ms vs 0.57 ± 0.33 V/0.24 ms, p = 0.70; impedance 714.03 ± 169.91 Ohm vs 723.78 ± 28 Ohm, p = 0.99; R wave amplitude 9.88 ± 4.42 mV vs 9.73 ± 4.68 mV, p = 0.68) and at 12 month F-U (group 1 vs group 2: pacing threshold 0.59 ± 0.37 V/0.24 ms vs 0.54 ± 0.24 V/0.24 ms, p = 0.85; impedance 575.52 ± 115.06 Ohm vs 599.09 ± 86.13 Ohm, p = 0.42; R wave amplitude 12.62 ± 5.18 mV vs 11.62 ± 5.04 mV, p = 0.51).
Conclusions: The demand for cardiac pacing is strongly related to ageing, driving the clinical practice to look for the best solution for a considered fragile patient population. MTP-S implant is an effective and safe procedure in elderly patients, with similar electrical performance and outcome compared with younger patients at midterm follow-up.

787 Factors that affect outcome of cryoenergy balloon ablation of atrial fibrillation

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Introduction: Ablation of atrial fibrillation (AF) has gone through several advancements in last recent years. Currently, pulmonary vein (PV) ablation represents a class

I indication for paroxysmal or persistent AF patients who failed antiarrhythmic drug (AAD) therapy.

The aim of this study was to evaluate the outcomes of PV isolation with cryoballoon energy (CBE), for shedding light on standardization of such technique in long-standing persistent AF patients.

Materials and Methods: Our study included 14 consecutive patients with symptomatic AF in spite of AAD. Subjects had either paroxysmal AF or long-standing persistent AF (mean age 58.1 ± 8.9 years; 85.7% men; mean CHA2DS2-VASc score 1.7 ± 1.2).

Echocardiographic parameters were assessed before procedure showing preserved left ventricular ejection fraction but dilated atrial chambers (mean LVEF $56.8 \pm 2.9\%$; mean LAVi 37.7 ± 2.9 mL/m2; LAD 42.4 ± 5.5 mm; mean LA strain $15.2 \pm 6\%$). CBE ablation required second generation cryoballoon device together with an octapolar spiral mapping catheter for monitoring and recording of potentials to guide real-time PV isolation. A deflectable quadripolar catheter was used for either differential atrial pacing or pacing in the superior vena cava to capture the right phrenic nerve.

The lowest temperature achieved during each CBE application was recorded (mean nadir temperature $-53.4 \pm 12.1\,^\circ C$). In order to evaluate the pattern of energy delivery during cryoablation, a plot of freezing temperature over procedural time was obtained off line for each case; more in detail, three consecutive segments were chosen, each consisting of three points, namely: first segment (beginning of ablation, intermediate point, beginning of decrease); second segment (beginning of decrease, intermediate down, the nadir); the final (upslope, intermediate point, end of ablation).

Results: We divided the patients into three groups: i) five patients in which temperature never reached $-40\,^\circ C$ or lower; ii) three patients in whom the threshold of $-40\,^\circ C$ was reached for less than 80 seconds; iii) six patients in whom the lowest temperature (below $-40\,^\circ C$) was kept for 80 seconds or more. At a mean follow-up duration of 6.9 months, 78.6 % of the patients were arrhythmia-free and a substantial reduction of EHRA score was obtained (from 2.1 ± 0.5 to 1.2 ± 0.4, $p < 0.05$), leading to a significant improvement in quality of life. The occurrence of relapse was 21.4%, related to all patients with long-standing persistent AF and classified in the group who kept the freezing temperature for the longest time. Finally, the LA strain analysis of the two sub-groups showed that the mean strain was significantly lower in the patients with recurrence than in those without recurrence (11 ± 5 % vs. 16.4 ± 6 %).

Conclusions: CBE had high rate of success in paroxysmal AF, but efficacy was reduced in long-standing persistent AF in our cohort. The cumulative plot analysis shows that the combination of low temperature and long duration of application might not be beneficial, and trigger relapses. Further studies are needed to understand whether the long time of the application associated with very low temperatures during cryoablation might cause additional injury on the LA, according to the LA strain.

386 Passive-fixation dual chamber pacemaker implantation in a patient with unknown persistent left superior vena cava

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Among great vessels congenital abnormalities, persistence of the left superior vena cava (PLSVC) emptying into the coronary sinus is the most common and it is an important cause of catheter instability and dislodgements. An active-fixation system and sometimes epicardial pacing may be necessary to maintain leads stability.

A 85-year-old man was submitted to permanent dual-chamber pacemaker because of recurrent lipotimia, dizziness, fatigue and documentation of intermittent sinus bradycardia less than 40 b.p.m. and sinus pauses more than 3 seconds at 24-hour Holter recording. The incision was made in the left pectoral region and the left cephalic vein was isolated in order to introduce both bipolar ventricular and, later, atrial electrode. Fluoroscopy during implantation revealed that ventricular catheter (Boston Scientific, Ingevity MRI 7732-59 cm, USA) followed an abnormal course along the left border of the thoracic spine and entered the right atrium after passing through the coronary sinus. We formed a wide loop in the right atrium in order to successfully advance the ventricular lead into the right ventricular apex. A stable ventricular pacing threshold of 0.2 V x 0.5 msec was obtained with the lead tip located in the right ventriclular apex, ventricular pacing impedance was 830 ohms and R-wave amplitude was 7.0 mV. The J-shaped atrial lead (Boston Scientific, Ingevity MRI 7736-52 cm, USA) was positioned with the stylet softly curved into right atrial appendage in which it was fixed passively after maneuvers to make its terminal part adherent to the lateral wall of the right atrium in order to give it greater stability. Atrial pacing threshold was 1.3 V x 0.5 msec, pacing impedance was 606 ohms and P-wave amplitude was 2.7 mV. Finally, generator Accolade MRI DR Pacemaker (Boston Scientific, USA) was been inserted in a left pectoral pocket and connected to the leads. The following day a fluoroscopy was performed ruling out an early dislodgement of the electrodes and a venography documented the PLSVC. The electronic follow-up of the device performed one week after implantation and also 40 days later showed the stability and validity of the sensing and pacing parameters. Furthermore, 40 days after implantation, the patient also underwent a further fluoroscopy in the same antero-posterior projection which excluded macro-dislodgement of both electrodes.

In our case passive-fixation atrial and ventricular catheter were successfully implanted and have given till now (40 days after pacemaker implantation) good short-term pacing and sensing data.

Therefore, although the use of active fixation catheters in the case of PLSVC is widespread and shared, we believe that the use of passive-fixation catheters can be a valid alternative as long as their implantation does not prove difficult and at the same time stable positions togheter with ideal electrical parameters can be obtained.

261 Clinical impact of atrial fibrillation in stable coronary artery disease: a meta-analysis

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Background: Atrial fibrillation (AF) is the most common supraventricular arrhythmia and is often associated with stable coronary artery disease (SCAD). Recent computational studies suggest that AF can exert influence on coronary circulation.

Aims: Given the likely influence of AF on coronary hemodynamics, we aimed to explore the clinical impact that super-imposed AF can exert in SCAD patients, in terms of mortality, cerebral vascular accidents (CVA) and coronary events (myocardial infarction – MI, and coronary revascularization).

Methods: PUBMED/Embase databases were screened for observational studies on SCAD patients providing adjusted estimates on the risk of mortality, CVA, MI or TLR for AF patients with respect to patients without any history of the arrhythmia. Meta-analysis of the adjusted risk estimates was performed using a random-effect model.

Results: After bibliographic search, 5 studies were finally selected, with a total of 30, 230 subjects included (2, 844 in the AF group, 27, 386 in the non-AF group). Meta-analysis of the included studies indicates an increased risk of mortality (HR 1.39, 95% CI 1.17-1.66) and CVA (HR 1.88, 95% CI 1.45-2.45) in SCAD patients with AF; on the contrary, there was no significant differences between AF and non-AF groups in terms of MI (HR $= 0.90$, 95% CI 0.66-1.22) and coronary revascularization (HR $= 0.96$, 95% CI 0.79-1.16).

Conclusions: AF in SCAD patients is an independent negative prognostic factor, associated with mortality and risk of cerebral vascular accidents. However, in terms of coronary events, the risk of MI or coronary revascularization was not different in patients with AF with respect to patients without the arrhythmia.

266 Non-invasive monitoring of cerebral hemodynamics during atrial fibrillation

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Background: Atrial fibrillation (AF) is the most common cardiac arrhythmia and currently affects up to 1-2% of the general population. It has been recently observed that AF is associated with dementia and cognitive decline, independently of stroke. Several mechanisms have been proposed to explain this association: systemic inflammation, cerebral atrophy, small vessel disease, cerebral hypoperfusion and hemodynamic effects. Due to the evident limitations of cerebral invasive monitoring, there is a lack of scientific data regarding cerebral hemodynamics during atrial fibrillation. For this reason, we tested a non-invasive method, the near infrared spectroscopy (NIRS), to study cerebral perfusion.

Aims: The aim of this work is to demonstrate whether NIRS can be used to extract beat-to-beat information of cerebral hemodynamics during AF.

Methods: From January 2019 to May 2019, we enrolled 29 consecutive AF patients, who underwent an hemodynamic and cerebral monitoring before and after an electrical cardioversion (ECV). Overall, NIRS yielded four output signals: two based on the Beer-Lambert law (O2Hb, HHb) and two estimated through the spatially resolved spectroscopy (SRS) algorithm (tissue oxygenation index (TOI, %) and tissue hemoglobin index (nTHI). In collaboration with the Politecnico of Turin, the first elaboration step of these signals has been run on 6 AF patients. Since the Beer-Lambert signals are more affected by the extracranial circulation, only the SRS signals were used. Due to the presence of noise, a filtering system has been necessary to extract the heart-beat interval (HBI) from these signals. The HBI values extracted from NIRS signals were compared with those extracted from their ECG.

Results: The mean (μ) and the standard deviation (σ) of the HBIs extracted from NIRS and ECG signals resulted in good agreement (pre-ECV μ HBI-NIRS 0.72, σ HBI-NIRS 0.12, μ HBI-ECG 0.73, σ HBI-ECG 0.12; post-ECV μ HBI-NIRS 0.92, σ HBI-NIRS 0.14, μ HBI-ECG 0.97, σ HBI-ECG 0.07).

Conclusions: Based on this preliminary analysis, it seems possible with NIRS to obtain information on cerebral hemodynamics, extracting information related to the variation of even a single heartbeat. Further analyses will focus on quantifying the variation of cerebral perfusion during arrhythmia compared to sinus rhythm (restored after electrical cardioversion), thus shedding light to hemodynamic mechanisms leading to cognitive decline in AF patients.

574 Management of anticoagulation protocols for cardiac implantable electric devices

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Background: The management of anticoagulation during a cardiac implantable electric devices (CIED) procedure can present challenges for electrophysiologists. Bleeding complications can significantly increase the risk for pocket hematomas, extended hospital stays, and elevated overall costs. The traditional approach has been interrupted oral anticoagulation therapy (OAC) for the procedure, and unfractionated heparin (UFH) or enoxaparin as a bridge until therapeutic OAC is reestablished, which has been associated with significant hematoma formation and infection. The current standard-of-care is to perform pulse generator replacements on fully anticoagulated patients. For CIED, uninterrupted warfarin therapy is superior to interrupted warfarin with heparin bridging with regard to bleeding complications. Many patients requiring pacemaker (PM) or implantable cardioverter-defibrillator (ICD) surgery are taking direct oral anticoagulants (DOAC). Management of pre-procedural anticoagulation is challenging in patients undergoing cardiac device insertion, particularly ICDs. Bleeding and pocket hematoma formation is a significant complication that can increase risk of infection and hospitalization. Although uninterrupted DOAC has been associated with less bleeding, the optimal management of DOAC prior to PM and ICD implantation is uncertain. For patients at high risk for thromboembolic events, guidelines recommend bridging therapy with heparin; however, case series suggest that it may be safe to perform surgery without interrupting DOAC treatment.

Methods: We randomly assigned patients with an annual risk of thromboembolic events of 5% or more to continued DOAC treatment or to bridging therapy with heparin. The primary outcome was clinically significant device-pocket hematoma, which was defined as device-pocket hematoma that necessitated prolonged hospitalization, interruption of anticoagulation therapy, or further surgery (e.g., hematoma evacuation). The DOAC and heparin treatments are monitored using the Trothrombine time (PT), Partial Thromboplastine time (APTT) and International Normalized Ratio (INR).

Results: The data and safety monitoring board recommended termination of the trial after the second prespecified interim analysis. Clinically significant device-pocket hematoma occurred in 3 of 53 patients (1.59%) in the continued-DOAC group, as compared with 7 of 58 patients (4.06%) in the heparin-bridging group (relative risk, 0.19; 95% confidence interval, 0.10 to 0.36; $P < 0.001$). Major surgical and thromboembolic complications were rare and did not differ significantly between the study groups.

Conclusions: In our experience as compared with bridging therapy with heparin, a strategy of continued DOAC treatment at the time of PM or ICD surgery markedly reduced the incidence of clinically significant device-pocket hematoma. At present, reports of DOAC safety and efficacy for CIED are limited to case-control and cohort studies; therefore, randomized and controlled studies are needed in this area. DOAC use during CIED procedures is expected to expand as data from randomized studies emerget:.

575 Taser and risk of cardiac arrest. Recommendations for a safer use into Italian policing

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Since September 2018 the Taser (electric gun) came into use among law enforcement also in Italy. 70 police officers of twelve Italian cities (Milano, Napoli, Torino, Bologna, Genova, Firenze, Palermo, Catania, Padova, Caserta, Reggio Emilia and Brindisi) were trained to use Taser. The model used is the TX2 made by Axon society (last year known as Taser) that has been in use in Europe for some time. Since 2001, acquisition date of the Taser in North America, there have been dozens of deaths following the use of Tasers. It can be lethal especially for individuals who already have congenital or acquired cardiac diseases (arrhythmogenic channelopathies like long QT syndrome). Moreover, it could interfere with some implanted medical devices, as the pacemaker or the implanted cardioverter defibrillator (ICD). People without cardiac diseases can also lose their life if hit by the Taser (ad example children, elders over 65 and pregnant women). Among the most vulnerable categories there are also people who take medicines, especially psychiatric drugs, high doses of alcohol and drugs (in particular cocaine). Antipsychotic drugs like piperazine phenothiazines and chlotiapine lengthen the QT interval causing an iatrogenic long QT syndrome and predisposing to cardiac arrest for ventricular fibrillation. Moreover, mood stabilizers (lithium, valproate, carbamazepine, oxcarbazepine, lamotrigine) change ventricular repolarization and their intake alongside antipsychotics and antidepressant drugs can cause proarrhythmic effects. The QT interval is also affected by methadone. There is, however, a potential risk of cardiac arrest caused by the Taser, it can in fact involuntary cause an arrhythmia and, consequently, an unwanted death by those who use it. So far there aren't any scientific studies on extensive cases. However, the Taser has already been object of some scientific publications. The scientific debate is still open and especially only at the beginning. Currently, from the medical and scientific viewpoint, it can be stated that before authorizing the use of a Taser, it is necessary for the police officers to take a specific training course. It is important to avoid hitting some particularly sensitive body parts such as the face or the precordial part, and to suspect a cardiac arrest or a respiratory arrest if the subject doesn't move in the minutes following the shot. Because of this risk, it has been suggested that law-enforcement experts reassess ECD use to maintain a balance of safety for subjects and officers while still achieving the goal of maintaining law and order. The use of TASERS may be increasing. I recommended ECD manufacturers should undertake an educational campaign to make all ECD users aware of the VF risk. Educational material should stress avoiding chest shots if possible and should warn against repeated or long trigger pulls. However, it is clear that a single 5-second shock can induce VF. A user should be judicious with ECD deployment and treat it with the same level of respect as a firearm, suspect cardiac arrest in any individual who becomes unresponsive after a shock, quickly call for medical support (call 118/112), and be prepared to resuscitate, including using an automated external defibrillator if needed.

585 Role of strategic programming of detection and therapy parameters in implantable cardioverter-defibrillator in patients with electrical storm

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Introduction: Considering that approximately 1-2 % of the adult population in developed countries suffer from heart failure (HF) and that at least half of these patients have a low ejection fraction, the number of ICD carriers is wide spreading. For these reasons, electrical storm (ES) is an increasingly frequent cause of access to emergency department. Considering current definition, the incidence of ES varies from 4 to 28 % in a follow-up period between 1 and 3 years. ES is definitely a medical emergency requiring a multidisciplinary approach. ICD uses mathematical algorithms defined by the manufacturer to discriminate life-threatening ventricular arrhythmias from (supraventricular arrhythmias (SVA) and delivers appropriate therapy. The operator interfaces with the ICD through a programmer able to communicate with the device. Each manufacturer uses a different programmer, so it is imperative to know the manufacturer and use the right equipment .

Method: Our retrospective experience included 23 patients (mean age 67 years, 90 % male) admitted for ES during the period 2009-2019. The mean interval from implant to ES was 48 months. Ischaemic heart disease was present in 13, non-ischaemic cardiomyopathy in 8, and other etiologies in 2, and 90 % of patients had been treated with ICD for secondary prevention. Mean ejection fraction was 35 %. In 15 patients the arrhythmia at admittance was incessant VT, while the remaining 8 experienced several VT/VF episodes, with a mean number of 6 shocks per patient. In more than half of patients (15), there wasn't a clear trigger and the ES rises from a primitive electrical instability. In the remaining the most frequent triggers were worsening heart failure, electrolyte imbalances, myocardial ischemia, proarrhythmic drug side effects and biventricular pacing. Initial diagnostic workup includes physical examination, electrocardiogram, chest X-ray, echocardiogram, blood gas analysis, electrolytes, serum creatinine evaluation, and ICD interrogation. The first issue to assess in a patient with multiple ICD shocks is to escluded inappropriate shocks(oversensing, atrial arrhythmias, lead fracture). The emergency strategic therapeutic protocol including: antiarrhythmic drugs, sympatholytic therapy, sedation and anxiolytic therapy, external cardioversion or defibrillation, ICD disabled by magnet, repogramming ICD: LV lead off, adjust RV-LV offset, lower FV detection rates, reduced detection time, PTCA / PCI, external cardiopulmonary support (ECMO or IMPELLA).

Results: With the ICD reprogramming we observed a significant decrease in the number of total ICD shock and significant increase in appropriate ATP in emergency department (all $P > 0.05$) . 4 pts (17, 4 %) death during the emergency period.

Conclusions: The ES in the end highlights the limits of the ICD's treatment in the prevention of sudden arrhytmic death. In fact even though the ICD interrupts the potentially fatal incessant arrhytmias can't remove the cause at the bottom of the complication. Placing a magnet on an ICD will stop the ICD from delivering shocks. It will have no effect on the ICD's pacing capabilities. This is a point of significant practice variation. In general, unless the patient has decided to change their goals of care, we want the ICD to shock. It is saving the patient's life. However, occasionally an ICD will be firing inappropriately. This can happen with rapid sinus tachycardia, because the ICD only detects the rate, not the specific rhythm.

407 Number of reconnected pulmonary veins: an underestimated predictor of atrial fibrillation recurrence after second catheter ablation

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Background: The most common finding during left atrial mapping in redo atrial fibrillation (AF) ablation is pulmonary vein (PV) reconnection. Weather to just re-isolate PVs or to create additional lesions is left to operator decision. Left atrial lines and substrate modification might have pro-arrhythmic effect. These ablative measures should be limited to selected patients showing substantial electrical/anatomical remodelling. Specific technologies, such as cardiac magnetic resonance, are needed to characterize these pathological aspects; but they are costly, time-demanding and not widely available in daily clinical practice.
Purpose: The aim of this three years retrospective single centre study is to define long term Follow-up after first PV re-isolation and to better understand the influence of simple electrophysiological variables on AF recurrences.
Methods: We considered 122 paroxysmal AF patients (83% male; 58.1 ± 10.8 years) undergoing first re-isolation of reconnected PVs.
Results: All patients showed at least one PV reconnected. They were divided into two groups: Group A (48 pts) with 1 or 2 PV reconnection and Group B (74 pts) with 3 or 4 PV reconnection. At a mean Follow-up of 20.4 months, 26 patients (54.1%) experienced recurrence in Group A and 22 patients (29.7%) in Group B. Higher recurrence rate was observed in group A, as depicted in Kaplan-Meier figure (log-Rank 0.022, figure)
Conclusion: In patients undergoing first redo ablation of AF, a lower number of reconnected PV predicts a worse clinical outcome of simple PV re-isolation. In this situation, additional substrate modification is probably needed at the time of a second procedure to achieve a better outcome.
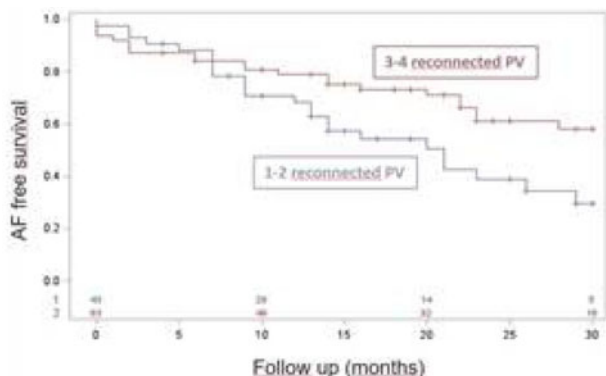
418 Left dominant arrhytmogenic cardiomyopathy: clinical presentation, diagnostic work up and consistency of current diagnostic criteria

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Background: Left-dominant arrhythmogenic cardiomyopathy (LDAC) is considered a new subtype of the classical right-dominant disease. Clinical presentation is unspecific and often confused with other disease involving left ventricle. The diagnostic criteria for right ventricle arrhythmogenic cardiomyopathy were revisited by Marcus et al. in 2010 and have improved the diagnostic sensitivity and specificity but did not include the left-dominant subtype which remains an underrated disease.
Purpose: Our study describes a population of patient suspected and finally diagnosed with LDAC, at our institution. We also show the typical work-up including symptoms and family history evaluation as well as diagnostic tools.
Methods: Patients with uncertain diagnosis but high clinical suspicion of arrhythmogenic cardiomyopathy underwent specific examinations and tests including cardiac magnetic resonance for both morphofunctional study and tissue characterization; electro-anatomic voltage mapping (EVM) for detecting decreased electrical activity and endomyocardial biopsy guided by voltage mapping that accurately detects fibro-fatty substrate involvement.
Results: Arrhytmogenic cardiomyopathy was diagnosed in 93 patients, 19 (20.4%) of them presented LDAC. 68.4% presented unspecific ECG abnormalities. Only 3 patients experienced a sustained ventricular arrhythmia with right bundle brunch morphology whereas other 6 had frequent ventricular ectopic beats of the same morphology. Echocardiography examination was nearly normal in the majority of patients. Late gadolinium enhancement at cardiac magnetic resonance revealed left ventricular fibro-fatty scarring in 100% of cases. EVM was performed in 18 patients

(in 38.9% of right ventricle, 33.3% of left ventricle, 27.8% of both ventricles) and detected areas of decreased electrical activity in 11 patients. Thirteen patients underwent endomyocardial biopsy (in 11 cases EVM- guided) which in 69.2% revealed fibro-fatty infiltration. 11 patients were evaluated with genetic analysis and 54.5% of them had causative mutations of desmosomal genes. Finally, only 4 (21%) patients would have LDAC diagnosed according to the existing criteria and in all these cases specific genetic tests and endomyocardial biopsy had to be used to reach the diagnosis.
Conclusion: LDAC is an underestimed pathology which require a specific work-up and probably a revision of diagnostic criteria for arrhythmogenic cardiomyopathy.

487 Validation of epicardial ventricular tachycardia criteria through left ventricular pacing in patients with non-ischaemic dilated cardiomyopathy: insights from a cardiac resynchronization therapy cohort

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Methods: 56 ECGs during pacing from epicardial and endocardial sites were collected in 28 patients with CRT. Discriminatory power of the following criteria were tested: q wave in lead I, no q waves in inferior leads, pseudo-delta wave ≥ 75 msec, maximum deflection index ≥ 0.59. We used logistic regression and receiver operating characteristic (ROC) curve analyses to evaluate diagnostic performance of each component and their combinations.Results: all the criteria showed a significant diagnostic performance (ROC areas ranging from 0.625 to 0.768, all p < 0.0001).
The combination of the 4 criteria into the same algorithm for pace map localization proved a ROC area of 0.886 (95% CI: 0.811-0.962) and an Akaike information criterion (AIC) of 50.54.
Nevertheless, the combination of only 2 criteria (pseudo-delta wave ≥ 75 msec + no q waves in inferior leads) proved a similar diagnostic performance (ROC area: 0.838, 95% CI: 0.742-0.934; AIC = 53, 92; chi-square = 1.04; p = 0.307 for comparison).
Conclusions: 2-step algorithm (pseudo-delta wave ≥ 75 msec and/or no q waves in inferior leads) may be useful in clinical practice to diagnose epicardial VT.
The combination of only 2 criteria* proved a similar diagnostic performance when compared to 4-step algorithm. ROC area: 0.838, 95% CI: 0.742-0.934; AIC = 53, 92 p = 0.307 for comparison

Diagnostic performance of components			Predictors of EPI origin (multivariable logistic regression analysis)			
	ROC area	95% CI	Variable	Coef.	z	p
q wave in lead I	0.768	0.658 – 0.878	No Q inferior*	3.06712	3.11	0.002
no q waves in inferior leads	0.696	0.591 – 0.802	pseudo-delta wave ≥ 75 msec*	3.597446	2.83	0.005
pseudo-delta wave ≥ 75 msec	0.625	0.507 – 0.743	maximum deflection index ≥ 0.59	2.181372	2.14	0.032
maximum deflection index ≥ 0.59	0.696	0.578 – 0.814	q wave in lead I	1.743333	2.09	0.037

64 Atrial fibrillation and single chamber ICDS: implications of atrial signal availability

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Introduction: Actual incidence of atrial fibrillation (AF) in single chamber ICD recipients is unknown. 50% of implanted ICDs are single chamber devices. Considering the population characteristics that include ischaemic heart disease, hypertension, age and other comorbidities, the incidence of new-onset AF is estimated around 15-20%. Without atrial sensing, single chamber ICD is unable to detect atrial arrhythmias.
Aim: To determine the number of a first "actionable" AT/AF (defined as AF on 12-lead ECG or AHRE episodes determining a clinical decision) in newly implanted single chamber ICDs and to compare the AF detection rates between patients implanted with DX vs VR ICD in routine clinical follow-up.

Methods: between 2014 and 2015 consecutive patients were randomized 1: 3 to receive a single chamber ICD (DX or VR ICD) and followed-up to detect atrial arrhythmias. The DX group was implanted with a Biotronik DX ICD which had a single coil ventricular lead with a floating atrial dipole capable of atrial sensing with a dedicated algorithm for AF diagnosis. The VR group consisted of standard single chamber ICDs implants from 3 others manufacturers with a VT monitoring zone set at a 130 b.p.m. to provide the possibility for indirect AF detection. All AF episodes were validated with an ECG or IEGM by a clinician.

Results: A total of 165 patients implanted with a single chamber ICD (median age 63 [48-72] years, male 79%, primary prevention 80%, ischaemic 53%, no difference in baseline characteristics between groups) were followed-up for a median period of 847 [666-1030] days. 40 patients (24%) had a Biotronik DX. New-onset AF was detected in 10 patients: 6/40 in the DX group (26, 9%), 4/125 in the remainder VR ICDs (4, 3%; $p < 0.0001$). At 36 months 5 patients were on oral anticoagulation for stroke prevention due to newly-diagnosed AF (15% of DX group vs 4% of VR group ($p = 0.033$).
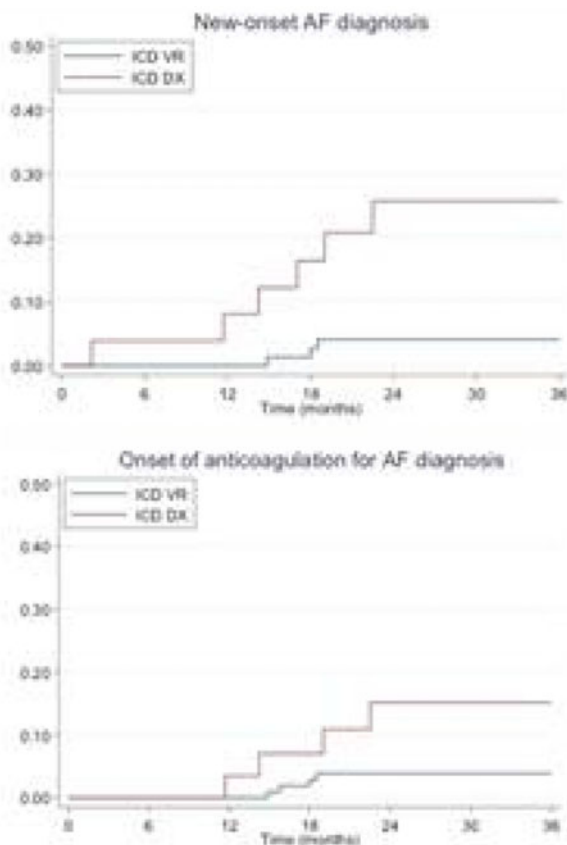
Conclusions: Results shows a significantly lower AF detection rates in single chamber VR ICD as compared with a DX group. AF detection rates in the DX group is similar to a dual chamber device actionable AF incidence. The capacity to detect atrial signal in single chamber ICD recipients can prevent underdiagnosis and undertreatment with potentially negative effect on patients' outcomes.

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530   Arrhythmia occurrence in a real life population of single chamber ICD recipients: the importance of ATP capability

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Aim of the study: to investigate the occurrence of Ventricular Tachycardia (VT) and Fibrillation (VF) in a contemporary cohort of single Chamber ICD recipients, programmed with long detection times and arrhythmia discriminators.

Methods: All patients had a VT zone as 350 ms and a VF zone as 280 ms programmed, with a detection duration > 20 seconds and >8 seconds respectively for VT and VF. Anti-tachycardia pacing (ATP) was available in both zones.

Results: A total of 165 patients (median age 63 [48-72] years, male 79%) implanted with a single chamber ICD were followed for a median period of 847 [666-1030] days.

VT/VF detection occurred more frequently in ischaemic and in secondary prevention patients in a fast VT range (>188 b.p.m.), who also had less inappropriate arrhythmia detections and fewer inappropriate ICD therapy delivery. With contemporary technology, 9% of patients receive inappropriate therapy, and only 3% of episodes are inappropriately treated.

	Total	ICM	NICM	Primary prevention	Secondary prevention
Per-patient					
n	165	88	77	133	32
Appropriate VT/VF detections	44 (27%)	31 (35%)	13 (17%)	30 (22%)	14 (44%)
ICD therapy	49 (30%)	34 (39%)	15 (19%)	37 (28%)	12 (37%)
Shock	34 (21%)	27 (31%)	7 (9%)	24 (18%)	10 (31%)
ATP	44 (27%)	29 (33%)	15 (19%)	33 (25%)	11 (34%)
Inappropriate therapy	15 (9%)	6 (7%)	9 (12%)	13 (10%)	2 (6%)
All-cause mortality	13 (8%)	9 (10%)	4 (5%)	9 (7%)	4 (12%)
Per-episode					
n	847	438	409	418	429
Appropriate VA detections	706 (83%)	417 (95%)	289 (71%)	280 (67%)	426 (99%)
ICD therapy	623 (73%)	376 (86%)	247 (60%)	207 (49%)	416 (97%)
Shock	147 (17%)	131 (30%)	16 (4%)	36 (9%)	111 (26%)
ATP	609 (72%)	362 (83%)	247 (60%)	201 (48%)	408 (95%)
SVT inappropriately detected as VT/VF	141 (17%)	21 (5%)	120 (29%)	138 (33%)	3 (1%)
SVT inappropriately detected eliciting therapy delivery	26 (3%)	13 (3%)	13 (3%)	23 (5%)	3 (1%)

ICM: ischemic cardiomyopathy; NICM: non-ischemic cardiomyopathy; VA: ventricular arrhythmia; ATP: anti-tachycardia pacing; SVT: supra-ventricular tachycardia; VT: ventricular tachycardia; VF: ventricular fibrillation.

Conclusion: ATP is the most commonly delivered therapy also in primary prevention and non-ischaemic patients. These observations have important implication for the broad application of subcutaneous ICD (S-ICD) to the current population of single-chamber ICD recipients, shock therapy being associated to increased mortality.

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688   Prescription pattern among oncologic patients with non-valvular atrial fibrillation

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Background: Direct oral direct anticoagulants (DOACs) are the standard of care for the prophylaxis of non-valvular atrial fibrillation (NVAF)-related cardioembolism, but their use in oncological patients has been limited so far, with a significant proportion still receiving vitamin K antagonists (VKA) or low molecular weight heparin (LMWH).

Methods: By retrospectively reviewing the records of 3, 197 subjects evaluated in a dedicated cardio-oncology outpatient unit between January 2017 and July 2019, we selected those presenting at the first visit with NVAF not triggered by surgical procedures, CHA_2DS_2-VASc ≥ 1 for men and ≥ 2 for women, cancer on active treatment, and no concomitant intracardiac thrombus. The following were considered as contraindications to DOACs: severe chronic kidney disease (CKD, estimated glomerular filtration rate <30 mL/m/1.73m^2); anti-neoplastic therapy unknown or with potential moderate-to-severe adverse interactions; cirrhosis or liver metastases. Clinical characteristics of patients appropriately on DOACs (group 1), on VKA or LMWH with at least 1 contraindication to DOACs (group 2), and on VKA or LMWH despite not having contraindications to DOACs (group 3) were compared by chi-square or ANOVA, as appropriate.

Results: One-hundred ninety five of 3, 197 (6.1%) patients met the inclusion criteria. Eighty-seven (44.6%) were in group 1, 52 (26.7%) in group 2 (16 on VKA and 36 on LMWH), and 32 (16.4%) in group 3 (8 on VKA and 24 on LMWH) (Figure). Finally, 24 (12.3%) did not receive anticoagulation for various reasons: spontaneous bleeding (5), anaemia and/or thrombocytopenia (5), frailty (4), CHA_2DS_2-VASc 1 (3), pharmacological interactions (1), and single, short episode of paroxysmal NVAF (1); in 5 patients the lack of anticoagulation was not clearly motivated.

The only significant baseline differences between the 3 groups were serum creatinine concentration (1 ± 0.3 vs. 1.4 ± 0.8 vs. 1 ± 0.3 mg/dL, respectively, $P = 0.001$) and renin-angiotensin system inhibitor use (61% vs. 44% vs. 34%, $P = 0.001$). Of note, only 3% of subjects in group 1 received an inappropriate DOAC dose, while LMWH was under-dosed for 25% of patients in group 2 and 50% of patients in group 3.

Conclusions: In a dedicated cardio-oncology unit, DOACs and VKA are most often appropriately prescribed to cancer patients with NVAF. However, there is residual use of LMWH, not infrequently at non-anticoagulant dosage. This is a non-evidence based common practice in clinical oncology that clearly represents room for improvement.
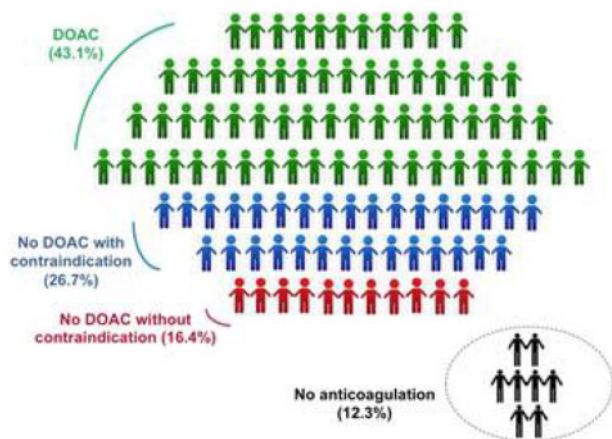
619 Permanent his bundle pacing in a patient with atrioventricular nodal disease and ventricular arrhythmias

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Background: Cardiac resynchronization therapy (CRT) with biventricular pacing (BVP) can mitigate the negative effects of RVAP on myocardial performance; however, it has not been universally beneficial and is not feasible in some patients. His bundle pacing (HBP) has recently emerged as a promising approach to achieving physiologic ventricular pacing and improving patient outcomes.

Case Presentation: A 75-year-old man with a history of hypertension, diabetes mellitus and paroxysmal AFib, treated with repeated electrical cardioversion, was admitted to the cardiology department because of recent onset of dyspnoea with marked limitation of physical activity (NYHA III). A 24-h Holter monitoring showed ventricular arrhythmias (frequent premature contraction and non-sustained ventricular tachycardia) and marked first-degree AV block (PR interval 340 ms). Vital parameters were within normal limits and physical examination was unremarkable. Surface electrocardiogram (ECG) showed normal sinus rhythm with marked first degree AV block (PR interval 340 ms), normal IV conduction and QS complexes in DII, DIII, aVF and poor R progression in precordial leads. Echocardiography showed global hypokinesis with reduced left ventricular function (EF = 35%). Coronary angiography was performed revealing three vessels disease with severe stenotic lesion of LAD, CX and RCA. Four DES were successfully implanted. Because of the ischaemic HFrEF with no possibilities of treatment titration because of conduction disease and the need for antiarrhythmic therapy, a CRTD was considered. In view of baseline ECG characteristic His bundle pacing was performed. We used Medtronic 3830 His lead with C315 delivery system. A selective his bundle pacing (SHBP) with narrow QRS was obtained. The patient was discharged after 2 days receiving optimal medical therapy. Three months later thresholds were stable and LVEF was increased.

Discussion and Conclusions: Permanent HBP was feasible with high success rates in patients requiring CRT. HBP was associated with significant narrowing of QRS and improvement in LV function. HBP can be an excellent alternative to BVP in patients who fail LV pacing and as a primary option in patients with narrow QRS at baseline and high RV pacing burden due to AV nodal disease or AV nodal ablation, like in the case of our patient. Future randomized studies are essential to understand the role of HBP compared to BVP in achieving CRT.
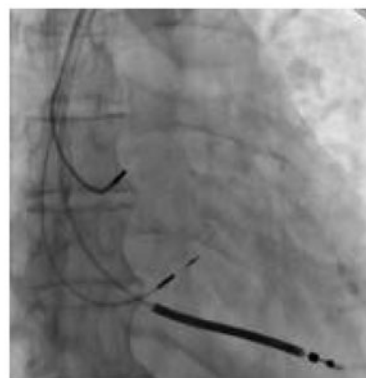
190 ECG abnormalities, atrial fibrillation and AV blocks in ATTR VS AL amyloidosis: an electrophysiological natural history

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Background: Electrocardiographic (ECG) and rhythm abnormalities are common in patients affected by light-chain (AL) and transthyretin (TTR) cardiac amyloidosis (CA) but systematic comparisons between the two are lacking. The purpose of this study was to assess the arrhythmic profile and the prevalence of ECG abnormalities in the two main types of CA, both at the time of diagnosis and during long-term follow-up.

Methods: Standard 12-lead ECG recordings and clinical files from two referral Amyloidosis Centers in Florence and Pavia were reviewed. Relevant findings

regarding rhythm (sinus rhythm vs atrial fibrillation [AF]), grade I or greater atrio-ventricular (AV) delays, intraventricular conduction abnormalities, low voltage QRS and pseudonecrosis pattern were reported. Patients with paced rhythm were included in the analysis and clinical data about pacemaker (PM) implantation were reported.

Results: A total of 244 patients were included in the study (106 with AL and 138 with ATTR-related CA). At baseline AL patients were younger and showed more often a NYHA class III, while ATTR subjects showed thicker left ventricular (LV) walls, greater left atrial (LA) size along with lower mean LV ejection fraction. At the time of diagnosis ATTR patients showed higher prevalence of AF (36% vs 6%, p = 0.0001), AV block grade I or greater (37% vs 13%, p = 0.0001), and previous device implantation (18% vs 1%, p = 0.0001) compared to AL, while low voltage pattern was more common in AL subjects. After a mean follow-up of 1.9 years, prevalence of AF was 67% among ATTR compared to 18% among AL patients (p = 0.0001). During follow-up a greater proportion of AL patients developed AV blocks (31% vs 16%, p = 0.015) and rate of PM implantation was similar between the groups. Low voltage pattern was prevalent in AL subjects. AL patients with intraventricular delay showed a worse survival rate compared to those without; nevertheless, survival in each group was not affected by presence of AF, AV blocks or low voltage pattern.

Conclusions: In this retrospective study ATTR subjects presented more frequently with AF and AV block requiring pacemaker implantation before disease recognition. AL patients showed a higher prevalence of low voltage and displayed a high rate of AV conduction disorders during follow-up. Such diversity reflects important pathophysiologic differences requiring tailored management strategies.

246   Clinical assessment of kidney function according to different equations in a cohort of patients admitted in a cardiology unit and impact of outcomes

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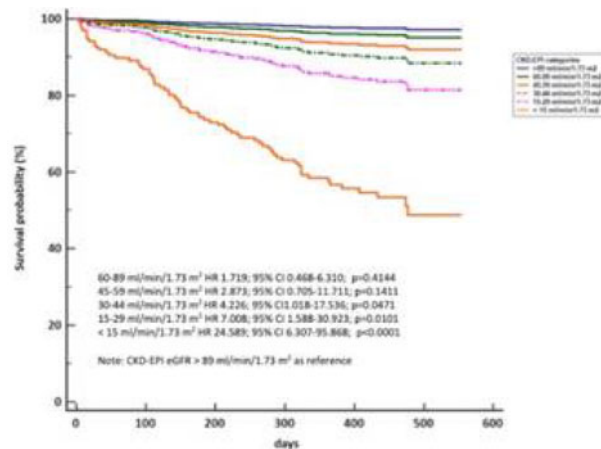
Background: For the evaluation and management of chronic kidney disease (CKD), the CKD-EPI equation is currently recommended. However other equations are commonly used in clinical practice.

Aim: To assess the concordance between CKD-EPI and other five equations for estimating GFR (eGFR) and to compare these formulas in terms of outcome prediction.

Methods: We retrospectively analyzed demographics, historical and clinical variables in a large cohort of patients consecutively admitted to our Cardiology Unit. At discharge serum creatinine eGFR was estimated according to 6 formulas: Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI), Cockroft-Gault (CG), CG adjusted for body surface area (CG-BSA), Modification of Diet in Renal Disease (MDRD), Berlin Initiative Study (BIS-1), and Full Age Spectrum (FAS).

Results: Between January and October 2016, 806 consecutive patients, median age 71 years, 510 (63.3%) males, electively or acutely admitted in our division and discharged alive, were enrolled. Overall substantial agreement was found between CKD-EPI, considered as reference, and CG-BSA, MDRD, BIS-1, FAS (Cohen's weighted K test 0.660; 0.758; 0.659; 0.667 respectively). In younger subjects (age <65 yrs) CKD-EPI and MDRD showed an almost perfect agreement (K = 0, 884), while in elderly (age ≥ 85 yrs) the agreement between CKD-EPI and all the other formulas was lower, with the best performance found for BIS-1 (K = 0.586). In the overall group CG and CKD-EPI had the lower concordance of attribution. Overall mortality [median Follow-up 407 days (interquartile range 284-473)] was 8%. The figure shows Kaplan Meier curves for all cause mortality according to eGFR class (CKD-EPI). Multivariable Cox regression analysis showed that survival was significantly worse for lower CKD-EPI eGFR values [eGFR < 60 ml/min/1.73m2HR 1.196; 95% confidence interval (95%CI) 1.011-1.415; p = 0.037]. Patients with eGFR < 15 ml/min/1.73m2had 24 fold increased risk in mortality compared to patients with eGFR ≥ 90 ml/min/1.73m2(HR = 24.589; 95% C.I. = 6.307-95.868, p < 0.0001). The discriminant capability of death prediction was tested with receiver operating characteristics curves and the best result was found for BIS-1 (AUC 0.782; p vs CKD-EPI 0.0013) and FAS (0.776; p vs CKD-EPI 0.0353), while the worst was for MDRD (AUC 0.750; p vs CKD-EPI 0.0052).

Conclusion: In an unselected cohort of patients admitted in a cardiology ward, the concordance between CKD-EPI and the other eGFR equations significantly decreases with age. In the elderly BIS-1 equation shows the higher agreement with CKD-EPI. Mortality rates were higher for lower eGFR. The best discriminant capability for death prediction according to eGFR equation was found for BIS-1 and FAS equations.

60-89 ml/min/1.73 m² HR 1.719; 95% CI 0.468-6.310; p=0.4144
45-59 ml/min/1.73 m² HR 2.873; 95% CI 0.705-11.711; p=0.1411
30-44 ml/min/1.73 m² HR 4.226; 95% CI1.018-17.536; p=0.0471
15-29 ml/min/1.73 m² HR 7.008; 95% CI 1.588-30.923, p=0.0101
< 15 ml/min/1.73 m² HR 24.589; 95% CI 6.307-95.868; p<0.0001

Note: CKD-EPI eGFR > 89 ml/min/1.73 m² as reference

202   Flecainide at hight doses suppress frequent ventricular extrasystolia in a case of MYBPC3 genetic mutation: data from ten years follow-up

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We report a long story started five years ago when a 45-year-old woman come to our attention for highly frequent ventricular extrasystoles. No prior syncope or chest pain. She remembered same episodes of short of breath and palpitations at rest in 1999-2004-2006. In 2008 she performed a 12 lead ECG that showed an highly frequent ventricular monomorphic extrasystoles (11900; 1558 couple) with left bundle branch block (LBBB) for the first time. She performed an ergometric stress test that was negative for coronary insufficiency and started b-blocker therapy with propranolol 80 mg/die. In 2009 the ECG and the echocardiography were normal. She was examined with CT angiography of coronary artery that showed normal coronaries. Propranolol was replaced with metoprolol 25 mg and flecainide 50 mg/bid. In 2010 a cardiac magnetic resonance (CMR) clarified the existance of abnormal left ventricular systolic dysfunction with an ejection fraction (EF) 45% and left ventricular dilatation. In the same year she underwent to an endocardial catheter ablation procedure. Unfortunately she suffered from a number of further recurrent of frequent ventricular contractions (PVCs) and another ablation procedure was performed. Propafenone 325 mg/daily substituted the therapy with b-blocker and flecainide. A CMR was repeated and the exam confirmed an abnormal left ventricular systolic dysfunction (EF 47%) and the left ventricular dilatation with comparable value. Therapy with sotalolo 80 mg replaced propafenone. In 2012 the ECG revealed a LBBB; a 12 lead ECG demonstrated an highly frequent PVCs (17871; 2731 couple and same episodes of non susteined ventricular tachicardia) with LBBB. At the echocardiography the EF was 42%. She discontinued sotalolo, she assumed ivabradine without clinical benefits. The echocardiography performed in 2015 prove a mild ventricular dilatation and EF 45%. She restarted flecainide 100 mg/bid. The 12 lead ECG in 2015 demonstrated a drastic reduction of PVCs (only 66 PVC). In 2016 the PVCs were 173 in 24 h monitoring. In November 2017 on 12 lead ECG reappeared highly frequent PVCs (28650). Flecainide was titrate to 150 mg three times a day; the echocardiography demonstrated EF 50%. The predictive value of ripetitive monomorphic ventricular extrasistoles remain uncertain. In same case the hight frequent ventricular monomorphic extrasystoles forward a reduction of the left ventricular systolic function. A not insignificant percentage of these cases evolve in tachicardiomyopathies definable as a reversible loss of function of the ventricle induced by persistent atrial and ventricular ectopy or arrhythmia that promoting dyssynchrony.In our case the genetic analysis finally revealed a mutation on the myosin-binding protein C (MYBPC3). Myosin-binding protein C is a myosin-associated protein found in the cross-bridge-bearing zone (C region) of A bands in striated muscle expressed exclusssively in heart muscle. Phosphorylation of the cardiac isoform by cAMP-dependent protein kinase upon adrenergic stimulation may be linked to modulation of cardiac contraction. Mutations in MYBPC3 are one cause of hypertrophic cardiomyopathy and left ventricular noncompaction. As we know it is the first time that MYBPC3 is related to case of tachicardiomyopathy or dilatative cardiomyopathy. The thing that emerge in this case is that the PVCs drastic reduced with high dose of flecainide without impairment of the left ventricle systolic functinon. We hypothesized that flecainide, an inhibitor of the cardiac late sodium current that suppress catecholamine-induced ventricular arrythmias has a key role in this case, further investigation will be needed to fully understand.

661 Analysis of substrate map in patients with arrhythmic storm

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Background: Transcatheter ablation of ventricular tachycardias in patients with electrical storm represents a challenge due to the complexity of the substrate through which they arise.

Below we will present 9 cases recently treated at our centre.

The average age of the patients is 59 ± 22 years, 3 were suffering from ischaemic heart disease, 2 from dilated cardiomyopathy, 2 from arrhythmogenic dysplasia, one patient had Becher's muscular dystrophy and one patient had no structural heart disease. In four cases an epicardial approach was required in addition to the endocardial one. Left ventricular ablation was performed in 8 cases and in 4 cases by retrograde aortic approach.

In only 3 cases it was possible to perform a clinical VT activation map. In the other cases, due to poor haemodynamic tolerance, ablation was performed using a substrate map, which allows the localization of the area on which the arrhythmia is sustained, represented in the map as a low potentials zone.

In cases where it wasn't possible to perform an activation map, the ablation target was the elimination of the late potential signals and the homogenization of the area. The choice to perform an epicardial approach was based on the patient's primary heart disease (dilated cardiomyopathy and arrhythmogenic dysplasia).

Results: The mean follow-up was 4 months (median 1, IQR 7 months) during which 2 patients had a sustained VT recurrence after 20 days and 1 month respectively after the procedure.

Pic1: epicardial bipolar map and late potentials in the postero-lateral wall of LV.
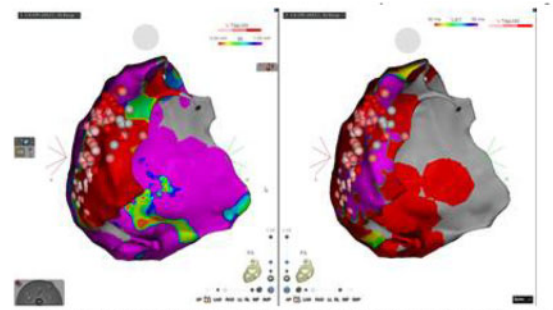
Pic1: epicardial bipolar map and late potentials in the postero-lateral wall of LV.

Conclusions: Endo-epicardial RF ablation was an effective treatment strategy in our patients with electrical storm The substrate map represented a valid ablation target in patients which it wasn't possible to create an activation map.