P3169 Propagation in the right atrium during common atrial flutter as determined by three-dimensional mapping

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Six male patients from 45 to 74 years of age (mean 64 ± 11) were referred for radiofrequency catheter ablation of common atrial flutter (AFl) and underwent three dimensional right atrial (RA) mapping during AFl before standard ablation in the inferior vena cava (IVC)-tricuspid annulus (TA) isthmus. One patient had dilated cardiomyopathy. Common AFl with cycle length (CL) ranging from 240 to 270 ms (mean CL 253 ± 12) was diagnosed by standard surface ECG criteria. Confirmation of counterclockwise RA activation was obtained with multielectrode catheter recordings while IVC-TA isthmus activation was related to the plateau of the surface ECG flutter wave.

Method: Three dimensional (3D) activation maps were obtained with the Carto-Biosense system by sequentially acquiring spatial and electrogram information from 42 to 102 sites (mean 80.1 ± 21) in the RA. The spatial information was gated to proximal coronary sinus activation and local activation was determined on line by minimum dv/dt criteria applied to local electrograms.

Results: In all the maps, activation beginning from the region of the proximal coronary sinus swept in counterclockwise fashion around the TA and returned to within close proximity of the earliest activity by the end of the flutter cycle. Significant change in activation front velocity denoted by rapid change of colour was only noted in and at the extremities of the IVC-TA isthmus. The upper part of the right atrium was smoothly activated by a front including all the region between the superior vena cava and the TA. The coronary sinus exhibited a pattern consistent with passive activation. Analysis of propagation maps and double potentials indicated sites of wavefront collision predominantly in the postero-lateral RA but also in the septal region.

P3170 Cibenzoline versus propafenone in the prevention of atrial tachyarrhythmias: a double-blind randomized study

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The purpose of the study was to compare the efficacy and the safety of Cibenzoline (C) versus Propafenone (P) to maintain sinus rhythm in patients with atrial tachyarrhythmias (AT). Sixty-Five patients (pts), 29 M and 36 W, mean age 66.1 ± 12.2 years, with atrial fibrillation (n = 52) or atrial flutter (n = 13), entered this double-blind controlled multicenter trial and were randomized to either C 130 mg twice daily (n = 34) or P 300 mg twice daily (n = 31). Pts with a left ventricular shortening fraction (LVSF) < 20% or recent myocardial infarction were excluded (< 3 months). All anti-arrhythmic drugs were discontinued for at least 5 half-lives. Pts were asked for symptoms and had a 12 leads-ECG and a 24 hour Holter recording at baseline, 3 and 6 months and in case of recurrence of symptoms. Both groups were comparable at baseline regarding age, history of AT, previous anti-arrhythmic drugs, LVSF, underlying heart disease and concomitant digitalis therapy. Kaplan-Meier life-table analysis was used in constructing the actuarial event free survival.

The mean maintenance dose was 205 ± 64 mg/day for C and 513 ± 138 mg/day for P. Three pts were lost to follow up (C pts) and 23 pts discontinued the trial for documented recurrence of AT: 11 pts on C and 12 pts on P. The cumulative percentage of pts without recurrence of AT and tolerating the drug at 6 months were 55.9% with C versus 48.4% with P (ns). Most of AT recurrences (22/33) occurred during the first three months of the trial. Mean recurrence delay of 53.4 ± 44.3 days for C and of 61.6 ± 35.3 days for P, (ns).

Adverse reactions were reported in 9 pts for C (26%) and P (29%; ns) and led to discontinuation of the treatment in 4 pts with each drug. QRS duration significantly increased in C pts compared to P pts (in one C pt widening QRS > 30% necessitates withdrawal). No pro-arrhythmia effect was observed.

Thus, in the prevention of atrial tachyarrhythmias, oral Cibenzoline demonstrates, as compared to Propafenone, similar antiarrhythmic activity and degree of safety.

ARRHYTHMIAS IN THE YOUNG AND IN CONGENITAL HEART DISEASE

P3171 Low specificity of tilt table testing in young adults

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Tilt table testing is in wide-spread clinical use to evaluate patients with syncope. In order to determine the usefulness of this approach we studied 3 different protocols in 36 healthy volunteers (12 females, 24 males, age 18–34 years, median 26 years).

Methods: Every protocol started with 30 min of supine rest. Participants were then positioned upright to a tilt angle of 80° for either a total of 80 min (group A), or for 25 min followed by a graded infusion of orciprenaline (stepwise increases to a maximum of 200 μg/min) for another 55 min (group B), or for 25 min after sublingual application of 10 mg isosorbide dinitrate (group C). Heart rate was monitored continuously and values were documented immediately before (HRrest) and after (HRup) tilting as well as 30 sec prior to syncope to determine the drop in pulse rate (HRdiff).

Result

	Group A	Group B	Group C
Syncope/total (n)	8/12	9/12	11/12
Time to syncope (min)	23.3 ± 17.9	34.2 ± 32.8	5.5 ± 5.4
HRrest (n/min)	74 ± 11	65 ± 9	86 ± 12
HRup (n/min)	85 ± 11	84 ± 12	111 ± 18
HRdiff (n/min)	25 ± 16	25 ± 18	30 ± 21

One volunteer of group B panicked during orciprenaline infusion, and in 4 volunteers syncope occurred before orciprenaline was given.

Conclusion: tilt table testing provokes symptoms in a large number of asymptomatic individuals, especially when used in connection with pharmacological provocation. Since the specificity of these protocols is very low their results may be misleading in the clinical setting of unexplained syncope, at least in young adults.

P3172 Use of a single pass lead for VDD pacing in children

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Concerns about preserving long-term venous access and a higher rate of lead displacement, have restricted the use of endocardial DDD pacing in children. To overcome the potential complications of two lead systems, we have assessed the effectiveness of a single pass lead to provide VDD (synchronous) pacing in children with atrioventricular block.

A single pass lead was implanted in 10 children aged 3.7 to 14.9 years (mean 10 years), weighing 13.5 to 76 kg (mean 38 kg). Congenital complete heart block was present in 6 children (structurally normal heart in 5 and ASD & pulmonary stenosis in 1). One child had 2:1 AV block of unknown cause. Three children developed complete heart block after corrective surgery (dextracardia, TGA & VSD in 1, atrioventricular septal defect & prosthetic mitral valve in 1 and VSD in 1). The older 6 children had 2–5 previous systems: 3 were converted from VVI/R after removing ventricular leads and 3 from DDD after removal of atrial J leads.

A 58 cm single pass lead (Vitatron (5), Medtronic steroid eluting (3), Intermedics (2)) with a 13.5 cm spacing between the atrial sensing rings and lead tip was implanted via a subclavian vein puncture. The adult size lead was chosen to permit coiling of redundant lead in the right atrium to avoid the need for lead advancement during growth whilst maintaining atrial sensing. In 1 child a complete loop was required to obtain adequate atrial sensing. Satisfactory acute ventricular pacing thresholds and atrial sensing was obtained in all. Saphir (6), Thera (2) and Unity (2) generators were attached to the lead and placed in a prepectoral pocket. During growth, the atrial dipole has moved towards the superior vena cava, but good atrial sensing and VDD pacing has been maintained over 1–28 months (mean 14 months) in all. The 3 children whose systems were upgraded from VVI/R have increased their exercise tolerance.

Conclusions: Physiological pacing can be reliably obtained in children with complete heart block and normal sinus node function by use of a standard single pass VDD lead thereby avoiding the complications of two lead systems in growing children.

P3173 Radiofrequency catheter ablation in paediatric patients with supraventricular tachycardias

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Aim of this study is to evaluate the efficacy and the safety of the radiofrequency catheter ablation (RF-CA) in young patients. In our Institution, between May 1991 and January 1996, 50 pts aged less than 15 years (30 M, 20 F 10 ± 3 yrs old, range 1 mo-14 yrs) with supraventricular arrhythmias refractory to medical therapy underwent RF-CA. Concomitant heart diseases were: dilated cardiomyopathy in 1 pt, hypertrophic cardiomyopathy in 1 pt, Ebstein's disease in 2 pts; in 5 pts, with incessant tachycardia, left ventricular dysfunction with cardiomegaly was present. Only 12 pts had less 10 yrs. Arrhythmias related to anomalous pathways (AP) were present in 36 pts, (4 showed PJRT), AV nodal reentrant tachycardia (AVNRT) in 8 pts, atrial ectopic tachycardia (AET) in 4 pts, AVNRT and AP in 1 pt and AVNRT and AET in the last pt. Globally, the ablation procedure was on the right side in 37 pts and on the left side by transseptal approach in the remaining 13 pts, (2 pts through the patent foramen ovalis). Procedure times and X-ray exposure times were 184 ± 66 and 35 ± 33 min. in pts with AP, 142 ± 29 and 19.5 ± 8 min. in pts with AVNRT, 178 ± 37 and 24 ± 18 min. in pts with AET, 120 ± 42 and 32 ± 9 min. in the remaining 2 complex cases respectively. Successful ablation was obtained in 49/50 pts (98%), no complications occurred. During the follow-up period (25 ± 12 months) all pts successfully treated are symptom-free and in the 5 pts with left ventricular dysfunction, the cardiomegaly had completely regressed.

In conclusion, RF-CA is an effective and safe procedure also in paediatric pts. However, in relation to the possible adverse effect of the procedure and to the X-ray exposure in young pts we prefer to perform RF-CA in selected cases only, in whom is impossible to delay the procedure over 14 yrs of age.

P3174 Radiofrequency catheter ablation in the young: an effective and safe therapy for symptomatic tachycardia

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The aim of this study was to evaluate the efficacy and safety of radiofrequency (RF) catheter ablation (CA) in patients less or equal to 17 years of age. From July 1991, 352 pts underwent RF CA in our institution, and 48 (13.6%) were 17 year-old or less (mean age 13.6 ± 2.5 years – range from 6 to 17 years). All were suffering from recurrent paroxysmal or permanent tachycardia (T), either atrial T (AT), A-V nodal reentrant T (AVNRT), junctional T related to assessory pathway (AP) or ventricular T (VT). The CA procedure was performed under general anaesthesia only in children ≤ 10 year-old, and under sedation in the others. In the absence of PFO, the mitral annulus was reached via a retrograde aortic catheterization.

Results: n = total number, RSA = ride side approach, LSA = left side approach, pulses = median of pulse number, rec = reccurrence at 2 months follow-up.

	n	RSA	LSA	Success	Pulses	Rec.
AT	4	4	–	4	3	1
AVNRT	13	13	–	13	2	0
AP	30	11	19	29	2	1
VT	1	–	1	1	4	0

Only 3 complications were observed: one 1st degree AV block (PR interval = 300 ms) after CA of a postero septal AP, and 2 moderate pericardial effusions with spontaneous resolution. In the 2 recurrent cases a second attempt was successfully performed.

Conclusion: RF CA ablation is effective (total success rate = 98%) and safe for treatment of symptomatic tachycardia in children and teenagers.

P3175 Catheter ablation of atrioventricular tachycardia in congenital heart disease

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Incidence, type and severity of congenital heart disease in patients (pts) suffering from recurrent atrioventricular tachycardia (SVT) were investigated. We report on 20 out of 500 consecutive pts with catheter ablation (RFA) of accessory pathways (AP) (n = 250) or AV nodal tachycardia (AVNRT) (n = 250).

Patients and Methods: 500 consecutive pts (233 female, 267 male, mean age 51 ± 10 y) with paroxysms of SVT were submitted for RFA. Preexcitation syndrome (overt in 180, concealed in 70 pts) or AVNRT (slow-fast in 241, fast-slow in 12 pts) were detected.

Results: Congenital heart disease was revealed in 20/500 pts (4.0%). We detected in 6/250 (2.4%) with AVNRT and 14/250 (5.6%) with preexcitation syndrome coronary veinous malformations (n = 7), Ebstein's anomaly (n = 5), secundum type atrial septal defect, bicuspid aortic valve, persistent left vena cava (n = 2), left transposition of great arteries, premium ASD (10 years after surgical closure) and parachute mitral valve (n = 1). Multiple accessory pathways were found in two pts with Ebstein's anomaly. Decremental accessory conduction was seen in an additional patient with Morbus Ebstein. No patient needed interventional treatment of congenital heart disease. Duration of the procedure ranged between 90 and 300 min, fluoroscopy time was minimal 18, maximal 56 min. 4 pts needed a 2nd, 2 pts a 3rd procedure. The number of RFA deliveries ranged between 1 and 28. One unwanted AV block occurred in AVNRT ablation of the patient late after primum ASD closure. SVT abolishment using RFA was successful in 19/20 pts.

Conclusions: (1.) Congenital heart disease was observed in 4.0% of pts with indication for RFA because of AV SVT. (2.) The incidence of congenital heart disease is higher in pts with accessory pathways than in those with AVNRT. (3.) Repeated RFA sessions, prolonged duration of RFA procedure, fluoroscopy time, number of RFC deliveries and complications (inadvertent AV block) may increase in comparison to pts without congenital heart disease. (4.) The overall success of RFA in this patient group is excellent.

P3176 Radiofrequency catheter ablation in a pre-term infant with permanent drug-refractory tachycardia diagnosed during pregnancy

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In this report, a case of radiofrequency catheter ablation (RFCA) of a left-sided accessory pathway (L-AP) responsible for permanent drug-refractory atrioventricular reentrant tachycardia (p-AVRT) in a preterm infant is described. The tachycardia in absence of organic heart disease was diagnosed at the 24th week of pregnancy by echography that showed also hydrops fetalis. The tachycardia was refractory to antiarrhythmic drugs (ADDs) administered to the mother and a cesarian section was planned at the 30th week of pregnancy; body weight (BW) at birth was 1.91 kg. After 3 weeks, in spite of a full-regimen AAD therapy, the pt had a permanent tachycardia at 280 bpm with an ECG pattern suggesting the diagnosis of AVRT involving a L-AP. After informed consent was obtained from parents and AADs discontinued, the pt was referred for RFCA when the BW was 1.85 kg and a cardiomegaly was evident. During deep sedation, two 5-F deflectable catheters were inserted from each femoral vein. Diagnosis was confirmed and the arrhythmia could be temporarily interrupted with appearance of preexcited QRS during sinus rhythm (SR). The shortest (20 ms) V-A interval was recorded through a patent foramen ovale in the anterior area of the mitral ring and differed from the latest by only 30 ms; in the same area, a suitable unipolar signal was also recorded during SR. Two RF energy pulses (9 & 5 s, 20 & 30 Volts, 150 & 100 Ohms, respectively) interrupted the L-AP; no complication was observed. Fluoroscopy time was 30 min and procedure duration 195 min. Postablation echocardiogram showed no damage to mitral valve and a mild pericardial effusion, not clinically relevant; serial echocardiograms evidenced its spontaneous remission. After 1 year, the pt had no recurrence and the BW is within normal range.

In conclusion: RFCA of potentially life-threatening p-AVRT in a preterm infant is feasible and safe; it requires adequate catheters, accurate mapping and low RF energy.

P3177 Radiofrequency catheter ablation of accessory pathways in young patients: results in children with structural heart disease versus patients with normal cardiac anatomy

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Radiofrequency catheter (RFC) ablation of an accessory pathway (AP) has emerged as an effective and safe procedure in children and adolescents. Data concerning efficacy in children with structural heart disease are lacking.

Since 5/1991 53 young patients (< 16 years) underwent RFC ablation of an AP. 10/53 children had structural heart disease (SHD). Diagnoses included Ebstein's anomaly of the tricuspid valve (n = 3), complex cyanotic heart defects (n = 3), hypertrophic cardiomyopathy (n = 3), and ventricular inversion (n = 1). 43 patients had a normal heart (NL). SHD patients were younger (9.9 ± 5.1 vs. 11.5 ± 4.2 years, n. s.) and had less body weight (34.9 ± 12.4 vs. 42.4 ± 15.4 kg, n. s.). Duration of the procedure (SHD 228 ± 90 min, NL 195.6 ± 112 min) and fluoroscopy time (SHD 45 ± 40.8 min, NL 42 ± 32.4 min) did not differ significantly between the 2 groups. Median number of energy applications was 5 for SHD and 7 for NL. Success rate was 8/10 (80%) for SHD and 40/43 (93%) for NL. During mean follow-up of 23 months, 1/8 (12.5%) SHD patients and 4/40 (10%) NL children had dysrhythmia recurrence. No early or late complications were observed.

RFC ablation of an AP may also be performed as a highly effective and safe procedure in children with structural heart disease.

P3178 Sudden 'arrhythmic' death in young people with apparently normal heart

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The aim of the present study was to assess whether and how often the ultimate diagnosis of structural heart disease underlying sudden cardiac arrest depends on histologic examination of the myocardium and specialized conduction system. Among 231 cases of consecutive sudden cardiac death in young people (≤ 35 yrs), which have been prospectively studied since 1979, in 66 (29%) macroscopic examination failed to show any cardiac cause of sudden death such as obstructive coronary atherosclerosis, congenital coronary anomaly, cardiomyopathy, valve disease and aortic dissection. The macroscopically normal heart group consisted of 45 males and 21 females, aged 4–35 yrs (mean 23.4); 29 patients experienced warning symptoms and signs consisting of syncope in 14, ECG abnormalities in 19, and arrhythmias in 15. None had been diagnosed while alive. Detailed histologic study, including examination of ordinary ventricular myocardium as well as serial sections of specialized conduction system, disclosed: 1) focal myocarditis in 21 patients; 2) conduction system abnormalities leading to heart block in 7 patients (sick sinus syndrome in 1, lipomatous discontinuity between the atrial myocardium and the atrioventricular node in 2, sclerotic interruption of His and bundle branches in 3, and longitudinal dissociation of the His bundle in 1), and to ventricular preexcitation in 15 (atrioventricular bypass fibers in 9, nodoventricular Mahaim fibers in 4, atriofascicular tract in 1, AV nodal hypoplasia in 1); 3) focal fibrous-fatty replacement of the right anterior wall and infundibulum in 7 patients. Sudden death remained unexplained in 16 cases. In conclusion, macroscopic heart features were normal in nearly one third of the young sudden cardiovascular death victims; in 76% of them, however, there was histopathologic evidence of concealed "arrhythmogenic" substrates mostly consisting of conduction system pathology and focal myocarditis.

RIGHT VENTRICULAR CARDIOMYOPATHY

P3179 Bradycardia-dependent right ventricle outflow tract ventricular tachycardia in normal hearts

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Five women (49 ± 10 years) with structurally normal hearts presented non-exercise related ventricular tachycardia (VT). Two cases presented a non-sustained polymorphic VT like Torsade de Pointes in which the morphology of the first VT beat was constantly LBBB with inferior axis. In the remaining three cases the VT's were monomorphic (LBBB-inferior axis), one patient presented sustained and non-sustained episodes and two patients only non-sustained VT's. The VT episodes increased during phases of bradycardia and disappeared during mental and physical stress. The Sinus cycle length preceding the initiation of VT was 1020 ± 35 ms, the QTc interval was less than 0.44 s in all less the two cases with Torsade de Pointes. The coupling interval of the first VT beat was constant for each patient (422 ± 41 ms). Atrial and ventricular pacing at baseline and after isoproterenol infusion failed to induced VT. Propranolol favored the appearance, or induction of VT with single extra-stimulus (SE) delivered during sinus rhythm by producing a short long short sequence. VT also appeared after the first sinus beats following the poststimulation pause during atrial and ventricular pacing. Endocardial mapping located the VT origin the RVOT, the earliest electrogram preceded the VT-QRS complex by 30 ± 5 ms, no Purkinje-like electrograms were found. RDF ablation was successfully performed in all cases.

We conclude: 1.- Some VT originating in the RVOT in patients with structurally normal hearts might be facilitated by bradycardia rather than tachycardia. 2.- In some cases Torsades de Pointes can be initiated by extrasystoles bradycardia dependent originated in the RVOT.

P3180 Idiopathic but symptomatic right ventricular premature beats: cure by radiofrequency catheter ablation

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Although the long term prognosis of patients (pts) with idiopathic right ventricular (RV) premature complexes (PVCs) is good, some pts are still highly symptomatic despite adequate medical therapy (MT). In 7 pts, 2 males and 5 females, mean age 47.6 ± 14 years, suffering from palpitations related to PVCs for at least 3 years, and uncontrolled by MT, radiofrequency (RF) catheter ablation (CA) of the ventricular focus was attempted. In all cases, surface ECGs were normal except monomorphic PVCs (isolated, couplets, triplets) of left bundle branch block pattern, and of vertical axis. During exercise test (ET) PVCs disappeared, and spontaneous ventricular tachycardia (VT) was never observed in any case. Signal-average ECG did not meet any criteria for ventricular late potential. During electrophysiologic study, sustained VT was induced in only 1 pt after isoproterenol infusion. Echocardiography, right and left ventricular angiography and coronarography were normal.

Both PVC mapping (earliest depolarization) and pace-mapping were used to select the ablation site which was, in the 7 cases, located on the anterior wall of the RV outflow tract (OT), just below the pulmonary annulus. In all cases spontaneous PVCs and inducible VT were eliminated. The number of RF pulses (15 to 30 w; up to 90 s) was from 1 to 11. The procedure duration ranged from 45 to 105 minutes and the fluoroscopy time from 8 to 41 minutes. Transient acute pericarditis without pericardial effusion occurred in 1 pt after the procedure. At follow-up (3 to 15 months), the 7 pts were symptom free without any MT, and no PVCs were documented (24 hours Holter recording, ET).

In symptomatic pts with benign idiopathic PVCs originating in RVOT and uncontrolled by MT, RF CA seems to be an effective and safe therapy.

P3181 Ventricular arrhythmias from right ventricle: evidence of adipose replacement by nuclear magnetic resonance

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The more frequent clinical entities producing a left bundle branch block morphology, right ventricle (RV) arising arrhythmias are: Arrhythmogenic Right Ventricle Displasia (ARVD), RV Outflow tract Tachycardias (RVOT) and repetitive, monomorphic Infundibular Premature Ventricular Beats (IVBP). The anatomopathological (AP) substrate for ARVD is well known but it is not so well for RVOT and IVPB. To evaluate the differences in the AP substrate of these 3 arrhythmias we studied 36 patients (pts) divided, as above, into 3 groups: *A (ARVD):* 17 pts (12 males, 5 females), mean aged 42 years (range 13–66 y), *B (RVOT):* 16 pts (6 males, 10 females), mean aged 43 years (range 10–66 y), *C (IVPB):* 13 pts (10 males, 3 females), mean aged 28 years (range 16–59 y) All the pts had a clinical evaluation with non-invasive tests (invasive electrophysiologic study was performed in all the pts with sustained ventricular tachycardias), and Nuclear Magnetic Resonance (NMR) by a 0.2 Tesla permanent ESATOM PM 4000, acquiring images through a spin-echo and cine NMR. When examining NMR we principally look for adipose replacement (AR) in right ventricle wall and for right ventricle wall motion abnormalities (bulges). 88% of group A pts showed AR in at least three different RV regions (35% four regions) and in 11 pts (64%) a large bulge was detected. In the group B only 6% of pts demonstrated AR in 3 RV regions, 31% of pts in 2 RV region and the majority of pts (57%) in only 1 region; 6% had no region interested by AR. The group C pts showed in quite similar percentage AR in none (39%) or only 1 (46%) RV region; only 15% show AR involving 2 RV regions. Bulges could not be detected in pts of both group B and C, except 1 pt (gr B). We think that these results may confirm that RV AR is the AP substrate in all the RV arrhythmias we studied. We want to stress that in the presence of ARVD the AR is largely interesting 3 or more regions of RV and is always associated with bulges; in RVOTs and IVPBs the AR is quite focal, generally in RV infundibulum or RV apex, without diskinesias. Up to day we think that these 3 clinical entities are different each other, despite their comune AR in RV and more clinical evaluation are needed to strongly bring out their clinical and AP differences.