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Insights into cerebral hemodynamics during atrial fibrillation: a noninvasive near-infrared spectroscopy approach

Original

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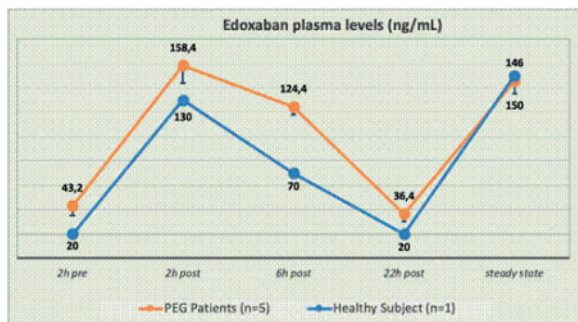
606 Oral anticoagulants in fragile patients with percutaneous endoscopic gastrostomy and atrial fibrillation: the Origami study

Alessandra Arcudi¹, Domenico D'Amario^{1,2}, Mattia Galli¹, Francesco Canonico¹, Attilio Restivo¹, Roberto Scacciavillani¹, Luigi Cappannoli¹, Maria Elena Riccioni¹, Maria Giuseppina Annetta², Gaetano Di Stefano², Carlo Piccini², Rocco Vergallo², Rocco Antonio Montone², Antonio Maria Leone², Giampaolo Nicolli², Mario Sabatelli², Massimo Antonelli², Felicità Andreotti², Raimondo De Cristofaro², and Filippo Crea^{1,2}
¹Università Cattolica del Sacro Cuore, ²Fondazione Agostino Gemelli Ircs

Aims: Randomized trials support the safety and efficacy of direct oral anticoagulants (DOACs) vs. vitamin K antagonists (VKA) in patients with nonvalvular atrial fibrillation (AF), leading to increased use of these compounds. Crushed forms of DOACs have shown to be reliable, but evidence supporting percutaneous endoscopic gastrostomy (PEG) delivery is lacking. PEG is a long-term option for enteral food and drug delivery in patients unable to maintain oral intake, bypassing the risks and disadvantages of parenteral nutrition. We investigate the safety and efficacy of Edoxaban administered via PEG in patients with atrial fibrillation and a clinical indication for a long-term anticoagulation.

Methods and results: In this prospective, single centre observational study, 12 PEG-treated patients with indication to anticoagulation will receive edoxaban via PEG and will be followed-up to 6 months. Plasma anti-Factor Xa activity and edoxaban concentrations will be assessed. Thromboembolic (ischaemic stroke, systemic embolism, venous thromboembolism) and bleeding events (Bleeding Academic Research Consortium and Thrombolysis in Myocardial Infarction) will be recorded at 1 and 6 months. A retrospective analysis of 5 AF cases undergoing PEG-implantation at our Institution, who received edoxaban via PEG, showed plasma anti-FXa levels at steady state of 146 ± 15 ng/ml, without major adverse event at a mean follow-up of 6 months.

Conclusion: We prospectively investigate PEG-administration of edoxaban in PEG-treated patients requiring long term anticoagulation. Our preliminary retrospective data support this route of DOAC administration.

**520 Ablation of focal and rotational activity detected by Cartofinder software in patients with persistent AF**

Leonardo Belfioretti^{1,2}, Umberto Falanga^{1,2}, Manuel Antonio Conti^{1,2}, Laura Cipolletta^{1,2}, Gino Grifoni^{1,2}, Alessandro Barbarossa^{1,2}, Giovanni Volpato^{1,2}, Paolo Compagnucci^{1,2}, Giulia Stronati^{1,2}, Federico Guerra^{1,2}, Michela Casella^{1,2}, and Antonio Dello Russo^{1,2}

¹Azienda Ospedaliero Universitaria Ospedali riuniti Ancona Umberto I–Lancisi–Salesi, ²Università Politecnica delle Marche

Aims: Mechanisms sustaining persistent atrial fibrillation (AF) remain poorly understood, but rotors and focal impulse sources could play an important role in maintaining arrhythmia. Cartofinder is a novel mapping software that uses the CARTO platform (Biosense Webster). It constructs an activation map through a recording of 30 seconds, referencing each electrogram relative to all the others in the LA by identifying focal and rotational activity. Currently, there is no well-defined ablation

strategy to treat persistent AF and ablation of focal drivers and rotors seems to determine an improved long-term outcome. Compare an ablation strategy guided by Cartofinder and ablation index (AI) vs. ablation of the posterior wall and other trigger identified by challenge test with isoproterenol and evaluate AF recurrences in a short term Follow-up.

Methods and results: We enrolled 16 consecutive patients with persistent AF and indication for catheter ablation. All patients underwent antral pulmonary vein isolation (PVI) guided by AI. Ablation points had an AI range of 500-550 in the anterior wall and 400 elsewhere side of PV. In 8 patients, atrial geometry was acquired using PentaRay NAV catheter (Biosense Webster) and recordings were analyzed with Cartofinder software. Stable rotational activity or focal activities were ablated follow AI targets. The other group of 8 patients underwent posterior wall homogenization and ablation of non-PV triggers identified by challenge test with intravenous isoproterenol. AF recurrences were evaluated after 3 months with 12-leads electrocardiograms. In Cartofinder group we found focal activities in left atrium (85%) and right atrium (15%). In the left atrium the majority of focal drivers were found in left atrial appendage, posterior wall and left atrium roof, while in right atrium we found focal activities in right atrial appendage, coronary sinus, superior vena cava and atrial septum. We performed an ablation index (AI) guided procedure: in left atrium mean AI value was 353, while in right atrium mean AI value was 342. Rotational activities were found only in left atrium: 30% left atrial posterior wall, 30% left atrial appendage and 30% warfarin ridge. Mean AI value in these areas was 363. During ablation of focal activities and rotors we did not observe sinus rhythm restoration. In the other group we performed posterior wall homogenization and we found non-PV triggers after challenge test with intravenous isoproterenol localized in posterior wall and atrial roof. In these areas mean AI value was 460. No complications were observed. AF recurrences were evaluated after a mean Follow-up of 3 months with in-office visit. We found three symptomatic AF recurrences in both groups, all within 3 months.

Conclusion: Cartofinder software allows a reliable identification of focal activities and rotors in patients with persistent AF. We did not observe any difference between these two different ablation strategies. A larger sample of patients is needed in order to evaluate the real efficacy of ablation strategy guided by Cartofinder and ablation index.

526 Segmental isolation of PV using LiveView system with LSI-guided lesions: a short-term follow-up

Leonardo Belfioretti^{1,2}, Umberto Falanga^{1,2}, Manuel Antonio Conti^{1,2}, Laura Cipolletta^{1,2}, Gino Grifoni^{1,2}, Alessia Urbinati^{1,2}, Paolo Compagnucci^{1,2}, Giovanni Volpato^{1,2}, Giulia Stronati^{1,2}, Federico Guerra^{1,2}, Michela Casella^{1,2}, and Antonio Dello Russo^{1,2}

¹Azienda Ospedaliero Universitaria Ospedali Riuniti Ancona Umberto I–Lancisi–Salesi, ²Università Politecnica delle Marche

Aims: The EnSite Precision™ cardiac mapping system (Abbott Technologies) and high definition Grid Mapping Catheter Sensor Enabled (Abbott Technologies) are well established diagnostic tools for catheter ablation of AF. The new EnSite™ LiveView Dynamic Display (Abbott Technologies) provides real-time visualization of electrical informations gathered by the Advisor HD Grid catheter in order to identify the pulmonary venous breakthrough. In this way the LiveView system provides instant identification of target areas for ablation, allowing a prompt segmental PV isolation instead of performing anatomical PV encircling. Moreover, to assure a complete transmural lesion, it's important the use of lesion index (LSI), representing a novel lesion quality marker incorporating contact force, power supply and radiofrequency time. Infact, mean LSI values of 5-5.5 and 4.5-5 for anterior and posterior wall, respectively, are associated with a better acute and long-term outcomes. Evaluate AF recurrences after segmental PV isolation using LiveView system and LSI in a short-term follow-up.

Methods and results: We enrolled 7 patients with paroxysmal and early-persistent AF who underwent RF ablation using Tactiath™ Quartz catheter (Abbott Technologies). The ablation procedure was conducted pursuing segmental PV isolation guided by LiveView system. Each ablation point had a target LSI value of 5-5.5 and 4.5-5 for anterior and posterior wall respectively. The complete PV isolation was validated after 30 minutes with pacing maneuvers and administration of intravenous Adenosine. In case of venous reconnection, PV isolation was completed with segmental ablation identifying venous breakthrough. Then, each patient underwent loop recorder implantation. AF recurrence was evaluated 1 month after procedure with in-office visit and loop recorder interrogation. The mean procedural time was 162.5 minutes which is less than mean procedural time (212.8 minutes) for patients

undergoing AF ablation with Ensite precision system using encircling PV isolation in our centre. The mean ionizing radiation exposure, quantified with Dose Area Product (DAP), was 139.2 mGy*cm². Mean LSI values were 4.8 and 4.7 for LSPV respectively anterior and posterior wall; 5.1 anterior and 5 posterior for LIPV; 4.9 anterior and 4.5 posterior for RSPV; 5.3 anterior and 5.1 posterior for RIPV; 4.6 and 5.1 for left and right carena respectively. Two patients showed PV reconnection after pacing maneuvers, while two patients showed PV reconnection after Adenosine test. No complications were observed. After a short term Follow-up of 1 month, although in the blanking period, AF recurrences were detected in 2 patients. The recurrences were self-limiting, lasting respectively 27 and 120 minutes and only one patient was symptomatic. Interestingly, both of these patients showed PV reconnection after pacing maneuvers.

Conclusion: Real-time visualization of PV breakthrough and ablation LSI-guided allow a reliable and safe segmental PV isolation potentially reducing procedural time and ionizing radiation exposure. Moreover, this approach avoids additional ablative lines which are potentially arrhythmogenic. These data are preliminary and not reliable because Follow-up is still in blanking period and the inflammatory process of ablation itself can be responsible of AF recurrences. We need longer Follow-up to evaluate efficacy of this new approach.

530 Evaluation of new algorithm LiveView-guided pulmonary vein isolation technique in patients with atrial fibrillation

Umberto Falanga^{1,2}, Leonardo Belfioretti^{1,2}, Manuel Antonio Conti^{1,2}, Laura Cipolletta^{1,2}, Gino Grifoni^{1,2}, Giovanni Volpato^{1,2}, Paolo Compagnucci^{1,2}, Giuseppe Ciliberti^{1,2}, Giulia Stronati^{1,2}, Federico Guerra^{1,2}, Michela Casella^{1,2}, and Antonio Dello Russo^{1,2}

¹Azienda Ospedaliero Universitaria Ospedali Riuniti Ancona Umberto I—Lancisi—Salesi, ²Università Politecnica delle Marche

Aims: Arentz et al. have reported in randomized prospective studies that “antral” PVI was superior to segmental or more ostial PVI, but in this study conventional electroanatomical mapping was used with static information and the procedure was not guided by a multiparametric index. A high density gridstyle mapping catheter (HD Grid) allows a simultaneous recording of adjacent bipolar EGMs in two directions (HD Wave). EnSiteTM Liveview dynamic display is designed to provide real-time visualization of breakthrough activity by electrical information gathered by the AdvisorTM HD Grid mapping catheter in an area of interest. The aim of this work is to evaluate the efficacy of a segmental PVI guided by the Lesion Index (LSI) based on the breakthrough activity identified thanks to Liveview with HD Grid mapping catheter.

Methods and results: Patients with paroxysmal and early persistent (< 3 months) AF underwent segmental PVI with a CF sensing catheter (TactiCathTM, Abbott) with LSI-guided ablation (LSI range 5.5 in the anterior and 4.5 elsewhere side of PV). RF lesions were created sequentially based on breakthrough activity identified by Liveview module with HD Grid mapping catheter, until the isolation of the vein was achieved. PVI was confirmed by demonstrating entry and exit block by pacing maneuvers and at least 20 minutes after electrical isolation of each PV, was performed a check with Adenosine. All patients were monitored with an implantable loop recorder. Preliminary data was collected in 7 patients. Patient characteristics are shown in table 1. De novo and repeat ablations represented 85.7% and 14.3% of cases respectively. The mean procedure time was 164.3 minutes [120-240]. The mean time of isolation of single vein was 12-17 minutes [0.45-28], with an average number of RF applications for single vein equal to 8 [2-28]. In 58% of cases persistent isolation of the vein guided by breakthrough activity was achieved by applying RF lesions in the anterior segments. Higher LSI values were reached in the anterior segments (median LSI = 5 [4.1-6.1]) than in the posterior wall (median LSI = 4.7 [4.1-5.4]). Persistent electrical isolation of each PV after Adenosine administration was achieved in 93% of PVs.

Conclusion: These preliminary data on segmental PVI driven by breakthrough activity identified by Liveview module, show a positive trend towards successful electrical isolation of PVs but more data with follow-up are needed to evaluate long-term efficacy.

Table 1:

Age, mean ± SD [years]	CHADS ₂ -VASC:	Paroxysmal AF, n 5	Ejection Fraction, mean ± SD [%] 60.7 ± 13
58 ± 13	0, n 1	AF, n 5	Left atrial AP volume mean ± SD [ml/m ²] 32.4 ± 13
Gender, male, n (%) 4 (57%)	1, n 1	Early persistent AF, n 2	Ischaemic cardiopathy, n (%) 0 (0)
Hypertension, n (%) 4 (57%)	2, n 2		Acute Complications, n (%) 0 (0)
Diabetes mellitus, n (%) 1 (14%)	3, n 3		
	4, n 0		
	5, n 0		

252 Restarting anticoagulation after chronic subdural hematoma neurosurgical evacuation: a prospective observational study

Stefano Urbinati⁴, Francesco Bernardini⁶, Gabriello Marchetti¹, Michele Romoli³, Filippo Friso⁵, Vittoria Rosetti⁵, Alessandra Serracchioli⁵, Diego Della Riva¹, Chiara Rafanelli⁶, and Diego Mazzatenta⁵

¹Division of Cardiology, Bellaria Hospital, Bologna, ²Division of Neurology, Bellaria Hospital, Bologna, ³Division of Neurology, Rimini Hospital, Bologna, ⁴Division of Cardiology, Bellaria Hospital, FESC, FACC, Bologna, ⁵IRCCS Division of Neurology, Bellaria Hospital, Bologna, ⁶Department of Psychology, University of Bologna, Bologna

Aims: Management of anticoagulation (AC) in patients with chronic subdural hematoma (cSDH) lacks evidences, with uncertainties regarding outcomes after neurosurgical intervention.

We aimed to define safety and effectiveness of AC resumption in a single centre cohort undergoing neurosurgical intervention for cSDH.

Methods and results: Consecutive patients undergoing neurosurgical intervention for evacuation of cSDH and taking anticoagulants due to atrial fibrillation were included and followed-up over time (3 to 30 months) to define evolution of cSDH thickness depending on AC restart. Secondary outcomes included: (i) ischaemic stroke and major bleeding (including intracerebral Haemorrhage, ICH), assessed at each visit, and (ii) recurrent cSDH needing neurosurgical re-intervention. Overall, we included 47 consecutive patients, mean age 82.5 ± 7.8 years. Previous trauma emerged in 68% of cases. Patients received warfarin (n=30, 64%), low molecular weight heparin (LMWH, n=6, 13%) or direct oral anticoagulants (DOAC, n=11, 23%). Oral AC was stopped before neurosurgery (7.9 ± 16.7 days before intervention), and 42 (89%) underwent AC reversal. Mean cSDH thickness was 2.3 ± 0.6 cm, midline shift was detected in 94% of patients. All patients survived surgical procedure and completed a minimum of 3-month follow-up. Over a mean 8-month follow-up (range 3-29), cSDH thickness substantially decreased (baseline 2.3 ± 0.6 cm vs. follow-up 0.7 ± 0.6 cm, *P* < 0.001). Overall, 26 patients (55.3%) restarted AC, 15 with DOAC, 8 with warfarin, 3 with LMWH. Compared to no AC, AC resumption was not associated with changes in cSDH thickness (0.7 ± 0.7 cm vs. 0.9 ± 0.6 cm, *P* = 0.4) or modified Rankin scale at follow-up (2.6 ± 1 vs. 2 ± 1.3, *P* = 0.3). Four patients restarting AC had cSDH recurrence requiring re-intervention vs. 0 in those avoiding AC (*P* = 0.11); 3 of 4 were post-traumatic. No peri-interventional complications occurred. No ischaemic stroke or major bleeding was detected during AC withdrawal.

Conclusion: The study has obviously limitations due to its preliminary nature. Even though, resumption of anticoagulation after neurosurgical intervention for cSDH seems safe, with no significant increase in recurrence rate and cSDH width over time. Longitudinal data from prospectively collected larger cohorts are needed to guide management.

303 Causes, safety and outcomes of switching from the initial direct oral anticoagulant to another in patients with non-valvular atrial fibrillation

Francesco Bernardini⁴, Gabriello Marchetti¹, Michele Romoli², Chiara Rafanelli⁴, and Stefano Urbinati³

¹Division of Cardiology, Bellaria Hospital, Bologna, ²Division of Neurology, Rimini Hospital, Rimini, ³Division of Cardiology, Bellaria Hospital, FESC, FACC, Bologna, ⁴Department of Psychology, University of Bologna, Bologna

Aims: The purpose of this study was to evaluate causes, annual rates and outcome of switching from one to another direct oral anticoagulant (DOAC) among patients with nonvalvular atrial fibrillation (NVAF).

Methods and results: Overall, 300 patients receiving first DOAC prescription at the Anticoagulation Center, from December 2017 to December 2019 were consecutively included and followed. Mean age was 79.3 ± 8.5, female 46.3% (n = 139). Mean follow-up was 1.6 years. Two hundred-twelve patients were received DOAC being naïve (70.7%), while 88 (29.3%) transitioned to DOAC from VKA. Baseline mean ischaemic and hemorrhagic risk were both moderate (mean CHA₂DS₂VASc 3.6, mean HASBLED 1.8). Most prescribed DOACs was rivaroxaban (n = 107), followed by apixaban (n = 82), edoxaban (n = 59) and dabigatran (n = 52). 39 patients (13%) switched from DOAC to DOAC. Minor bleeding led to switch in 54%, major bleeding in 100%, and non-CV events in 93% of cases. Non-CV adverse events were significantly more frequent with dabigatran vs. apixaban or rivaroxaban (17.3% vs. 1.2% and 0% respectively, *P* < 0.001). Crossover was preferentially oriented towards apixaban (43% of cases, *P* < 0.04). After switch, 87.2% of patients had complete resolution or absence of further events. Minor bleeding annual rate was 6.9% (95%CI 4.2-9.4), while major bleeding was 0.5%/year, (95%CI 0.1-1.7). Annual rate of switch due to minor and major bleeding being was 3.6% (95%CI 2.1-5.8) and 0.7% (95%CI 0.2-1.9) respectively. Minor bleeding was less frequent after switch (1.7% vs. 6.4%, *P* = 0.09).

Conclusion: Minor bleeding and non-cardiovascular adverse events are the most common causes of switch: 15%/year. Apixaban seems, compared to other DOACs, the one with the highest persistence rate.

210 Effect of atrial fibrillation on angiographic characteristics and severity of coronary artery disease in patients undergoing percutaneous coronary intervention

Flavio Giuseppe Biccirè¹, Gaetano Tanzilli¹, Pasquale Pignatelli¹, Francesco Violi¹, Francesco Barilla¹, Carlo Gaudio¹, and Daniele Pastori¹

¹Dipartimento di Scienze cardiovascolari, Respiratorie, Nefrologiche, Anestesiologiche e Geriatriche—Umberto I Hospital Sapienza University of Rome

Aims: Patients with atrial fibrillation (AF) have an increased risk of coronary artery disease (CAD) compared to patients without. Angiographic characteristics, clinical presentation and severity of CAD according to the presence of AF have been poorly described.

Methods and results: Retrospective study including 303 consecutive patients with and without AF undergoing percutaneous coronary intervention. Data on 1) type of CAD presentation, 2) coronary involvement and 3) number of diseased coronary vessels ($\geq 70\%$ /luminal narrowing), have been collected. CHA₂DS₂-VASc and 2MACE score were calculated. Mean age was 69.6 ± 10.8 years and 23.1% were women. Presentation of CAD was STEMI in 37.6% of patients, NSTEMI-UA in 55.1%, and other in 7.3%. NSTEMI-UA was more common in AF (69.6% vs. 46.6%, $P < 0.001$), while STEMI was more in the non-AF (22.3% vs. 46.6%, $P < 0.001$) group.

Left anterior descending artery (LAD) was the most common diseased vessel (70.6%) followed by right coronary artery (RCA, 56.4%) and obtuse marginal artery (36.6%). Patients with AF had a slightly lower LAD (64.3% vs. 74.3%, $P = 0.069$) and a significantly lower RCA involvement (47.3% vs. 61.8%, $P = 0.016$). At multivariable logistic regression analysis, AF remained inversely associated with RCA involvement (Odds Ratio [OR] 0.541, 95% Confidence Interval [CI] 0.335-0.874, $P = 0.012$) and with ≥ 3 vessels CAD (OR 0.470, 95%CI 0.272-0.810, $P = 0.007$). The 2 MACE score was associated with diseased LAD (OR 1.301, 95%CI 1.103-1.535, $P = 0.002$) and with ≥ 3 vessels CAD (OR 1.330, 95%CI 1.330-1.140, $P < 0.001$).

Conclusion: Patients with AF show lower RCA involvement and a general less severe CAD compared to non-AF ones. 2MACE score was higher in LAD obstruction and identified patients with severe CAD.

405 CHA₂DS₂-VASc as a predictor of atrial fibrillation recurrence after catheter ablation

Elena Causin¹, Federica Bellante¹, Domenico Grieco³, Silvio Romano⁴, Maria Penco⁴, Leonardo Calò³, Gabriele Dell'Era², Giacomo Nucci⁴, Emiliano Coletta⁴, and Giuseppe Patti^{1,2}

¹Università del Piemonte Orientale, ²Ospedale Maggiore della Carità Novara, ³Policlinico Casilino Roma, ⁴Università Degli Studi dell'Aquila

Aims: The identification of patients affected by atrial fibrillation (AF) who preferentially benefit from transcatheter AF ablation is a relevant and debated issue. CHA₂DS₂-VASc score is widely utilized to stratify the thromboembolic risk in patients with non-valvular AF. A high CHA₂DS₂-VASc score has been also associated with a major grade of LA fibrosis and systemic inflammation, both representing pro-arrhythmic features. In this study we evaluated the correlation between CHA₂DS₂-VASc score and arrhythmia recurrence after AF catheter ablation.

Methods and results: In a retrospective analysis we collected data from 250 patients. All patients received a strict follow-up at 3 months after the ablation and then every 3-6 months or in the case of symptoms. Primary endpoint was the incidence of AF recurrence at a mean of 23.6 ± 2.2 month follow-up according to baseline CHA₂DS₂-VASc score. Mean age was 59.37 ± 1.34 years and 198 patients (79.2%) were men; 104 (41.6%) had paroxysmal AF, 139 (55.6%) persistent AF and 7 (2.8%) both. All patients underwent radiofrequency ablation except 12, who received cryoablation. Class I and III antiarrhythmic drugs were used at discharge in 137 (54.8%) patients. Mean LV ejection fraction was $55.2 \pm 0.9\%$.

CHA₂DS₂-VASc score was calculated in each patient: mean CHA₂DS₂-VASc score was 1.63 ± 0.18 ; 176 (70.4%) patients had a score ≥ 3 . AF recurrence raised progressively with parallel increase of CHA₂DS₂-VASc score. For a CHA₂DS₂-VASc of 0, the recurrence rate was 12.2%; for CHA₂DS₂-VASc 1 was 18%; for CHA₂DS₂-VASc 2 was 33.3%. For a CHA₂DS₂-VASc of 3, 4 and 5 the recurrence rates were 50, 56 and 50%, respectively.

CHA₂DS₂-VASc score was 2.43 ± 0.33 in patients with AF recurrence after the ablation vs. 1.31 ± 0.20 in those without. Multivariate analysis confirmed CHA₂DS₂-VASc as an independent predictor of AF recurrence; in particular, patients with CHA₂DS₂-VASc ≥ 3 had a 2.7 fold higher risk of AF recurrence after the intervention (OR 2.7; 95% C.I. 1.26-5.65; $P = 0.011$).

Conclusion: A high CHA₂DS₂-VASc score is independently associated with increased risk of AF recurrence after ablation. CHA₂DS₂-VASc score could be an additive tool to conventional predictors for accurately forecasting the recurrence of AF in patients undergoing catheter ablation of the arrhythmia.

544 Preliminary results of the identification of the optimal ablation index target value in ventricular tachycardia ablation (idea VT) study

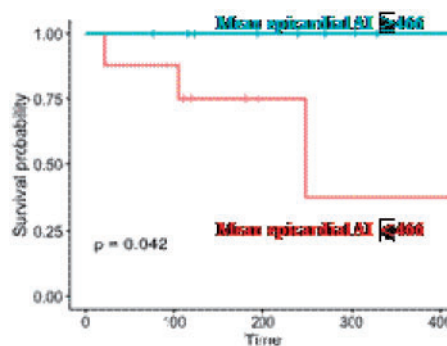
Paolo Compagnucci¹, Michela Casella¹, Giovanni Volpato¹, Laura Cipolletta², Manuel Conti², Gino Grifoni², Umberto Falanga¹, Leonardo Belfioretti¹, Alessio Gasperetti¹, Giulia Stronati¹, Fabrizio Guarracini³, Federico Guerra¹, Claudio Tondo⁴, and Antonio Dello Russo¹

¹Università Politecnica delle Marche—Clinica di Cardiologia e Aritmologia, ²Azienda Ospedaliera Universitaria Ospedali Riuniti—Clinica di Cardiologia e Aritmologia, ³Dipartimento di Cardiologia—Ospedale Santa Chiara, ⁴Centro Cardiologico Monzino IRCCS

Aims: catheter ablation (CA) is a fundamental therapeutic measure for patients with ventricular tachycardia (VT) and/or electrical storm (ES), resulting in the reduction and often elimination of future ventricular arrhythmias (VAs). Conventionally, radiofrequency (RF) energy is delivered in critical areas identified by activation and/or substrate mapping, aiming to eliminate local electrograms. The optimal duration of RF delivery, as well as the role of multiparametric indexes incorporating contact force, power, and time are yet to be defined. to assess whether ablation index (AI) is related to risk of recurrence in patients undergoing CA for VT and/or ES.

Methods and results: these are the preliminary results of a multicentric prospective observational study, the IDentification of the optimal Ablation index target value in Ventricular Tachycardia ablation (IDEA VT) study, enrolling patients undergoing CA for VT and/or ES in three high volume Italian referral centers (University Hospital Ospedali Riuniti, Ancona; Monzino Heart Centre, Milan; S. Chiara Hospital, Trento). We enrolled each consecutive patient in whom CA was performed under the guidance of the CARTO electroanatomical mapping system (Biosense Webster, Diamond Bar, CA). For each procedure, mean endocardial and epicardial AI values were obtained. Patients were followed for recurrences using remote monitoring data; VT recurrence was defined as any VT episode lasting longer than 30s. The prognostic contribution of AI for the prediction of VT recurrences was assessed in Cox proportional hazards models by the likelihood ratio (LR) test and, in case of significant association, with the Kaplan-Meier method, comparing patients reaching AI values over and under the median of mean AI with the log-rank test. We included 65 patients (mean age, 62 ± 14 years, 89% male), undergoing endocardial (n=40, 62%), epicardial (n=4, 6%), or epi-endocardial (n=21, 32%) CA for ES (n=46, 71%) or VT (n=19, 29%). VAs were considered idiopathic in just 4 subjects, whereas most patients had significant structural heart disease: ischaemic cardiomyopathy was the most common substrate (n=32, 49%), and mean ejection fraction was $29 \pm 20\%$. During follow-up, 11 patients (17%) experienced recurrences; the median survival free from VT recurrence was 900 days. The median of mean endocardial AI was 452, whereas the median of mean epicardial AI was 466. Although mean endocardial AI values were not predictive of VT recurrences (LR=0.08, $P = 0.77$), we noted a significant association between mean epicardial AI values and VT recurrences (LR=12.4, $P = 0.004$); furthermore, patients reaching mean epicardial AI values 466 had significantly fewer recurrences than patients with lower values (log-rank test $P = 0.04$, figure).

Conclusion: AI is an important parameter, which may become a procedural target in patients undergoing CA for VT. Larger data sets as well as longer follow-up are needed to confirm our preliminary observations and to define an optimal AI cutoff to maximize both safety and effectiveness.

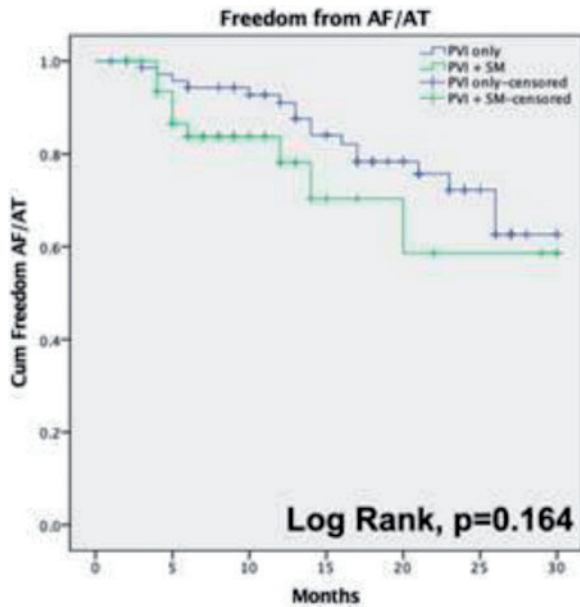


254 Tailored low voltage zones ablation using contact force sensing technology in patients with persistent atrial fibrillation (tweet-AF): a pilot study

Gabriele D'Ambrosio^{1,2}, Raffa Santi¹, Silvio Romano², Markus Frommhold¹, Obaida Alotman¹, Georgi Borisov¹, Issa Karam¹, and Maria Penco², Johann Christoph Geller^{1,3}

¹Zentralklinik, Bad Berka, Germany, ²University of L'Aquila, L'Aquila, Italy, ³Otto-Von-Guericke University School of Medicine, Magdeburg, Germany

Aims:



Although pulmonary vein (PV) isolation (PVI) is very effective in paroxysmal atrial fibrillation (AF), in patients (pts) with persistent AF, PVI often is not sufficient. Many studies suggested that low voltage zones (LVZs) outside of the PV might be involved in the complex mechanisms perpetuating AF. However, ablation strategies involving substrate modification (SM) did not show additional benefits in persistent AF pts. Those studies were performed before the introduction of contact force technology, and the most likely explanation for these results could be the inability to achieve effective transmural lesions and continuous linear ablation. We hypothesized that the use of contact force technology would improve ablation efficacy. Therefore, we analyzed the long-term outcome after two different ablation strategies in pts with persistent AF depending on whether there was evidence of LVZs in the left atrium or not.

Methods and results: The presence of LVZs were defined as sites of >3 adjacent low-voltage points <0.5 mV during electrophysiology study. Depending on the location of the LVZ, mainly linear ablation was performed. Catheter ablation was performed using TactiCath™ or SmartTouch™ ablation catheters aiming at contact values ≥ 10 g < 20 g and FTI > 400 g/s. Ablation was performed in a temperature-controlled fashion with energy of 30 W except at the posterior wall (20-25 W). 121 consecutive pts with persistent AF (46 female, median age 66 [59-72] years, mean duration of AF 16 [7-73] months, CT derived LA volume index 66 [56-75] ml/m²) were included: pts without LVZs underwent PVI alone (n=74), in pts with LVZs, PVI + SM (n=47) was performed (mitral Isthmus line in 2, supero-septal line in 39, and roof line in 47; bidirectional block was achieved in 100%, 97%, and 100%, respectively). After a median follow-up of 13 [6-21] months, 86% of pts without and 78% with substrate were in sinus rhythm, mainly without antiarrhythmic drugs (89% PVI only, 84% PVI + SM) (Figure).

Conclusion: In patients with persistent AF without LVA, PVI alone leads to excellent 2-year freedom from AF. In pts with LVZs, additional substrate modification with CF sensing technology is associated with improved success rates compared to previous studies.

533 Left chambers longitudinal strain increase predicted score of sudden cardiac death risk in hypertrophic cardiomyopathy patients with concomitant coronary atherosclerotic disease

Emilia De Luca¹, Antonio Curcio^{1,2}, Iolanda Aquila¹, Giuseppe Santarpia¹, Carmen Spaccarotella¹, and Ciro Indolfi^{1,2}

¹Division of Cardiology, Department of Medical and Surgical Sciences, Magna Graecia University, Catanzaro, Italy, ²CNR-IFC, Catanzaro, Italy

Aims: Hypertrophic cardiomyopathy (HCM) is the most common inherited arrhythmogenic disease predisposing young adults to sudden cardiac death (SCD). It is not known yet how the coexistence of coronary atherosclerotic disease (CAD) might increase the arrhythmic burden (either brady- or tachy-arrhythmias) in patients with HCM. According to current European 2014 guidelines, the SCD risk is calculated using the HCM Risk SCD which, by means of individual risk variables, classifies HCM patients into low, intermediate or high risk, and helps clinicians in the appropriate selection of candidates to the cardioverter/defibrillator implantation (ICD) therapy in primary prevention; only for the subgroup of high-risk patients it is mandatory to implant an

ICD against an increased rate of SCD/year > 6%. To date, it is not clear whether the use of echocardiographic parameters such as left atrial strain (AS) and left ventricular global longitudinal strain (LV-GLS) might predict the increased arrhythmic burden in patients with HCM. The aim of our study is to propose both AS and LV-GLS as prognostic SCD risk markers in patient with HCM and concomitant CAD.

Methods and results: We collected a cohort of 45 patients with HCM who came to our intensive care unit diagnosed with acute coronary syndrome (ACS). All subjects underwent standard echocardiographic in order to quantify the systolic thickness of interventricular septum (IVS) and two-dimensional strain examination (AS and LV-GLS) by 2D Speckle tracking. All patients underwent coronary angiography after which we identified two subgroups: HCM-concomitant CAD (n=15) and HCM-no CAD (30). We excluded subjects presenting age <18 years, maximal LV outflow tract gradient >40 mmHg, bundle branch block or atrial fibrillation, previous pacemaker/cardiac surgery, including myectomy/alcohol ablation, severe aortic stenosis and other diseases associated with increased IVS thickness. During long term Follow-up of 5 ± 4 years, we monitored the onset of both brady- and tachy-arrhythmias in that two subgroups. In our 45 HCM patients (age 65 ± 14 years, 80% male), median 5-year risk of SCD at HCM Risk SCD was $4.5 \pm 3\%$. The percentage of ICDs implanted were higher in HCM-CAD patients. HCM-CAD patients displayed a significantly higher HCM Risk-SCD Score compared to HCM-no CAD (6.3 ± 1.8 vs. 5.2 ± 1.3 , $P < 0.05$). Multivariate analysis revealed AS ($P < 0.05$) and LV-GLS ($P < 0.05$) to be independent predictors of appropriate ICD therapy regardless of the thickness of the SIVs ($18 \text{ mm} \pm 3.4$). Both in HCM-no CAD and HCM-CAD patients, AS and LV-GLS showed higher accuracy to predict appropriate ICD therapy, as shown by likelihood ratio test ($P < 0.002$) and value of $AS > 3.8 \pm 2$ and $LV-GLS < 14 \pm 2.2$ correlate with values of HCM Risk SCD >6%. In particular, in the HCM-CAD subgroup, there is a statistically significant linear correlation ($P < 0.05$) between AS and GLS values and HCM Risk Score > 4%, allowing a sub-compartmentalization of the intermediate risk in the high risk category. No patient with both $AS > 40\%$ and $GLS < -14\%$ experienced appropriate ICD therapy. The likelihood ratio test showed a significant incremental prognostic value of AS and GLS ($P < 0.001$) as compared with a model with other standard echocardiographic risk factors (LAVI, LVOT, mitral regurgitation).

Conclusion: HCM Risk Score is the current algorithm that calculate the potential life-threatening arrhythmias and sudden death and indicates ICD implantation. Echocardiographic investigation of two novel risk markers, AS and LV-GLS, for sudden death and their add in HCM-Risk Score should be encouraged to identify high-risk patients who may benefit from a prophylactic therapy with an ICD in both HCM-concomitant CAD and HCM-no CAD.

214 Relation of echocardiographic findings and cardiac autonomic function with ventricular arrhythmias in patients with mitral valve prolapse

Giulia Piccinni¹, Antonio De Vita¹, Salvatore Emanuele Ravenna¹, Gessica Ingrassiotta¹, Monica Filice¹, Eleonora Ruscio¹, Gabriella Locorotondo¹, Angelo Villano¹, Veronica Melita¹, Gaetano Antonio Lanza¹, and Filippo Crea¹

¹Dipartimento di Scienze Cardiovascolari, Università Cattolica del Sacro Cuore (Roma)

Aims: Cardiac arrhythmias are frequently detected in patients with mitral valve prolapse (MVP). The mechanisms causing ventricular arrhythmias, however, remain poorly known, although mechanical traction of prolapsing leaflets, myocardial fibrosis and sympathetic/vagal imbalance might be involved. In this study we aimed to identify whether echocardiographic parameters and cardiac autonomic function are associated with ventricular arrhythmias in patients with MVP.

Methods and results: We studied consecutive patients referred to our Department of Cardiology to undergo an echocardiographic examination and had evidence of MVP. Patients with acute or chronic heart disease (e.g., acute myocardial infarction, atrial fibrillation, cardiomyopathies or other significant valvular disease), previous cardiac surgery and other significant comorbidities were excluded. All patients underwent 1) a transthoracic Doppler echocardiogram (TTDE) with speckle tracking examination to assess global and regional longitudinal strain (GLS), and 2) a 24-hour ECG Holter monitoring for the evaluation of arrhythmias and heart rate variability (HRV). Patients were divided in 2 groups according to ventricular arrhythmic burden: 1) 12 patients (24.5%) with frequent premature ventricular complexes (PVCs ≥ 10 /hour); 2) 37 patients (75.5%) with no PVCs or PVCs < 10/hour. Forty-nine consecutive patients (35 F, mean age 49.4 ± 15 years) with MVP were enrolled. No significant differences were found in the main clinical characteristics between the 2 groups. No complex supraventricular arrhythmias or significant ischaemic ST segment changes were detected. The main echocardiographic parameters were similar between the 2 groups, except for the E/e' ratio, which was lower in patients with PVCs ≥ 10 /hour (5.8 ± 3.2 vs. 7.8 ± 2.8 ; $P = 0.043$), although it was in the normal range in both groups. Although mean GLS did not significantly differ between the 2 groups, regional longitudinal strain of the basal infero-lateral wall was significantly lower in patients with PVCs ≥ 10 /hour (17.5 ± 3.6 vs. 20.4 ± 4.3 , $P = 0.004$). There were differences in some time-domain HRV parameters [SDNNi ($P = 0.02$) and pNN50 ($P = 0.02$)], which showed higher values in patients with PVCs ≥ 10 /hour, whereas no differences were found in frequency-domain HRV variables.

Conclusion: Our data show that in patients with MVP, subclinical abnormalities in regional left ventricle systolic function are associated with a frequent PVCs,

suggesting their involvement in the genesis of ventricular arrhythmias. Conversely, the sympathetic/vagal imbalance does not seem to play a significant role in the occurrence of frequent ventricular arrhythmias in these patients.

169 Unexplain sudden cardiac arrest in children: clinical and genetic characteristics of survivors

Emanuele Monda³, Berardo Sarubbi³, Martina Caiazza³, Cristina Mazzaccara^{1,2}, Eduardo Bossone⁴, Emanuele Romeo³, Maria Valeria Esposito^{1,2}, Valeria D'Argenio^{2,5}, Francesco Salvatore^{1,2}, Giuseppe Pacileo³, Lia Crotti^{6,7}, Giulia Frisso¹, and Giuseppe Limongelli³

¹Dipartimento di Medicina Molecolare e Biotecnologie Mediche, Università Federico II, Napoli, ²Ceinge-Biotecnologie Avanzate, NAPOLI, ³Dipartimento di Scienze Mediche Traslazionali, Università Della Campania Luigi Vanvitelli, Napoli, ⁴Divisione di Cardiologia, Ospedale A. Cardarelli, Napoli, ⁵Dipartimento di Scienze Umane e Promozione, Della Qualità Dello Vita, Università San Raffaele, Napoli, ⁶IRCCS Istituto Auxologico Italiano, Milano, ⁷Dipartimento di Medicina e Chirurgia, Università di Milano-Bicocca, Milano

Sudden cardiac arrest (SCA) is defined as the sudden cessation of cardiac activity with hemodynamic collapse, with restores of circulation by an intervention (e.g., defibrillator) or spontaneously. The aim of this study was to evaluate prevalence, clinical and genetic characteristics of survivors that experienced an unexplained SCA as disease onset in a consecutive cohort of pediatric patient.

Of 4025 consecutive pediatric patients, we investigated 9 consecutive survivor patients that experienced an unexplained SCA with documented ventricular tachycardia or ventricular fibrillation requiring direct current cardioversion or defibrillation (unexplained SCA group). All patients underwent a comprehensive clinical-instrumental-genetic evaluation. Patient with known cause for SCA were excluded. Moreover, we investigated 3 consecutive patients that experienced transient loss of consciousness (TLOC) due to arrhythmogenic syncope (arrhythmogenic syncope group).

Of the 9 patients of unexplained SCA group, 7 (78%) showed a primary electrical disease (6 (67%) with long QT syndrome, LQTS, and 1 (11%) with catecholaminergic polymorphic ventricular tachycardia, CPVT) and 2 (22%) a structural heart disease (1 (11%) with myocarditis and 1 (11%) with hypertrophic cardiomyopathy, HCM). A disease-causing mutation was identified in all the genetically analyzed patients. All patients belonging to the arrhythmogenic syncope group showed Brugada syndrome, and no pathogenic mutation was identified in these patients.

In conclusion, primary electrical disease can explain the largest part of survived pediatric patients who experienced an unexplained SCA as disease onset.

364 Submammary implantable cardioverter defibrillator with periareolar approach: technique and follow-up

Chiara Ghiglieno¹, Gabriele Dell'Éra¹, Eraldo Occhetta¹, Antonio Taveggia¹, Stefano Porcellini¹, Matteo Santagostino¹, and Giuseppe Patti¹

¹Università del Piemonte Orientale Amedeo Avogadro—Ospedale Maggiore Della Carità—Novara

Aims: Given the increased indications for implantable cardioverter defibrillator (ICD), different new devices and implant techniques to limit patient's discomfort are emerging. Conventional ICD implantation in the infraclavicular region usually leads to scarring and prominence of the device generator, with young women often experiencing aesthetic concerns, psychological distress and physical discomfort. Submammary device implantation (SMI) could represent a valid alternative to the conventional infraclavicular site of implant. We present our experience with periareolar technique of SMI implantation.

Methods and results: We implanted submammary ICD in five young women. Veins for the lead passage were identified with an infraclavicular incision; a second incision was made along the areola to access the subglandular area. The leads were connected to the generator via a tunnel from the subglandular pocket to the infraclavicular region. A regular Follow-up was performed every 3-6 months. Mean Follow-up was 50 ± 37 months. No device complication was observed. One patient experienced an electrical storm and received appropriate ICD therapy; one had inappropriate antitachycardia pacing (ATP) therapy while on atrial fibrillation. One patient underwent successful generator replacement. All patients were pleased with the aesthetic results. No patient reported pain or any discomfort related to the device.

Conclusion: Submammary ICD implantation in women appears to be a valid alternative to standard infraclavicular implants, offering superior cosmetic results and causing less patient's discomfort. The periareolar technique, although more complex, is effective, safe and may warrant further aesthetic advantages and lesser discomfort.

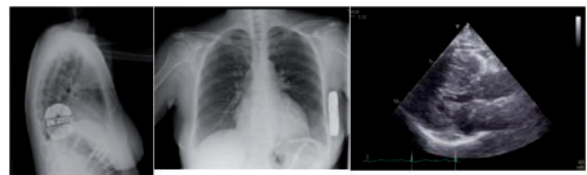


595 Hypertrophic cardiomyopathy: when to choose S-ICD

Andrea Silvio Giordani¹, Federico Migliore¹, Daniela Mancuso¹, and Sabino Illiceto¹

¹Department of Cardiac, Thoracic, Vascular Sciences and Public Health, University of Padova

A 56-year-old woman was admitted to the Cardiology Department of our Hospital after the finding of various episodes of non-sustained ventricular tachycardia (NSVT) at a routine Holter ECG exam. She had a history of non-obstructive hypertrophic cardiomyopathy (HCM), diagnosed 12 years before, and no further known cardiovascular risk factors. At that time, as she complained palpitations, in the absence of chest pain, dyspnoea or syncope, an EKG was performed, showing signs of severe left ventricular hypertrophy with secondary T-wave abnormalities, and the patient was referred to another hospital. A transthoracic echocardiogram was performed, showing a picture of HCM. Moreover, a cardiac MRI showed late enhancement signs. In addition, she reported that her father had died at the age of 46 for sudden death in end staged not specified cardiomyopathy. The patient was therefore discharged on beta-blocker therapy, with benefit on the palpitations symptoms. A dedicated Follow-up was carried out: from 2014 on, she was followed by the Outpatient clinic of our Centre. In 2018, an echocardiogram showed asymmetric hypertrophy of septum and anterolateral wall with papillary hypertrophy; the interventricular septum was 24 mm thick, with normal left ventricular function and dimensions, impaired relaxation with high filling pressures, and moderate left atrium dilation. She was asymptomatic. In April 2018 the patient underwent a routine Holter ECG exam that showed various episodes of NSVT during the night sleep. Therefore, a bicycle stress echocardiogram was carried out, reaching 81% of the predicted maximal HR, in course of metoprolol therapy; no SAM was present, and no arrhythmias were reported. Therefore, given the intermediate risk of sudden cardiac death because of the family history, the MRI findings and the documented NSVT episodes, she was then admitted to the hospital in order to be submitted to the implantation of an ICD in primary prevention. As she fulfilled the correct criteria, she was offered the opportunity to an S-ICD that she accepted. The implantation of S-ICD was then performed, in the thoracic subcutaneous site at the level of the left middle axillary line. An induction test was performed, which proved effective with restoration of sinus rhythm following shock at 65 J. No complications were found. The patient is now carrying out her routine Follow-up, with regular controls of S-ICD. This case suggests that S-ICD may be a good option for HCM patients, given the young age, the risk of transvenous ICD lead failure related to age and activity level and specific lead, if the centre experience can provide this option.



496 Electrogram characterization of ventricular tachycardia reentrant circuits in post-myocardial infarction patients

Felicia Lipartiti¹, Antonio Frontera¹, Alexios Hadjis¹, Giorgio Tsitsinakis¹, Luca Rosario Limite¹, Giovanni Peretto¹, Gabriele Paglino¹, Caterina Bisceglia¹, and Paolo Della Bella¹

¹Dipartimento di Aritmologia IRCCS Ospedale San Raffaele

Aims: To explore EGM characteristics along the diastolic pathway of VT reentrant circuits with the three most common 3D mapping systems in post-myocardial infarction patients undergoing ablation of ventricular tachycardia (VT) in order to identify specific signatures of those EGMs. Ventricular tachycardia (VT), in the context of

ischaemic structural heart disease, is related to patchy or incomplete scar, usually arising from re-entrant circuits which are dependent on surviving channels of activation through scar tissue. These protected isthmuses are critical for the maintenance of VT. An improved understanding of the characteristics of the diastolic pathway of VT is key in guiding VT ablation strategies.

Methods and results: 29 consecutive patients who underwent VT ablation guided by high-density mapping were enrolled. Patients were consecutively enrolled in the study when activation mapping was performed and the full diastolic pathway was recorded. 12 patients underwent endocardial electroanatomical mapping with Rhythmia (Boston Scientific), 10 patients with Ensite Precision (Abbott Medical) and 7 patients with Carto V3 (Biosense). Only patients with ischaemic cardiomyopathy (ICM) were included in the study. The EGMs were analyzed in terms of amplitude and duration and distinguished as belonging to the entrance, isthmus or exit. Bystander EGMs were collected and compared to EGMs belonging to the diastolic circuit. 29 patients were included. Complete recording of the diastolic pathway was achieved in all patients. Entrance and exit sites were characterized by long duration and low amplitude EGMs (entrance mean 109.29 msec \pm 37 and 0.15 mV \pm 0.20; exit mean 103.8 msec \pm 27 and 0.18 mV \pm 0.17) while isthmus sites demonstrated high amplitude and shorter duration EGMs (isthmus mean 56 msec \pm 17 and 0.60 mV \pm 0.55, *P* value < 0.0001). Only in the Rhythmia group we recorded the bystander EGMs that presented distinct features, higher amplitude and shorter duration, (mean 71.3 msec \pm 39.9 and 1.44 mV \pm 1.5) as compared to EGMs belonging to the diastolic pathway of VT circuit (100.9 msec \pm 44 and 0.21 mV \pm 0.43), *P* value < 0.0001

Conclusion: Entrance and exit sites demonstrate EGMs with longer duration and lower amplitude reflecting their slower conduction while isthmus sites have higher amplitude and shorter duration EGMs reflecting faster conduction. Bystander EGMs present distinct features (higher amplitude, short duration) which make these easily distinguishable from EGMs belonging to the VT circuit.

307 Catheter ablation of left-sided macro-reentrant atrial tachycardias after mitral valve surgery: a single centre experience

Jacopo Marazzato¹, Raffaella Marazzi¹, Lorenzo Adriano Doni¹, Massimo Stella¹, Cesare Beghi¹, and Roberto De Ponti¹

¹Medicine and Surgery Department—University of Insubria, Varese, Italy

Aims: Data regarding catheter ablation (CA) of atrial tachycardias (AT) occurring after mitral valve surgery (MVS) are scarce. Considering the high prevalence of complex AT in this setting and the potential issues occurring during CA in patients with MV prostheses, aim of this study was to assess safety and efficacy of CA of left-sided post-surgical AT occurring in a patient population with prior history of MVS.

Methods and results: A patient population undergoing CA of left-sided AT occurring after MVS was retrospectively considered at our centre from April 2005 to May 2018. Before ablation, a thorough point-by-point mapping of the arrhythmogenic substrate was performed using a 3D-electroanatomic mapping system (CARTO®) by means of a dedicated setting of the window of interest, as previously described elsewhere. Radiofrequency CA was performed at the mid-diastolic isthmus and was considered successful after validation of the CA lines of block using dedicated pacing manoeuvres. Periprocedural efficacy and safety together with mid and long-term maintenance of sinus rhythm on/off antiarrhythmic drugs were evaluated. Electrophysiologic features and anatomic locations of the investigated AT were further assessed. Twenty-two consecutive patients (65 \pm 10-year-old; F: M 13:9) with prior MVS (19 mitral valve replacements, 3 mitral valve valvuloplasty) underwent 27 CA procedures (1.2 procedure/patient). No periprocedural complication requiring interventions were recorded. Thirty-five left-sided macro-reentrant AT were identified (1.6 \pm 0.8 per patient) and 27 (77%) were mapped and ablated. Twenty-five (93%) out of the 27 mapped AT (15 single loop AT; 12 double loop AT) were successfully ablated achieving the periprocedural success in 19 (86%) patients. The average procedure time, fluoroscopy time, and radiological exposure were 233 \pm 50 min, 33 \pm 20 min, and 27 \pm 23 mSv, respectively. Mid-diastolic isthmus was commonly located at the left atrial roof (33%), followed by interatrial septum (30%), left atrial posterior wall and mitral isthmus (22%), and, finally, pulmonary vein ostia (15%). Maintenance of sinus rhythm on/off antiarrhythmic drugs at mid and long-term follow-up (range from 2 to 11 years) was 74% and 90% after single and repeat procedures, respectively.

Conclusion: CA of left-sided macro-reentrant AT occurring after MVS is highly safe and effective. Before ablation, proper setting of the window of interest and mapping of the arrhythmic substrate with the aid of 3D electro-anatomic mapping systems could have played a key role to achieve the observed high success rate even at a mid and long-term follow-up. Moreover, the anatomic location of the ablated AT was closely located to the site of prior surgical scar, providing useful information for the proper strategical planning of CA in this setting.

379 Sporadic high pacing impedance at remote monitoring in hybrid CIED systems: a multicenter retrospective experience

Marco Valerio, Mariani², Carlo Pignalberi¹, Agostino Piro², Michele Magnocavallo², Martina Straito², Claudio Pandozi¹, Giuseppe Giunta², Francesco Fedele², and Carlo Lavalle²

¹San Filippo Neri, Roma, ²Policlinico Umberto I, Roma

Aims: Cardiac implantable electronic devices (CIEDs), as pacemakers and implantable cardioverter defibrillators (ICDs), are used worldwide for the treatment of rhythm disorders. Pulse generator and lead integrity are necessary for the right functioning of CIEDs and are usually assessed by periodic controls of sensing, capture thresholds and lead impedance measurements. Impedance represents the ratio of voltage to current in an electrical circuit and provides important diagnostics in CIED systems. Small studies have reported transient high lead impedance on remote evaluation, without sensing and pacing anomalies, as consequence of header-lead pin mismatch in hybrid CIED systems with pulse generator and leads from different manufacturers. We report our retrospective, multicenter experience with hybrid ICD systems, the associated anomalies and related management.

Methods and results: We collected data about patients with transient high lead impedance alert on remote monitoring and an hybrid ICD system with pulse generator implanted between January 2015 and December 2019. Following data were retrieved: patient age, generator position, generator model, leads model, date of generator implantation and replacement, date of lead implantation and revision and extraction (when available), and indication for CIED implantation. Impedance values, sensing and pacing thresholds were collected at generator implantation or last generator substitution and at last in-office visit. Furthermore, the ranges of impedance, sensing and pacing thresholds by remote monitoring and at in-office controls were collected. Pace impedance and shock impedance trends from Boston Scientific remote monitoring Latitude™ were retrieved for each patient. Among 150 patients with hybrid CIED system, 14 presented with high impedance value at remote monitoring (7 dual-chamber ICD, 3 single-chamber ICD and 4 biventricular ICD). All had Boston Scientific ICD paired with Medtronic or Biotronik leads. The median age at first high impedance recording was 69.5 years (64.5; 81.2 years). Ten patients were male (71%), and in all but one patient the CIED system was implanted for primary prevention of arrhythmic death. The most frequent cardiomyopathy leading to CIED implantation was post-ischaemic dilated cardiomyopathy (n = 7, 50%), whereas other etiologies were valvular cardiomyopathy (n = 2, 14%), idiopathic dilated cardiomyopathy (n = 4, 29%) and Brugada Syndrome (n = 1, 7%). By remote monitoring, 3 patients presented high atrial lead impedance, 6 patients high right ventricular lead impedance, 1 patient left ventricular impedance and 2 patients high shock impedance values. In all patients but one, all lead measures were in normal range at initial evaluation and during different maneuvers, and in none of the cases was detected oversensing phenomenon during device interrogation. In the remaining patient with right ventricular pacing impedance increase, lead fracture was diagnosed leading to lead extraction and new lead implantation. In two patients jumpy high shock impedance values were found at remote monitoring, without any other associated anomaly at chest radiograph or fluoroscopy. In one patient, after two months from the first high shock impedance recording at remote monitoring, the CIED system correctly recognized and treated a sustained ventricular tachycardia. In one patient with a CRT-D INOGEN G141 and Biotronik leads, 41 months after generator replacement a first episode of high pacing impedance in the left ventricular lead (Biotronik Corox implanted in 2007) was found, with peak values as high as > 3000 ohm, returning at baseline value of 550 ohm after 1 month.

Conclusion: Sporadic high pacing and shock impedance values at remote monitoring are detected in almost 10% of patients with hybrid CIED system and seem to be associated with a normal functioning of the device. For the first time we describe this phenomenon for shock impedance and for coronary sinus lead impedance in biventricular ICD. Follow-up is needed to diagnose possible lead fractures. However, the clinical importance of underscoring this phenomenon, especially for shock impedance and coronary sinus lead impedance, is that lead extraction or system revision should be avoided in the setting of hybrid system.

279 Impact of percutaneous mitral valve repair on ventricular arrhythmias burden in patients with crt-d

Andrea Matteucci¹, Michela Bonanni¹, Marco Centioni¹, Federico Zanin¹, Domenico Sergi¹, Giuseppe Stifano¹, Saverio Muscoli¹, Valeria Cammalleri¹, and Francesco Romeo¹

¹Policlinico Tor Vergata, UOC di Cardiologia

Aims: Functional mitral regurgitation (MR) is a common valvular disorder in patient with heart failure (HF), associated with poor prognosis and an increase of ventricular arrhythmias. In selected patients who are not eligible for mitral valve surgery, percutaneous valve repair with MitraClip (MC) device may improve clinical outcomes. Cardiac resynchronization therapy with implantable defibrillator (CRT-D) is for HF patients, with depressed ejection fraction (EF), left ventricular dyssynchrony and functional mitral regurgitation. Our aim was to evaluate the impact of percutaneous

mitral valve repair using Mitraclip system on ventricular arrhythmic burden in patients with CRT-D.

Methods and results: We enrolled in our study 24 patients with CRT-D and functional MR treated with Mitraclip. We collected clinical and remote monitoring data before procedure and at a Follow-up of 1 and 12 months. In particular, we analysed ventricular arrhythmias burden recorded by CRT-D home monitoring transmissions. Mean age of patients was 67.6 ± 8.5 y.o. Twenty patients (83%) were men. Mean of EF was $21.8 \pm 3.8\%$. Before percutaneous repair, 33% of patients had premature ventricular complex (PVC) burden $> 5\%$, at a Follow-up of 1-month it decreased to 3% ($P=0.06$), while at a Follow-up of 12-months it decreased to $< 1\%$ ($P=0.04$). Non-sustained ventricular tachycardia (NSVT) occurred in 66% of patients before MC and reduced to 33% 1-month after procedure ($P=0.11$), and to 16% at 12 months ($P=0.01$).

Conclusion: From our analysis, patients undergoing percutaneous mitral valve repair showed some interesting data on arrhythmic burden reduction. These preliminary data may be related to changes in the cardiac chamber remodelling process due to preload variation leading to changes in regional wall stress. We suppose that the reduction of ventricular arrhythmic load is related to this mechanism, but further studies are needed to better understand this relationship.

28 Association between antiarrhythmic therapy and risk of ventricular life-threatening arrhythmias in ARVC

Chiara Cappelletto¹, Caterina Gregorio², Giulia Barbati², Simona Romani¹, Antonio De Luca¹, Marco Merlo¹, Luisa Mestroni³, Davide Stolfo^{1,4}, and Gianfranco Sinagra¹

¹Dipartimento Cardiotoracovascolare, Ospedale di Cattinara, Azienda Sanitaria Universitaria Giuliano Isontina e Università di Trieste, ²Dipartimento di Scienze Mediche, Unita' di Biostatistica, Università di Trieste, ³Cardiovascular Institute and Adult Medical Genetics Program, University of Colorado Anschutz Medical Campus, Aurora, Colorado, ⁴Division of Cardiology, Department of Medicine, Karolinska Institutet, Stockholm, Sweden

Aims: Antiarrhythmic drugs (AAD) are prescribed in Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC) to prevent ventricular arrhythmias and control symptoms. However, there are no controlled clinical trials and knowledges regarding the efficacy of AAD in ARVC are lacking. The aim of our study was to investigate the benefit of AAD (beta-blockers, sotalol, amiodarone) in a cohort of ARVC patients with long-term longitudinal Follow-up.

Methods and results: The study population included 123 patients with definite diagnosis of ARVC and ≥ 2 clinical evaluations. The primary outcome was a composite of sudden cardiac death (SCD) or major ventricular arrhythmias (MVA): sudden cardiac arrest, sustained ventricular tachycardia (VT) and appropriate ICD interventions, including recurrent events in patients with > 1 MVA. Time to first event (SCD or MVA) was considered as secondary composite endpoint. Sixteen patients were taking AAD at baseline and 75 started at least one AAD during a median follow-up of 132 months [61-255]. A total of 37 patients experienced ≥ 1 MVA with a total count of 83 recurrent MVA. After adoption of a propensity score analysis, no AAD were associated with lower risk of recurrent MVA. However, if dosage of AAD was considered, beta-blockers at $> 50\%$ target dose were associated with a significant reduction in the risk of MVA (HR 0.10, 95% CI 0.02-0.46, $P=0.004$).

Conclusion: In a large cohort of ARVC patients with a long-term follow-up, only beta-blockers administrated at $> 50\%$ target dose were associated with lower risk of recurrent MVA.

165 A rare case of calmodulin-related long QT syndrome

Chiara Tioni¹, Dario Sut², Francesca Longo¹, Valentino Collini¹, Davide Barbisan¹, Guerino Giuseppe Varrà¹, Roberto Ceolini¹, Ilaria Armellini², Daisy Pavoni², Domenico Facchin², and Gianfranco Sinagra¹

¹Cardiovascular Department, Azienda Sanitaria Universitaria Giuliano-Isontina (ASUGI) and University of Trieste, ²Cardiovascular Department, Azienda Sanitaria Universitaria Friuli Centrale (ASUFC), Udine

Aims: Long QT syndromes (LQTS) are arrhythmic diseases in structurally normal heart, characterized by mutations of different ion channels and proteins. If a specific trigger is present (adrenergic stimuli, bradycardia, swimming, auditory stimuli and other) ventricular tachycardias, typically torsade de pointes, may occur and degenerate in ventricular fibrillation. Among the spectrum of these syndromes, there are some rare forms characterized by mutations of calmodulin genes that encode for an ubiquitously protein, a modulator of different ion channels expressed in the heart.

Methods and results: Here we present a case of a newborn girl, born from a caesarian section because of heart rate deceleration during cardiocography. The electrocardiogram showed a sinus rhythm with a very prolonged QTc (almost 600 ms). During the hospital stay the newborn developed two episodes of torsade de pointes that required treatment with intravenous magnesium Sulfate. Propranolol and mexiletine were started to short the QT interval and inhibit adrenergic stimuli. Genetic analysis showed a heterozygous, pathogenetic mutation of Calmodulin Gene 3 (CALM3), encoding for calmodulin, and an heterozygous mutation, with uncertain significance, of Solute Carrier Family 4 Member 3 (SCL4A3), encoding for a solute carrier

expressed in different sites of the organism. The little patient was dismissed in home-monitoring, in therapy with propranolol and mexiletine; parents was properly trained at p-BLS. ICD implantation will be considered when the newborn weighs 8-10 kg.

Conclusion: Calmodulinopathies are a very rare cluster of early-onset arrhythmic diseases, characterized by poor prognosis; only 74 cases are documented in the world. LQTS and catecholaminergic polymorphic ventricular tachycardia (CPVT) are the more frequent conditions, but idiopathic ventricular fibrillation (IVF), sudden unexplained death (SUD), sudden cardiac death (SCD) and aborted cardiac arrest (ACA) are encountered among the clinical presentations. Some patients may develop neurological features, due to post-anoxic sequelae or unrelated to cardiac arrest. There is a need for new studies to better understand the underlying mechanisms and improve prognosis.

243 Prevalence and predictors of persistent sinus rhythm in a cohort of patients undergoing to electrical cardioversion for atrial fibrillation: a real life experience

Matteo Castrichini¹, Luca Restivo¹, Enrico Fabris¹, and Gianfranco Sinagra¹

¹Division of Cardiology, Cardiovascular Department, Azienda Sanitaria Universitaria Giuliano Isontina, Trieste, Italy

Aims: Electrical cardioversion (EC) for atrial fibrillation (AF) is a common procedure performed in an attempt to restore normal sinus rhythm (NSR). However, recent data on long-term effectiveness of EC and on possible predictors of persistent restoration of NSR are lacking. The aim of this study was to evaluate the prevalence and predictors of persistent NSR in a recent cohort of unselected patients undergoing to EC for AF.

Methods and results: We analyzed the data of all consecutive patients undergoing elective EC for AF at our institution between January 2017 to December 2018. We analyzed clinical and echocardiographic data as well as pharmacological antiarrhythmic therapy at baseline and at 12-month follow-up. Primary endpoint was the maintenance of NSR at 12-month. Of the 300 patients enrolled, 270 (90%) had successful EC and among them 201 patients (i.e. study population) have follow-up data (mean age 70 ± 10 years; 74% male; 47.8% with hypertensive cardiomyopathy). After 12 months, only 45.7% were in NSR. Whereas patients without persistent NSR at 12 months had a lower left ventricle ejection fraction (LVEF) at the baseline (49.1 ± 16 vs. 59.7 ± 9 , $P=0.02$), no significant differences in the baseline other clinical variables have been found. Regarding pharmacological antiarrhythmic therapy, patients without persistent NSR at 12 months were less prescribed to flecainide (21(23.1%) vs. 11(10.8%); $P=0.018$) and sotalol (13 (14.3%) vs. 5(4.9%); $P=0.045$), whereas there were no differences in the use of amiodarone at baseline and during follow-up. At the multivariate analysis only the duration of the disease beyond 12 months (OR 0.269, 95% CI : 0.078–0.932, $P=0.038$), an higher LVEF (OR 1.065, 95% CI: 1.011–1.122, $P=0.018$.) and the presence of RS at 1 month follow-up (OR 17.789 95% CI: 3.2–99.9, $P=0.002$.) were associated with the probability to maintaining NSR.

Conclusion: In a cohort of unselected patients with AF undergoing elective EC, only 45.7% were in NSR at 12 months follow-up. Only the duration of the disease beyond 12 months, an higher LVEF and the presence of RS at 1-month follow-up emerged as independent predictors of maintenance of NSR. This highlights that early re-evaluation of these patients appears useful for assessing longer-term outcome. Further larger studies are needed to confirm these results also in the perspective of possible selective approach to ablation strategies.

207 Concomitant thoracoscopic left cardiac sympathectomy and right epicardial ablation of the arrhythmogenic substrate in a patient with long QT and Brugada syndromes related to uncommon sodium channel beta-subunit mutation

Cinzia Monaco^{1,2}, Alessio Galli¹, Federico Cecchini¹, Vincenzo Miraglia¹, Gian Battista Chierchia¹, Mark La Meir¹, and Carlo De Asmundis¹

¹UZ Brussel, ²Policlinico di Roma Tor Vergata

Aims: Long QT syndrome and BrS may present as overlap syndrome. We describe the case of a patient with both BrS and likely LQTS and the BrS-associated mutation in the SCN2B gene, which has never been linked to LQTS before.

Methods and results: A 24 years old man with a family history of sudden cardiac death was scheduled for screening in our Center after syncope. The 12-lead ECG showed intermittent long QTc. The patient also tested positive for a Brugada type 1 pattern Syndrome following an Ajmaline test resulted. The genetic analysis revealed a heterozygous variant (KL3) of the SCN2B gene, encoding for the β -subunit domain-2 of the sodium channel, known to be associated with BrS. Short VTs were documented on a implantable loop recording. Considering the clinical findings and the patient history we proposed a video assisted thoracic sympathectomy with epicardial right ventricle (RV) arrhythmogenic substrate ablation for Brugada syndrome and ICD implantation. The procedure was performed under general anesthesia guided both by the EnSite Precision™ 3D electroanatomical mapping system (Abbott, Chicago, Illinois, USA) and the noninvasive Cardiolsight™ mapping vest (Medtronic,

Minneapolis, Minnesota, USA). A minimal-invasive left thoracoscopic access was obtained. Bipolar voltage mapping of the RV epicardium was performed, showing a small area of abnormal electrograms (AEMs) in the RVOT, close to the pulmonary valve. A protocol of ajmaline infusion was then started with appearance of complete RBBB. Epicardial mapping of the RVOT/RV anterior wall at peak ajmaline was repeated pre ablation to identify the full extension of the arrhythmogenic substrate, revealing an increased area of AEMs if compared to baseline. A video assisted thoracoscopic left cardiac sympathectomy (from distal C8 to T5) was performed. A second infusion of ajmaline was started. At peak ajmaline, complete RBBB appeared once again. Invasive epicardial mapping of the RVOT and anterior RV wall revealed the same area of AEMs, but late fragmented potentials had longer duration and double potentials appeared, indicating a likely increase in the conduction delay in this area as compared with pre sympathectomy. A Coolrail™ linear ablator (Atricure, Mason, Ohio, USA) was then advanced on the area of AEMs and erogation of radiofrequency (RF) energy was performed on a surface of approximately 15 cm² of the anterolateral RVOT and anterior RV wall. The last ajmaline infusion after the RF epicardial ablation revealed no more fragmented potentials in this area at the contact and non invasive mapping. At a Follow-up of 4 months, the patient had no symptoms and no episodes of VT/VF.

Conclusion: Noninvasive mapping (ECGi) provides useful information on the arrhythmogenic substrate of BrS and can help to identify areas of activation delay. The inferolateral region of the right ventricle, in proximity to the tricuspid valve, may harbor the same arrhythmogenic substrate of the RVOT. This area may be more sensitive to the effect of the autonomous nervous system, showing appearance of the BrS pattern upon parasympathetic stimulation. This phenomenon may explain the parasympathetic dependence of the BrS pattern previously described in some patients.

482 Mechanical dispersion as a predictor of arrhythmic death

Francesco Figus¹, Mattia Biddau¹, Cinzia Soro¹, Vincenzo Nissardi¹, Francesca Aste¹, Fabrizio Manca¹, Martina Giusti¹, Mauro Marongiu¹, Luigi Meloni¹, and Roberta Montisci¹
¹Dipartimento di Scienze Mediche e Sanita'Pubblica, Cardiologia-UTIC, Policlinico di Monserrato, Aou Cagliari

Aims: Sudden Cardiac Death (SCD) is defined as a non-traumatic, unexpected fatal event occurring within 1 hour of the onset of symptoms in an apparently healthy subject, due to a cardiac cause. SCD represents the cause of 25-50% of deaths from cardiovascular disease. In 88% of cases SCD is due to an arrhythmic mechanism. The guidelines of the European Society of Cardiology (ESC) for primary prevention of SCD use the reduction of Left Ventricular Ejection Fraction (LVEF) < 35% as the main indicator to decide if a patient needs an Implantable Cardioverter Defibrillator (ICD). However, several trials have demonstrated that LVEF lacks sensitivity and specificity. In our study we focused on the role of Global Longitudinal Strain (GLS) and Mechanical Dispersion (MD) assessed by Speckle Tracking Echocardiography (STE), in the prediction of arrhythmic events.

Methods and results: In our study 71 patients (62 men and 9 women) with ICD or CRT-D were enrolled; 49 for primary prevention and 22 for secondary prevention. All patients underwent an ICD/CRT-D control, a 12 leads ECG before implantation and during the follow-up, and a transthoracic echocardiogram with color Doppler. During the follow-up 39 patients had no arrhythmic event (group A), 32 patients had arrhythmic events (group B), 11 ventricular fibrillation and 22 ventricular tachycardia. All events were treated successfully by ICD/CRT-D intervention. Before device implantation all patients had LVEF markedly depressed. We found no significant differences in age, gender, cardiovascular risk factors, and underlying heart disease etiology between patients with and without arrhythmic events. No significant difference was found for EF before implantation or during follow-up (EF before 39% ± 17.5% vs. 35.9% ± 12.7%, $P=0.28$ and during follow-up FE 43.7% ± 16.3% vs. 39.9 ± 13.7%, $P=0.42$) and for GLS (9.3 vs. 9.7; $P=0.72$). We found a significant linear correlation between the mechanical dispersion value and the presence of ventricular arrhythmic events ($r = -0.53$, $P=0.0001$) and the MD was significantly higher in patients with arrhythmic events in when comparing patients of group A (80.9 ± 36.1 vs. 129 ± 38.4 ms; $P=0.0001$). The correlation between mechanical dispersion and arrhythmic events is confirmed both in patients with EF ≥ 35% ($r=0.51$, $P=0.007$) and in patients with severely impaired systolic function (EF < 35%, $r=0.58$, $P<0.001$). From the analysis of ROC curves, a MD value ≥ 104.5 ms was the best predictor of arrhythmic events (area under the curve = 0.81, $P=0.0001$ sensitivity 75%, specificity 80%). Analysis of the Kaplan Meier curve shows that patients with a MD ≥ 104.5 ms had a significantly higher incidence of events at the follow-up (75% vs. 25%, $P=0.0001$) compared to patients with a lower mechanical dispersion (log-rank $P=0.03$, chi square 4.42). At multivariate analysis only a MD value ≥ 104.5 ms (HR 3.1, 95% CI 1.27-7.54, $P=0.012$) and age were found to be independent predictors of arrhythmic events (HR 1.04, 95% CI 1.01-1.07, $P=0.017$).

Conclusion: Mechanical dispersion measured by STE improve arrhythmic risk stratification regardless LVEF. Using a more specific MD cut-off could allow for a better selection of high-arrhythmic risk patients eligible to ICD/CRT-D implantation, however further studies are needed.

98 Additive predictive power of the cha2ds2-vasc and has-bled scores for mortality in patients with atrial fibrillation

Doralisa Morrone¹, Fabrizio Ricci², Renda Giulia², Giuseppe Patti³, Paulus Kirchhof^{4,5}, Sonja Kroep⁶, Ling-Hsiang Chuang⁶, Ben Van Hout^{6,7}, and Raffaele De Caterina^{1,8}
¹Institute of Cardiology, University of Pisa, Italy; ²Institute of Cardiology and Center of Excellence on Aging, G. D'Annunzio University-Chieti-Pescara, Italy; ³University of Eastern Piedmont, Novara, Italy; ⁴University of Birmingham Institute of Cardiovascular Science, University of Birmingham UHB and SWBH NHS Trust, Birmingham, UK; ⁵Univeristy Heart and Vascular Center Hamburg, Germany; ⁶Pharmerit International, Rotterdam, The Netherlands; ⁷University of Sheffield, UK, ⁸Fondazione Villa Serena Per la Ricerca, Città Sant'Angelo, Pescara, Italy

Aims: ATRIAL fibrillation (AF) associates with increased mortality, predictors of which are poorly characterized. We investigated the predictive power of the CHA₂DS₂-VASc and the HAS-BLED score, commonly used to assess the risk of stroke and bleeding, for mortality in AF patients.

Methods and results: PREFER-in-AF was a large, prospective, real-world registry including AF patients across 7 European countries. We used logistic regression to analyze the relationship between the CHA₂DS₂-VASc and HAS-BLED scores and outcome events, including mortality, at one year. The performance the logistic regression models was evaluated by discrimination measures (c-index and DeLong test for statistical difference) and calibration measures (quantified by the Hosmer and Lemeshow goodness of fit test, integrated discrimination improvement). In addition, the integrated discrimination improvement (IDI) were evaluated. 5209 AF patients had complete information on both scores. Mean age was 71.8 ± 10.5 years; 3145 subjects (60.4%) were male. Stroke risk was high (mean CHA₂DS₂-VASc total score of 3.4 ± 1.8), with a total score ranging between 2 to 5 in the majority of patients (>70%). Bleeding risk had a total score ranging from 1 to 3 in >80% of cases, and a mean HAS-BLED total score of 2.0 ± 1.1. The majority of the non-study sample (N=2034, excluded when no risk scores were available) had similar baseline characteristics as those included in the study sample. Average 1-year mortality was 3.1%. We found strong gradients between examined outcomes (stroke and systemic embolic events (SSE), major bleeding and mortality) for both the CHA₂DS₂-VASc and the HAS-BLED risk scores. Both scores had similar c-statistics for models predicting stroke/SSE, major bleeding and mortality. When including the individual components of both scores separately, c-statistics increased to 0.715, 0.694 and 0.636 with CHA₂DS₂-VASc, and to 0.681, 0.697 and 0.680 with HAS-BLED. The improvement of the models with the CHA₂DS₂-VASc and HAS-BLED combined components over the HAS-BLED individual component models alone was significant for models predicting mortality and stroke in terms of c-statistics (c-statistics: 0.73, 0.70, and 0.74, respectively) and IDI. For prediction of major bleeding, the increase in c-statistic was non-significant (0.680 vs. 0.705, $P=0.112$). Moreover, a very small but significant improvement in sensitivity was found (IDI: 0.88%, $P<0.001$).

Conclusion: Both the CHA₂DS₂-VASc and the HAS-BLED score predict mortality similarly in patients with AF, and a combination of all their components increases prediction significantly. Such combination may be clinically useful.

100 Intracranial haemorrhage in atrial fibrillation: a systematic review of current literature

Doralisa Morrone¹, Giovanni Picardi¹, Giacinta Guarini¹, Alberto Aimo¹, Giulia Renda², Fabrizio Ricci², MartaDi Nicola³, Andrea Angelozzi⁴, Silvia Scalerà¹, Riccardo Liga¹, Paola Capozza¹, Rosalinda Madonna¹, Riccardo Morganti⁵, and Raffaele De Caterina¹
¹Institute of Cardiology, Pisa University, Italy; ²Institute of Cardiology and Center of Excellence on Aging, G. D'Annunzio University, Chieti-Pescara, Italy; ³Laboratory of Biostatistics, Department of Medical, Oral and Biotechnological Science, G D'Annunzio University, Chieti-Pescara, Italy; ⁴Cardiology and Arrhythmology Clinic, University Hospital "Ospedali Riuniti" and Department of Biomedical Science and Public Health, Marche Polytechnic University, Ancona, Italy, ⁵Laboratory of Statistic, University Hospital Pisa, Italy

Aims: Evidence-based medicine (EBM) establishes a hierarchy of evidence based on the study design with randomized controlled trials (RCTs) considered superior to observational studies. A well conducted Systematic reviews (SR) of the RCTs is essential to empower the results of the RCTs. The present study aims to conduct a systematic review of randomized controlled trials on NOAC compared to warfarin to evaluate intracranial Haemorrhage in patients with atrial fibrillation.

Methods and results: We retrieved all published papers that compared NOAC with warfarin in patients with non-valvular atrial fibrillation. Three clinician-researchers independently reviewed and abstracted a total of 110 articles that meet our inclusion criteria. A total of 9 randomized controlled trials (RCT) published between 2010 and 2020 were analyzed by random-effects meta-analysis. A total of 54 877 patients, randomly allocated to a direct oral anticoagulant (n=23940) or warfarin (n=23901), were included in our analyses. No significant differences were observed between patients who received NOACs and those who received warfarin in terms of total bleeding, major bleeding, non-major clinically relevant bleeding. The risk of fatal bleeding (HR 0.53), intracranial Haemorrhage (HR 0.51), hemorrhagic stroke

(HR 0.58) and all-cause mortality (HR 0.91) was lower in patients who received NOACs compared to the patients who received warfarin.

Conclusion: This was the first systematic review in the published literature, comparing NOACs vs. warfarin, that evaluates the risk of ICH. Our results clearly confirm that NOACs significantly reduce the onset of intracranial Haemorrhage and bleeding-related death. Systematic reviews (SR) of RCTs are essential to empower the results and minimize the bias weight of the single publications.

481 Long-term follow-up of highly characterized myocardial substrate in complex ventricular arrhythmic phenotype: myocarditis, myocardial fibrosis, arrhythmogenic cardiomyopathy

Maria Lucia Narducci¹, Antonio Bisignani¹, Gemma Pelargonio¹, Curzio Santangeli¹, Giulio Larosa¹, Francesco Perna¹, Gianluigi Bencardino¹, Gaetano Pinnacchio¹, Massimo Massetti¹, and Filippo Crea¹

¹Dipartimento Scienze Cardiovascolari, Fondazione Policlinico a Gemelli

Aims: Ventricular tachyarrhythmias (VA) are closely related to the risk of Sudden Cardiac Death (SCD). Risk assessment should be based not only on left ventricular ejection fraction but also on additional parameters, as late gadolinium enhancement (LGE) detected by cardiac magnetic resonance imaging (MRI), scar by three-dimensional electroanatomic mapping (3D-EAM), genetic third-level screening. Therefore, the evaluation of different predictors of life-threatening VA in different clinical settings represents a crucial step in the arrhythmic risk stratification. To identify the electroanatomic and histological substrate in three well-defined populations with SCD-related cardiomyopathies in order to define independent predictors of life threatening VAs.

Methods and results: This population-based risk prospective single-centre observational study enrolled consecutive patients with unexplained complex VAs, defined as sustained VT and/or VF, or Non sustained VT +high burden of premature ventricular contractions (PVCs) > 25% recorded by 24h-Holter ECG. All patients underwent cardiac MRI, coronary angiography and electrophysiological study with 3D-EAM and Endomyocardial biopsy (EMB) guided by 3D-EAM. A follow-up scheduled at 6 months interval, including a recording of 24h-ECG Holter and device (ICD/Loop Recorder) interrogation in patients with implanted device, was performed. We enrolled 99 patients, 63 males (63.6%), with mean age was 39.11 ± 15.00. Sixty-seven patients (67.7%) presented PVCs/Non sustained VT, 26 patients (26.3%) presented VT or VF, and 8 patients (8.1%) presented aborted SCD. Histological diagnosis divided all patients in 4 defined groups: 50 patients (50%) with myocarditis (M group); 26 patients (26.3%) with focal replacement myocardial fibrosis (FRMF group); 10 patients (10%) with arrhythmogenic cardiomyopathy (ACM group) histological diagnosis; 13 patients (13%) with no histological myocardial alterations. Significant differences in cardiac MRI and in 3D-EAM among the four groups were observed: in occurrence of RV alternations, in terms of LDE or wall motion abnormalities or bulging or hyperintensity in T1 ($P=0.02$) and in terms of mean bipolar scar area ($P=0.01$).

After a median Follow-up of 79 ± 53 months, the primary outcome of sustained VT/VF or death occurred in 20/99 patients (20%): 14 in M group (28%), 1 in FRMF group (3.8%), 1 in control group (7.7%) and 4 in ACM group (40%) ($P=0.02$). Regression analysis demonstrated that sustained VT/VF at admission, catheter ablation, histological diagnosis of myocarditis or arrhythmogenic cardiomyopathy and bipolar and unipolar total scar areas were independent predictors of sustain VT/VF or death. After 170 months of Follow-up, freedom from sustained VT/VF or death is significantly different among the four groups (survival rate 60% ACM; 72% M; 96.2% FRMF; 92.3% control group; log rank $P=0.02$).

Conclusion: Patients with unexplained VAs should be evaluated with an extensive diagnostic work - up including 3D-EAM and tissue cardiac characterization by EMB. Personalizing population-based risk stratification for SCD could be very helpful for primary prevention ICD implantation and future perspectives should include multi-variable risk score for different clinical settings.

490 Ventricular ectopic beats as a predictor for clinical outcomes in a cohort of young patients with major cardiac events and early repolarization pattern

Giuseppe Panuccio¹, Antonio Curcio¹, Antonio Strangio¹, Giuseppe Neri¹, Emilia De Luca¹, Pierangelo Calvelli¹, and Ciro Indolfi²

¹Magna Graecia University, Division of Cardiology, Department of Medical and Surgical Sciences, Catanzaro, Italy; ²U.R.T.-C.N.R., Catanzaro, Italy; ³Magna Graecia University, Division of Cardiology, Department of Medical and Surgical Sciences, Catanzaro, Italy

Aims: The early repolarization pattern (ERP) on the electrocardiogram (ECG) is widely diffused in the general population, representing a benign variant; however, it has been associated with arrhythmic death in a minority of cases. ERP can be diagnosed in the presence of J-point elevation ≥ 1 mm in ≥ 2 contiguous inferior and/or lateral leads of a standard 12-lead ECG. To date, electrophysiological determinants of major ventricular arrhythmias (VTach) in this condition are not clarified yet, and the real impact of ERP "per se" is poorly defined in the ventricular

arrhythmogenicity. we sought to investigate the link between ST-segment elevation and ventricular ectopic beats (VEBs), and to find ECG markers of major cardiac events.

Methods and results: we investigated a cohort of thirty-four consecutive patients (28 males, 40 ± 15 years, median 40 years) referred to our outpatient clinics for the presence of J-point elevation 2.0 ± 0.7 mm in 3 ± 1 contiguous inferior and/or lateral leads of a standard ECG. Clinical history (asymptomatic, N=9; palpitations, N=13; syncope, N=9; and cardiac arrest/sudden cardiac death, CA/SCD N=3) were collected. Twelve lead twenty-four-hours holter ECG monitoring (12L-Holter) was performed in all subjects, while echocardiography, effort test, HUTT, and coronary angiography were performed according to clinical judgement and to current recommendations. Univariate and multivariate logistic regression analysis were performed to assess predictors of syncope. P value < 0.05 was considered statistically significant. All data were processed using the Statistical Package for Social Sciences, version 25 (SPSS, Chicago, IL, USA). ERP was located in lateral ECG leads in 7 cases; in inferior leads in 12 cases; in inferolateral site in the remaining 15 subjects. The majority of cardiac events was observed in patients with inferior and inferolateral site patterns. We then evaluated VEBs count (861 ± 3206 counts/24hour), which was aggravated by progressive shortening of the coupling interval (according to symptoms). In group 1 (asymptomatic) VEBs count was 7.8 ± 9.1 ; in group 2 (palpitations) it was 2112.31 ± 4868.02 ; in group 3 (syncope) it was 1.13 ± 1.12 ; finally, in group 4 (CA/SCD group) VEBs count was 8.00 ± 13.856 . Therefore, we did not observe correlation between symptoms and number of ventricular extrasystoles. In fact, CI count in group 1 was 338.60 ± 51.81 ms, in group 2 was 455.36 ± 229.44 ms, in group 3 was 362.14 ± 270.46 ms, and in group 4 was 400 ± 10.0 ms. Interestingly, in multivariate logistic regression analysis, a strong correlation was observed between syncope occurrence and VEB with short CI, irrespective of age and number of VEBs (95% CI - 0.002-0.001; $P < 0.05$). In our cohort, ERP was associated with cardiac arrest in 8.8% cases and syncope was detected in those patients with the shortest VEBs CI, irrespective of number of VEBs.

Conclusion: These findings suggest that CI of VEBs may be considered as an independent predictor of cardiac events in ERP patients and aggressive treatment might be indicated in patients with coexistence of ERP and short CI for preventing major cardiac events.

390 The predictor role of worsening renal function in patients with new onset atrial fibrillation on direct oral anticoagulant

Lorenzo Bartoli¹, Francesco Angeli¹, Chiara Chiti¹, Pasquale Paolisso¹, Andrea Stefanizzi¹, Andrea Rinaldi¹, Luca Bergamaschi¹, Emanuela Conchetta D'Angelo¹, Michele Fabrizio¹, Francesco Donati¹, Sebastiano Toniolo¹, Alberto Foà¹, Mauro Biffi¹, Carmine Pizzi¹, and Nazzareno Galie¹

¹Department of Experimental, Diagnostic and Speciality Medicine (DIMES), University of Bologna

Aims: Chronic kidney disease (CKD) is an important outcome predictor in patients with atrial fibrillation (AF). Moreover, renal function at baseline is used to guide oral anticoagulant (OA) selection and dosing. The prognostic role of worsening renal function (WRF) during treatment with direct oral anticoagulants (DOACs) has been poorly explored. To estimate the prognostic role of WRF in terms of major adverse cardiovascular events (MACEs) and bleedings in a series of patients with newly diagnosed non-valvular AF (NVAf) treated with DOACs.

Methods and results: Between January 2017 and March 2019, we enrolled 866 patients with newly diagnosed NVAf treated with DOACs. Renal function (creatinine levels and estimated glomerular filtration rate - eGFR) was assessed at baseline and at follow-up. eGFR was calculated using Cockcroft-Gault (CG), Modification of Diet in Renal Disease (MDRD) and Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) formulas and as the mean value (MV) of the three. At baseline, hemorrhagic risk was estimated with the main available scores (HAS-BLED, ATRIA and ORBIT). WRF was defined as an increase in creatinine levels or a decrease in eGFR of at least 20%. Bleedings were identified according to the ISTH definition. Patients were followed for a median time of 21.7 ± 8.3 months. WRF was observed in 159 (18.3%), 139 (16.1%), 170 (19.6%), 153 (17.7%) and 153 (17.7%) patients using creatinine, CKD-EPI, CG, MDRD and MV, respectively.

Patients with WRF had significant higher rates of acute heart failure (AHF) and major bleedings (MB), while acute coronary syndrome (ACS) episodes were more frequently observed only in WRF detected by creatinine levels or CKD-EPI formula. Mortality was higher exclusively in patients with WRF using CKD-EPI. Conversely, the incidence of total bleeding events and stroke was not affected by WRF.

Different type of DOAC did not significantly impact the observed renal impairment and had no effect on the occurrence of MACEs in patients showing WRF. The baseline predictors of WRF were found to be age, female sex, lower hemoglobin and creatinine levels, and higher CKD-EPI and MDRD eGFRs. At multivariate analysis, WRF was identified as an independent predictor of MB (OR 2.04, 95% CI, 1.06-3.94, $P=0.034$), regardless of the bleeding risk.

Conclusion: This is the first prospective study to evaluate the impact of WRF on cardiovascular events in patients with NVAf treated with DOACs. In this population, WRF resulted a frequent event, was associated with higher rates of MB, death, and

MACEs, and emerged as an independent predictor of MB. CKD-EPI showed the best accuracy in predicting MACEs among patients with WRF. The specific DOAC did not affect either the entity of worsening renal function or the incidence of cardiovascular events.

434 Admission blood glucose level as an ischaemic stroke modifier in patients with new onset atrial fibrillation

Luca Bergamaschi¹, Francesco Angeli¹, Pasquale Paolisso¹, Chiara Chiti¹, Michele Fabrizio¹, Andrea Stefanizzi¹, Francesco Donati¹, Sebastiano Toniolo¹, Matteo Armillotta¹, Lorenzo Bartoli¹, Emanuela Concetta D'Angelo¹, Andrea Rinaldi¹, Alberto Foà¹, Carmine Pizzi¹, and Nazzareno Galiè¹

¹Department of Experimental, Diagnostic and Specialty Medicine, University of Bologna, Italy

Aims: Several scores have been proposed to assess the stroke risk in patients with non-valvular atrial fibrillation (NVAF). However, type 2 diabetes mellitus (T2DM) is considered a major stroke risk factor regardless of glycemic control. Whether blood glucose level at baseline modifies the risk of stroke in NVAF is still unclear. To evaluate the risk of ischaemic stroke according to the presence of T2DM and admission blood glucose (ABG) level in patients with new-onset NVAF starting direct oral anticoagulants (DOACs)

Methods and results: We analyzed all consecutive patients with NVAF at our outpatient clinic from January to December 2018. The study population was constituted by 1014 patients with new-onset NVAF starting new anticoagulant therapy. Baseline characteristics were evaluated in the overall cohort whereas outcomes were assessed for 915 patients. The median follow-up time was 19.6 ± 12.9 months. Overall, 50.3% were male with a mean age of 73.9 ± 12.5 years.

Diabetic NVAF patients were more frequently male ($P=0.04$) with higher prevalence of dyslipidemia ($P<0.001$), hypertension ($P<0.001$), severe renal impairment ($P=0.02$), peripheral vasculopathy ($P=0.007$) and history of myocardial infarction ($P<0.001$) compared to non-diabetic NVAF. Conversely, no differences were observed between subgroups in terms of age ($P=0.8$). Baseline blood glucose level was significantly higher in the diabetic NVAF population (160 ± 67 mg/dL vs. 119 ± 39 mg/dL; $P<0.001$). As expected, the mean CHA2DS2-VASc score was significantly higher in diabetic NVAF compared to non-diabetic groups (4.7 ± 1.4 vs. 3.2 ± 1.5 ; $P<0.001$).

During a 2 year Follow-up period, we collected 27 (3.0%) ischaemic stroke. As expected, the rates of stroke were significantly higher in diabetic NVAF (7.6% vs. 2.3%, $P<0.001$). Also, the ABG was significantly greater in NVAF who had an ischaemic stroke compared to others (160 ± 68 mg/dL vs. 119 ± 39 mg/dL, $P=0.005$). The incidence of stroke was almost five-time greater in NVAF with ABG level major than 150 mg/dl (9.8% vs. 1.9%, $P<0.001$).

At multivariate Cox-regression model adjusted for age, sex and presence of T2DM, blood glucose level at admission was the only independent predictor of ischaemic stroke at Follow-up (HR 1.01, 95%CI 1.001-1.02; $P=0.03$). Finally, another multivariate Cox-regression model, adjusted for the mean CHA2DS2-VASc score, showed that the ABG still remained a strong independent predictor of ischaemic stroke at Follow-up (HR 1.012, 95%CI 1.003-1.02; $P=0.01$).

Conclusion: Diabetic NVAF had a worse baseline profile and higher stroke risk compared to non-diabetic NVAF. Baseline blood glucose level was an independent predictor of stroke regardless of the presence of diabetes mellitus or stroke risk profile. These findings underline the role of basal blood glucose level as a potential stroke risk modifier and therefore emphasize the importance of its routine determination to better stratify the stroke risk in NVAF starting DOACs

577 Epicardial or endo-epicardial vs. endocardial only approach in catheter ablation of electrical storm and ventricular tachycardia

Samuele Principi¹, Marco Silenzi¹, Paolo Compagnucci¹, Giulia Stronati¹, Giuseppe Ciliberti¹, Laura Cipolletta¹, Manuel Conti¹, Michela Casella¹, Federico Guerra¹, and Antonio Dello Russo¹

¹Ospedali Riuniti Ancona

Aims: Few studies have suggested that a strategy of combined endo- and epicardial access for mapping and transcatheter-ablation (CA) of ventricular tachycardia (VT) may provide superior efficacy to an endocardial-only approach in selected patients. We sought to evaluate the number of VT recurrences in patients undergoing CA for ventricular tachycardia or electrical storm (ES), comparing endocardial approach to epicardial or endo-epicardial approach.

Methods and results: We conducted a retrospective, single centre, observational study, enrolling patients who underwent CA for treatment of VT or ES. The ablation strategy (endocardial vs. endo-epicardial or epicardial approach) was chosen by the operators according to their personal evaluation of the characteristics of patients, preferring the epicardial approach for patients with non-ischaemic cardiomyopathy and ECG criteria suggesting an epicardial origin of the VT. Patients were divided into two groups (endocardial approach vs. epicardial or endo-epicardial approach), and the primary outcome was sustained VT recurrence at short- middle term follow-up, as assessed by implantable cardioverter-defibrillator (ICD), remote monitoring and

clinical evaluation. We included 43 patients, with a total of 44 procedures (27 endocardial ones and 17 endo-epicardial or epicardial ones). Most common indication for CA was ES (61.5%).

Ischaemic-cardiomyopathy was the most common disease in patients that underwent endocardial approach (66.7%), while non-ischaemic cardiomyopathy was the underlying disease of the 17 patients that underwent epicardial or endo-epicardial CA. In our short-middle term follow-up (median Follow-up: 4 month), we found six VT recurrences (3 in the endocardial approach group, 3 in the epicardial or endo-epicardial approach group). In particular, among the 3 recurrences occurred using the epicardial approach, a premature in-hospital recurrence took place in a patient with severe ventricular dysfunction and several comorbidities.

Conclusion: In our experience, we found the same number of VT recurrences between the two approaches. Further data on a larger number of patients with longer follow-up are needed to assess the comparative efficacy of endocardial and epicardial or endo-epicardial approaches.

In the future, further analysis focusing on patients' underlying cardiomyopathy or electrophysiological's characteristics could show interesting prospectives.

35 Insights into cerebral hemodynamics during atrial fibrillation: a non-invasive near-infrared spectroscopy approach.

Andrea Saglietto¹, Stefania Scarsoglio², Daniela Canova¹, Silvestro Roatta¹, Nefer Gianotti¹, Alessandro Piccotti¹, Simone Franzin², Elisabetta Toso¹, Mauro Rinaldi¹, Fiorenzo Gaita³, Carla Giustetto¹, Gaetano Maria De Ferrari¹, Luca Ridolfi², and Matteo Anselmino¹

¹Università Degli Studi di Torino, ²Politecnico di Torino, ³Clinica Pinna Pintor, Torino

Aims: Atrial fibrillation (AFib) is the most common cardiac arrhythmia, currently affecting about 3% of the general population. Recently, it has been observed that AFib is associated with cognitive decline/dementia, independently from clinical strokes. Several mechanisms have been proposed to explain this association. Among these, the hypothesis of an altered cerebral blood flow dynamics during AFib has been the least investigated, most likely due to the evident concerns related to the direct sampling in the cerebral circulatory system. In particular, it is unknown how abnormal heart rhythm influences hemodynamic parameters of the distal cerebral circulation. The aim of this study was to use non-invasive cerebral near-infrared spectroscopy (NIRS) to investigate: (a) the behaviour of hemodynamic signals in the deep cerebral circle, (b) how these signals are affected by different rhythm status (AFib, atrial flutter - AFL, restoration of sinus rhythm - SR).

Methods and results: From January to August 2019, we enrolled 53 consecutive patients, who underwent a hemodynamic and cerebral monitoring before and after an effective electrical cardioversion (ECV) (39 in AFib, 14 in AFL). We analyzed the Tissue Oxygenation Index (TOI), a spatially-resolved NIRS signal known to effectively reflect tissue blood flow. A statistical paired t-test was used to compare pre and post-ECV signals. ECV was successful in maintaining SR in 51 out of 53 (96%). Mean (μ) TOI did not differ pre and post-ECV both in AFib and in AFL patients (AFib: 64.72 ± 6.61 vs. 65.59 ± 7.22 , $P=0.26$; AFL: 64.35 ± 7.37 vs. 63.64 ± 7.43 , $P=0.32$; Overall: 64.61 ± 6.75 vs. 65.02 ± 7.25 , $P=0.48$), while standard deviation (σ) of TOI showed a trend towards significant decrease in the totality of the sample (1.313 ± 0.671 vs. 1.139 ± 0.715 , $P=0.01$). When we compared the coefficient of variation (CoV) of TOI, calculated as the ratio between σ and μ (σ/μ) and representing a measure of signal variability, normalized for the CoV of arterial blood pressure (ABP), we found a significant decrease of normalized CoV of TOI in AFib and in the totality of the sample, but not in AFL (AFib: 0.124 ± 0.055 vs. 0.103 ± 0.066 , $P=0.03$; AFL: 0.108 ± 0.050 vs. 0.090 ± 0.052 , $P=0.10$; Overall: 0.119 ± 0.054 vs. 0.099 ± 0.062 , $P=0.01$). Of note, the cv of ABP did not differ between pre and post-ECV (AFib: 0.183 ± 0.055 vs. 0.194 ± 0.058 , $P=0.26$; AFL: 0.187 ± 0.055 vs. 0.189 ± 0.050 , $P=0.87$; Overall: 0.184 ± 0.054 vs. 0.193 ± 0.055 , $P=0.27$).

Conclusion: NIRS non-invasive analysis of deep cerebral hemodynamics suggest that, even though baroreceptor reflexes adequately dampen central blood pressure oscillations in AF, the deep cerebral circle suffers from an increased variability of hemodynamic signals, which are restored with the return to the SR. These data support previous computational studies which claimed that during AFib transient hypoperfusive or hypertensive events occur deeply in the brain, plausibly related to cognitive decline.

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369 In-hospital mortality in COVID-19 patients according to presence of atrial fibrillation

Enrico Guido, Spinoni¹ Marco Mennuni², Andrea Rognoni², Veronica Lio¹, Crizia Colombo¹, Leonardo Grisafi¹, Giulia Renda³, Melissa Foglietta³, Pier Paolo Sainaghi¹, Ivan Petrilli³, Damiano D'Ardes³, Gianluca Aimaretti¹, Mattia Bellan¹, Luigi Mario Castello¹, Gian Carlo Avanzi¹, Francesco Della Corte¹, Marco Krenghli¹, Mario Pirisi¹, Mario Malerba¹, Sante Donato, Pierdomenico³, Sabina Gallina³, Francesco Cipollone³, and Giuseppe Patti¹

¹Università del Piemonte Orientale, ²Aou Maggiore della Carità di Novara,

³Università Gabriele d'Annunzio, Chieti, ⁴Ospedale Sant'Andrea, Vercelli

Aims: Since the outbreak of Coronavirus Infective Disease (COVID-19) by the end of 2019, it was found that patients with cardiovascular (CV) diseases show greater susceptibility to the infection than the general population. Atrial fibrillation (AF) shares with COVID-19 various prevalent co-morbidities and risk factors. The impact of AF on adverse outcomes, rather historical AF and new onset of AF, in patients with COVID-19 has not been evaluated yet.

Methods and results: Six hundred thirty-seven patients hospitalized for COVID-19 in three large Italian hospitals were enrolled in the study. Main clinical characteristics, past medical history, and clinical course were collected. In-hospital mortality, according to the presence of AF, both historical and new-onset, was then investigated. Estimated survival rates were investigated in the three subgroups. Mortality odds ratios adjusted for demographic, baseline characteristics and treatment were calculated. 134 (21.0%) patients had overall AF (79 with historical and 55 with new-onset AF). Patients with new-onset AF were younger than those with historical AF but older than those without AF. Patients with a history of AF showed a higher prevalence of co-morbidities (cardiomyopathy, peripheral artery disease, chronic obstructive pulmonary disease, renal failure, cancer, and liver disease) than patients with new-onset AF. The in-hospital mortality rate was significantly higher in patients with new-onset of AF and in patients with historical AF than patients with sinus rhythm ($n=27$, 49.1%; $n=29$, 36.7%; $n=107$, 21.3%; $P<0.001$). The estimated survival rates at 30 days were 30.8% (CI 17.4%-45.2%) in those with new onset AF (log-rank $P<0.001$ vs. no AF) and 44.3% (CI 27.7%-59.6%) in patients with historical AF (log-rank $P=0.007$ vs. no AF). The adjusted odds ratio for mortality were 1.26 (0.58-2.74, $P=0.55$) and 3.34 (1.54-7.25, $P=0.002$).

Conclusion: The presence of AF in patients with COVID-19 seems to be associated with increased risk of in-hospital mortality, especially among patients with new-onset arrhythmia.

371 Two dual-coil ICD leads transvenous extraction in patient with left ventricular assist device: a case report

Enrico Guido Spinoni^{1,2}, Chiara Ghiglieno^{1,2}, Veronica Lio^{1,2}, Gabriele Dell'Era^{1,2}, Anna Degiovanni^{1,2}, and Giuseppe Patti^{1,2}

¹Universita' del Piemonte Orientale, Novara, ²Aou Maggiore Della Carita't1, Novara

Aims: Implantable intracardiac device can require complete extraction due to lead failures or infection; this procedure is deemed at high-risk and appears very challenging in patients with left ventricular assist device (LVAD), due to patient's frailty, risk of systemic infections and the need of uninterrupted oral anticoagulation therapy (OAC, target INR 2-3). We present here the case of complete 2 right ventricular (RV) lead extraction in a patient with LVAD.

Methods and results: A 68years-old man with esotoxic dilated cardiomyopathy (DCM) with ejection fraction (EF) 10% received a CRT-D device in 2009; in 2010 the right ventricular (RV) coil (Medtronic Sprint Fidelis Active Fixation Dual coil) showed signs of rupture, so it was abandoned, and a new coil (Medtronic Sprint 4 Active Fixation Dual coil) was implanted. In 2013 he received a LVAD (HeartWare, Medtronic). In 2020 the patient was admitted for inappropriate ICD shock delivery due to noise sensing and increased impedance of RV lead suggesting lead fracture was documented (pre-operative chest XR, panel A). Considering the residual risk of malignant arrhythmias, complete extraction of both the RV leads and implantation of a new RV lead was planned, maintaining warfarin with a INR of 2.11 the day of the procedure. After opening the pocket and freeing the proximal portion of the leads, the lead connectors were cut and two locking stylets (Liberator Beacon Tip Locking Stylet, Cook Medical), secured with compression coils, were inserted into the central core of each of the malfunctioning RV leads to prevent disruption. The mechanical rotational extractor (one short 11 French and one long 13 French Evolution RL, Cook Medical) with tissue stabilization sheath (SteadySheath Evolution, Cook Medical) were then advanced gradually lysing vascular adhesions until we gained access of the whole RV lead and were able to extract the leads without complications. After completing the extraction, a new RV single-coil lead was implanted (post-operative chest XR, panel B). In the days after the procedure, a pocket hematoma required treatment with ice and a tight medication. Empirical antibiotic therapy was then administered for 10 days (patients was chronically colonized by *S. epidermidis* on LVAD wiring). Patient was discharged after two weeks.

Conclusion: Complete transvenous lead extraction is a high-risk procedure associated with important complications, especially in patients with OAC and with higher risk of infection. The procedure should be performed by a well-trained staff in a complete full-safe setting with a close clinical monitoring after the procedure, to prevent all the possible complications.



(panel A - panel B)

170 Impact of emergency medical service arrival time and initial arrest rhythm on return of spontaneous circulation (ROSC) after out of cardiac arrest: the experience of the Province of Lecce, Italy

Gaetano Tammaro¹, Maurizio Scardia¹, Daniele Antonaci¹, Cesare Sabetta¹, and Domenica Ruggeri¹
¹SEUS 118

Aims: Out-of-hospital cardiac arrest (OHCA) is a major cause of death and disability worldwide. In 2013, the Territorial Emergency Medical Service (EMS) of Lecce, a public service operating in an Italian province of 814 495 inhabitants, developed an OHCA registry. The present study aims to evaluate the relationship between EMS arrival time, shockable rhythms and return of spontaneous circulation (ROSC).

Methods and results: All OHCA cases from 1st January 2013 and 31st December 2017 in Lecce OHCA registry were assessed. Data were collected chronologically by the ambulance crew and included patient characteristics (age and sex), arrest features, EMS response times, treatment and patient outcomes (ROSC or death). 4203 OHCA cases of EMS treated cardiac arrests were recorded in the study period (103 per 100 000 of resident population per year), with a survival rate at hospital transfer of 4.5%. Asystole was the most common cardiac arrest rhythm (87.2%), while ventricular fibrillation or tachycardia (VF/VT) and pulseless electrical activity (PEA) were observed for 9.4% and 3.4% of cases, respectively. Relative to ROSC cases, the percentage of shockable rhythms raised to 54.1%. Mean EMS response times (mm:ss) were 11:37 for shockable rhythms with ROSC, 13:31 for shockable rhythms with death, 12:58 for non-shockable rhythms with ROSC and 16:12 for non-shockable rhythms with death. ROSC cases with VF/VT were assisted in less time than the others.

Conclusion: According to Lecce OHCA registry, survival rate after OHCA is low. Initial arrest rhythm can influence the outcome, since most ROSC cases are represented by shockable rhythms. ROSC cases after VF/VT were associated with the shorter EMS arrival time, thus suggesting that an early assistance could increase the possibility to find a shockable rhythm and to improve survival rate.

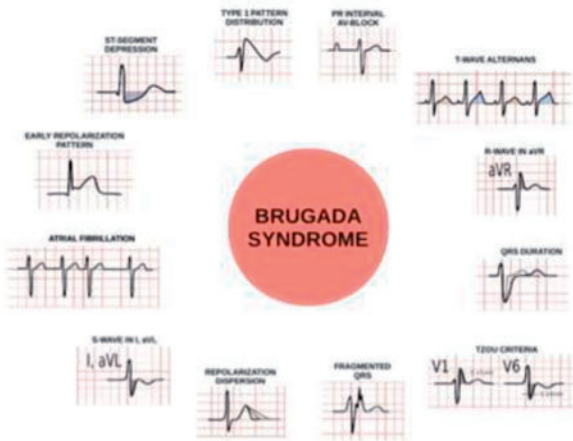
221 Electrocardiographic signs related to worst prognosis in Brugada syndrome

Francesco Vitali¹, Alessandro Brieda¹, Cristina Balla¹, Michele Malagù¹, Martina De Raffe¹, Matteo Serenelli¹, and Matteo Bertini¹
¹UO Cardiologia, Azienda Ospedaliero-Universitaria di Ferrara

Aims: the 12-lead electrocardiogram (ECG) has played an essential role for the diagnosis of Brugada Syndrome (BrS) since its first description. Different ECG signs other than spontaneous type 1 ECG pattern were linked to arrhythmic risk with conflicting results. to evaluate the prognostic value of different ECG signs in BrS patients.

Methods and results: we retrospectively analyzed 46 patients with Brs and spontaneous type 1 ECG pattern. Patients were categorized in three groups: asymptomatic, with previous syncope and with previous cardiac arrest (CA)/documented ventricular arrhythmias (VTA)/appropriate ICD interventions. Signs collected from each ECG were: presentation rhythm, heart rate, atrial depolarization duration and axis, PR interval (ms), QRS complex morphology, QRS duration in V2 and DII (ms), QRS fragmentation, Tzou criteria ($V1R > 0.15$ mV, $V6S > 0.15$ mV, $V6S/R > 0.2$ mV), duration and voltage of S wave in lateral leads (≥ 40 ms and ≥ 0.1 mV), aVR sign ($R' \geq 0.3$ mV), QT and QTc (Bazett) duration in DII and repolarization dispersion (T peak - T end in V2 and V6). in our BrS patients with spontaneous type 1 ECG pattern PR interval > 200 ms ($P=0.017$), QRS duration > 120 ms in DII ($P=0.001$) and > 140 ms in V2 ($P=0.02$), presence of aVR sign ($P=0.006$), wide and or large S wave in DI-aVL ($P=0.02$), fQRS ($P=0.012$) and Tzou Criteria ($P=0.039$) were associated with CA and VTA.

Conclusion: in our population, prolonged PR interval, wide QRS in DII and V2, fragment QRS, wide and large S wave in lateral leads, wide R' wave in aVR and presence of Tzou Criteria were associated with worst clinical outcome.



222 Perioperative antibiotic prophylaxis for cardiac implantable electronic devices tailored on patient infection risk

Francesco Vitali¹, Michele Malagù¹, Alessandro Brieda¹, Cristina Balla¹, and Matteo Bertini¹

¹UO Cardiologia; Azienda Ospedaliero-Universitaria di Ferrara

Aims: cardiovascular implantable electronic devices (CIEDs), such as pacemakers (PMs), implantable cardioverter defibrillators (ICDs) and cardiac resynchronization therapy (CRT) devices, have an estimated incidence of infections between 1 to 7%. A pre-implant evaluation of the potential risk factors for device infection is important to the implementation of prophylactic strategies to prevent the infective event. peri-operative antibiotic prophylaxis tailored on patient infection risk could reduce infective complications.

Methods and results: we analyzed prospectively 872 patients undergoing CIED implantation enrolled in the "PRACTICE" study. Patients undergoing leadless PM or subcutaneous ICD implantation were excluded. The Shariff score was used for patient infection risk quantification. One point was given for each item: diabetes, heart failure, chronic kidney disease (eGFR < 60 ml/min), oral anticoagulant therapy, corticosteroid use, previous CIED infection, generator replacement, device upgrade, presence of more than two leads, epicardic leads and temporary pacemaker. If the Shariff score was < 3 only two intravenous (IV) administrations of antibiotic were given, one before the index procedure and one six hours thereafter. If the score was ≥ 3, antibiotics were given IV after the procedure (every 8 hours for two days) and then orally thereafter (for 7 days). mean Shariff score was 1.5 ± 1.3, 685 patients were in the low infective risk group (score < 3) and 187 were in the high infective risk group (≥ 3). The protocol was not applicable for 68 patients. At 30 days no difference in CIED infection rate (7 vs. 4 patients—*P* = 0.17) and in all cause death (72 vs. 51 patients—*P* = 0.1) was noted between the two groups. We reported only one case of infective endocarditis, in a patient with low baseline infective risk.

Conclusion: without new prophylactic antibiotic regimen the rate of CIED infections at 30 days was low (1.6%), and not statistically different between risk groups.

223 Combination of a leadless pacemaker and subcutaneous defibrillator in a severely obese patient

Martina De Raffele¹, Alessandro Brieda¹, Francesco Vitali¹, Michele Malagù¹, Cristina Balla¹, and Matteo Bertini¹

¹UO Cardiologia; Azienda Ospedaliero-Universitaria di Ferrara

Case report: we present the case of a 68-year-old male patient with severe obesity (BMI 58.8 kg/m²), diabetes, permanent slow atrial fibrillation, idiopathic dilated cardiomyopathy with severe biventricular dysfunction emerged in 2008 with sustained ventricular tachycardias. The patient had a transvenous bicameral cardioverter defibrillator (ventricular pacing 99%) with an additional atrial lead abandoned due to an insulation defect; the ICD generator was replaced in June 2018 for natural battery depletion. The patient came to our attention in June 2019 for swelling of the ICD pocket after an accidental trauma. He was asymptomatic and persistently apiretic, with normal blood tests, despite this he was given Amoxicillin thrice daily for two weeks. In October 2019 the patient came to the emergency department for

pulmonary oedema and suppuration at the level of the ICD pocket. At that time, blood cultures and pocket cultures were still negative thus empirical antibiotic therapy was started. Transesophageal echocardiogram was performed, highlighting the presence of vegetations attached to the ICD leads and small aortic endocarditic lesions (3 mm x 2 mm); left ventricular ejection fraction was 25%. A F-FDG PET/CT showed F-FDG activity in the region of the pocket generator, leads and at the left clavicular level. The patient underwent lead extraction and surgical removal of the generator. The culture of the leads was positive for multisensitive *Staphylococcus Capitis* and therapy with Oxacillin was started, as per antibiogram. During hospitalization the patient had slow atrial fibrillation phases with significant pauses and multiple episodes of hemodynamically stable sustained ventricular tachycardia. Given the need for ventricular pacing, titration of antiarrhythmic therapy and defibrillation, leadless pacemaker implantation (Micra - Medtronic) was performed at first. The procedure was complicated by multiple device thrombosis during anchoring, despite effective periprocedural anticoagulation. After 7 days, subcutaneous defibrillator implantation (Emblem S-ICD - Boston) was performed in conscious sedation thanks to anesthesiological blockage of the serratus muscle. The patient was discharged after few days, still receiving antibiotic therapy with optimal pacemaker and subcutaneous defibrillator parameters.

463 Efficacy of activation map during ventricular tachycardia ablation

Giovanni Volpato¹, Paolo Compagnucci¹, Manuel Antonio Conti¹, Laura Cipolletta¹, Gino Grifoni¹, Alessandro Barbarossa¹, Umberto Falanga¹, Leonardo Belfioretti¹, Giulia Stronati¹, Federico Guerra¹, Michela Casella², and Antonio Dello Russo¹

¹Cardiology and Arrhythmology Clinic, University Hospital Ospedali Riuniti, Italy, Ancona, ²Department of Clinical, Special and Dental Sciences, University Hospital Ospedali Riuniti, Marche Polytechnic University, Italy, Ancona

Aims: Catheter ablation (CA) of ventricular tachycardias (VT) represents a challenge, due to the complexity of the underlying substrate and to the difficulty in characterizing the arrhythmia mechanisms and circuitry.

Methods and results: We conducted a prospective cohort study, aimed at investigating whether VT interruption during radiofrequency (RF) delivery can be regarded as a marker indicating a lower risk VT recurrence during follow-up. From November 2018 to September 2020, 43 patients with VTs underwent CA using RF energy. Six patients were not included in the study due to the shortness of follow-up (<2 months). In patients in whom activation mapping could be performed, we first attempted VT interruption, followed by substrate modification (fragmented/late potential elimination and/or dechanneling of the entire pathologic zone). In 14 patients, activation mapping was not feasible due to the poor hemodynamic VT tolerance and/or to the absence of VT inducibility with programmed ventricular stimulation. In these cases, substrate CA was performed, aimed at eliminating fragmented and/or late potentials, which could act as presumed arrhythmia mediators. Recurrences were assessed via ICD in office interrogations and remote monitoring for a median of 6 (IQR 3-9) months of follow-up. Thirty-seven patients were included in the study. The median age at baseline was 62 ± 14 years. Fifteen patients underwent endo-epicardial CA due to the presumed epicardial VT origin and/or to the non-ischaemic etiology of the underlying cardiomyopathy. In 22 patients, the indication for the procedure was electrical storm refractory to pharmacological therapies. Among the 17 patients in which it was possible to interrupt the arrhythmia through RF delivery, we observed only 1 sustained VT recurrence at follow-up. Among the 20 patients in which VT was not interrupted with RF delivery or the VT had poor hemodynamic tolerance, there were 5 sustained VT recurrences at follow-up. Risk of recurrence at follow-up was numerically lower in patients in which VT was interrupted with RF delivery during the procedure (OR 0.187, CI 0.02-1.8; *P* value = 0.13).

Conclusion: In patients undergoing CA for VTs, activation mapping is a useful tool to enhance the understanding of the arrhythmia circuitry. Our preliminary results seem to suggest that VT interruption during RF delivery may represent a positive prognostic factor, pointing to better outcomes and lower recurrence rates, even if the results were not statistically significant.

Further investigations with a larger cohort of patients is required to confirm these findings.

