values between not inducible MD1 and VANH patients (-2.28±1.57% and -2.91±1.8% respectively, p<NS), while a difference was observed between inducible MD1 and VANH patients (2.32±4% and -2.9±1.8% respectively, p<0.001).

Conclusions: our data suggest a dysfunction of the nervous autonomic system, assessed by HRV analysis, in MD1 respect to VANH patients, more evident in inducible MD1 patients. Therefore TO seems an useful non invasive risk predictor of sustained ventricular arrhythmias induced at EPS in MD1 patients.

Conclusions: our data suggest a dysfunction of the nervous autonomic system, assessed by HRV analysis, in MD1 respect to VANH patients, more evident in inducible MD1 patients. Therefore TO seems an useful non invasive risk predictor of sustained ventricular arrhythmias induced at EPS in MD1 patients.

Pulmonary vein ablation and complications: how to avoid?

279
Regression of phrenic nerve injury after AF ablation
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Background: phrenic nerve injury (PNI) is a well known complication of cardiac surgery. It has also been reported after Wolff-Parkinson-White and inappropriate sinus tachycardia ablation and one case report has recently been published after atrial fibrillation (AF) ablation.

Methods and results: between 1997 to 2004, 10 patients (5 M, 52±10 yrs) in 4 centres had PNI (8 right, 2 left) after AF ablation. 6 had paroxysmal AF and 4 permanent AF: AF ablation consisted in pulmonary vein isolation alone in 6 cases, associated with line(s) in 4 cases. None had superior vena cava disconnection.

Maximum power setting was 40 W using an irrigated-tip catheter. Right PNI occurred during RSPV ablation whereas the two left ones occurred during ablation near the left appendage root. Immediate symptoms were diaphragmatic stimulation, hiccup or sudden diaphragmatic elevation.

Nevertheless, diagnosis was only made after ablation in 6 patients with a complaint of dyspnoea. After 26±34 months, 5 patients (50%) have a complaint of dyspnoea. After 26±34 months, 5 patients (50%) have a complaint of dyspnoea. After 26±34 months, 5 patients (50%) have a complaint of dyspnoea. After 26±34 months, 5 patients (50%) have a complaint of dyspnoea. After 26±34 months, 5 patients (50%) have a complaint of dyspnoea. After 26±34 months, 5 patients (50%) have a complaint of dyspnoea.

Conclusions: in this multi-centre experience, PNI is a rare complication of AF ablation. Nevertheless physicians need to be aware of this complication because the diagnosis is often delayed and when diagnosis is made during RF delivery, the early interruption of RF may improve the outcome.

Pulmonary vein stenosis after ostial cryoisolation in patients with atrial fibrillation?
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Purpose: pulmonary vein (PV) isolation with radiofrequency current (RF) as ablation source results in stenoses or occlusions in about 5% of patients (p) treated for paroxysmal atrial fibrillation (AF). On the contrary, the lesions created by cryoablation are more homogeneus with the vascular architecture, particularly the intimal layer, remaining intact.

The aim of this study was the assessment of PV anatomy after circumferential, single cryoimpulse (CI) isolation, or a combined technique regarding the development of PV stenoses. In all p magnetic resonance angiography with gadolinium was performed before and every 3 months (mo) after cryoablation.

Methods and results: 52 p, 14 women, mean age 58±9 years, mean AF duration of 80±65 mo, 42 p with paroxysmal, 10 with persistent AF of, 9 with CAF, 13 with hypertension, 30 with idiopathic AF refractory to antiarrhythmic therapy, mean left atrium diameter 44±7 mm, were treated with the Arctic Circle (AC) alone or with a 6-mm cryotip catheter (Freezer xtra) or combined in order to close the ostial gaps. In 13 p the cryo procedure was a redo, in 10 p after Freezer xtra, and in 3 p after RF 10 p had a single procedure with segmental ostial cryoisolation with Freezer xtra, 29 p were treated with the AC as a first intervention. The mean burden of segmental or circumferential CI and of RF impulses was not significantly different (table). The mean follow-up period after primary 6-mm tip isolation, after 6-mm tip and following circumferential isolation with AC and after AC ablation as a first intervention were 18±1 mo, 14±2 mo and 11±3 mo, respectively. Even with this marked burden of CI, no PV stenoses or narrowing could be detected during serial follow-up.

Cumulative burden of impulses per vein

<table>
<thead>
<tr>
<th>Targeted veins (n)</th>
<th>Targeted veins (n)</th>
<th>Targeted veins (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arctic Circle</td>
<td>Freezer xtra</td>
<td>RF</td>
</tr>
<tr>
<td>Left upper</td>
<td>37 6:5 (2-12)</td>
<td>42 12:9 (4-11)</td>
</tr>
<tr>
<td>Left lower</td>
<td>27 4:2 (1-9)</td>
<td>37 8:5 (4-13)</td>
</tr>
<tr>
<td>Right upper</td>
<td>35 5:3 (1-12)</td>
<td>42 9:6 (2-25)</td>
</tr>
<tr>
<td>Right lower</td>
<td>33 4:1 (2-8)</td>
<td>30 7:6 (1-28)</td>
</tr>
</tbody>
</table>

Conclusions: circumferential and single pulse cryoablation of the PV is safe. Neither acute stenoses, shrinking nor proliferative structural remodeling were observed during long-term follow-up of cryoablation of the PV.

281
Incidence of asymptomatic pulmonary vein stenosis in atrial fibrillation ablation. Segmental ostial ablation versus pulmonary veins encircling
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Purpose: segmental Ostial Ablation (SOA) and Pulmonary Veins Encircling (PVE) have demonstrated efficacy in atrial fibrillation (AF) treatment. Pulmonary vein (PV) stenosis is an important complication of the AF ablation and could be underestimated if their assessment is not systematically done. In this study we compare the real incidence of PV stenosis in patients (pts) submitted to both SOA and PVE procedures with Magnetic Resonance Angiography (MRA).

Methods: drug-refractory AF pts with focal activity (determined by frequent and sustained atrial tachycardia runs in Holter recording) and normal left atrial size (determined by transhoracic echocardiography) were submitted to SOA, rest of the pts were submitted to PVE. SOA was performed with a temperature limit of 50°C and 45W maximal output power, and PVE at 60°C 55W limits. In SOA procedures, only PVs with electrical activity were treated. MRA was routinely performed 3 months after the ablation procedure. PV stenosis was defined as >70% of lumen narrowing.

Results: we included 63 consecutive pts, they were 77.8% men, 74.1% with paroxysmal AF, mean age of 50.7±10.9 years, 28.6% with structural heart disease and mean left atrial diameter of 39.5±5.3 mm (ranged...
from 30 to 51 mm). Thirty pts were submitted to SOA and 33 pts were submitted to PVE with similar effectiveness results (73.3% vs 81.8% arrhythmia free; p=NS). In SOA group, a mean of 1.8±0.7 PVs were treated per pt: 86.7%, 69%, 16.7% and 3.3% of the Left Superior PV (LSPV), Right Superior PV (RSPV), Left Inferior (LIPV) and Right Inferior PV (RIPV) were treated. Six pts with PV stenosis were detected, all in SOA group none in PVE (20% vs 0% of pts; p= 0.009): 4 with LSPV stenosis, 1 with LIPV stenosis and 1 with both LSPV and LIPV stenosis. Therefore, 19.2% of the treated LSPV and 40% of the treated LIPV developed stenosis. No differences in pt characteristics or procedural details were found between pts with and without PV stenosis in SOA group. All of them remained asymptomatic for a 10,5±4.2 months follow-up and PV stenosis was detected by MRA routinely performed.

Conclusions: PV stenosis is a potential complication of SOA, specially in left sided PVs, not observed in PVE. MRA is useful to detect PV stenosis.

282 Recognition of phrenic nerve location for ablation at right pulmonary vein and superior vena cava
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Purpose: Recognition of the phrenic nerve (PhN) course is helpful for avoiding complications during ablation. We evaluated the PhN route along the heart using electro-anatomical mapping (EAM).

Methods: In 18 patients with atrial fibrillation (AF) undergoing pulmonary vein (PV) isolation, EAM of superior vena cava (SVC), right and left atria, and right pulmonary veins (PVs) was reconstructed using a CARTO system during sinus rhythm. The location of the PhN adjacent to the heart was defined as the site twitching of the diaphragm with shifting of the oesophageal location.

Results: The PhN began at the upper limit and anterior aspect of the SVC and twisted down to the posterior aspect of the right atrium near the sinus node in 14 patients (78%), or it was located at the postero-lateral aspect of whole SVC in 4 patients (22%). In most cases (89%), the PhN could be captured at the anterior aspect of the right superior PV (RSPV) which was 8.1±3 mm inside RSPV ostium, whereas it could not be captured from the right inferior PV in any patients or from the lower right atrium in 11 patients (61%).

Conclusions: A careful decision on ablation sites located at the anterior aspect of the RSPV as well as RA-SVC junction may be required to avoid PhN injury.

283 Oesophageal Tagging: a new method to prevent oesophagus perforation during AF ablation
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Background: invasive therapy is increasingly used to treat patients with highly symptomatic AF. Given the need for more continuous and trans-mural ablation lines at the posterior left atrium (LA) the life threatening complication of oesophageal perforation, well known from surgical approaches, has been increasingly reported with catheter interventional approaches as well. The present study analyzed a new method visualizing the left atrial-oesophageal relationship during ablation within the electroanatomical LA reconstruction.

Methods: 80 pts. with AF received a LA ablation using CARTO for placement of circumferential lines around left and right PVs and linear lines connecting left and right PVs as well as left PVs and mitral annulus. Following LA reconstruction the oesophagus was tagged by introducing and withdrawing a CARTO catheter within a conventional gastric tube. Course and contact of the oesophagus in relation to LA was prospectively studied and validated against the respective CT scans. In 10 pts. the oesophagus was re-tagged 4 times during ablation, in order to account for possible peristaltic, breath depending or cardiac related shifting of the oesophageal location.

Results: the oesophageal course and contact showed a remarkable interindividual variation. 16% of the pts. had a location of the oesophagus directly at the funnel of the left PVs. In 50% of the pts, the oesophagus was situated in the midportion of the LA. The remaining pts. had an oesophagus positioned at the posterior LA towards the left PVs (26%) and towards the right PVs (8%). In all pts. the oesophagus had contact to the mid and inferior part of the LA. Visualisation of the oesophagus resulted in an adjustment of the left encircling line in 42% of pts., the right encircling line in 8% of pts. and the PV connecting line in 100% of pts. Validation of the CARTO tag against the CT scans revealed 88% concordance of oesophageal course and 80% concordance of oesophageal contact. Re-tagging of the oesophagus during the same ablation showed a very stable left atrial-oesophageal relationship without any sidewards shift.

Conclusions: tagging of the oesophagus is a reliable method to visualize the left atrial-oesophageal relationship during AF ablation in order to prevent oesophagus perforation. The variable interindividual location underlines the need for such an visualization.

284 Where is the esophagus? Anatomical implications for ablation of atrial fibrillation
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Background: atrio-esophageal fistula have been reported as rare but life-threatening complications of ablation of atrial fibrillation (AF). Therefore, the position of the esophagus in relation to the left atrium is of major importance for AF ablation.

Methods and results: in order to investigate the possible anatomic variability between the esophagus and the left atrium, multidetector-row spiral computed tomography (MDCT) of 60 healthy males (age 58±5.1 years; LA diameters 5.5±0.7 x 3.8±0.6 mm; LA volume 61.5±15.6 ml) were analyzed. The distance between the esophagus and the ostia of the pulmonary veins (PV) ranged between 0.0 and 50.7 mm (table). Especially for left PV the esophagus was closer than 5 mm to the ostia in 29 cases (48%; n=24 for left superior PV; n=10 for left inferior PV;

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