Catheter ablation of focal atrial tachycardia in pediatric patients: A ten year single centre experience using modern mapping systems

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Introduction
Focal atrial tachycardia (FAT) is a relatively common cause of chronic supraventricular tachycardia (SVT) in children and adults. However, experience of catheter ablation of FAT in pediatric patients is still limited and data have mainly been gathered prior to the introduction of modern 3D mapping and navigation systems into clinical routine. In these studies, conventional catheter ablation of FAT was associated with relatively low success rates and long fluoroscopy times in comparison to ablation of accessory pathways and atroventricular reentrant tachycardia. Aim of our study was to present clinical and electrophysiological details of patients with FAT who underwent catheter ablation for FAT using different modern mapping or navigation systems.

Patients and Methods
We retrospectively reviewed 17 consecutive patients and young adults (Table 1) who underwent electrophysiological studies (EPS) for FAT between March 2003 and April 2013.

Table 1: Patients characteristics:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
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<tr>
<td>Median Age</td>
<td>15 (4-30) years</td>
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<tr>
<td>Mean Body Weight</td>
<td>47.5±17.8 [16-72.5] kg</td>
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<tr>
<td>Gender</td>
<td>Female n=9; Male n=8</td>
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Indications for EPS
- SVT n=9
- Permanent FAT n=4
- Tachycardia-induced cardiomyopathy n=3
- Side effects of antiarrhythmic medication n=1

Electrophysiological study and ablation procedure
All patients underwent EPS according to standard protocol. Prior to EPS, P-wave morphology was analyzed to infer type of SVT and origin of FAT, respectively (Figure 1). For reconstruction of endocardial anatomy, optimal control of catheter positions, analyzing activation and marking ablation sites the Navx® system (St. Jude Medical, St Paul, MN, USA) (n=7) or the non-contact mapping system (EnSite®, St. Jude Medical, St Paul, MN, USA) (n=6) were utilized when FAT was suspected prior to EPS (Figure 2). In the remaining patients, when AVNRT or AP was initially assumed, the Loca Lisa® system (Medtronic, Minneapolis, MN, USA) was used. Cryoablation was performed in selected patients with foci close to the AV node, in all other patients radiofrequency (RF) was the primary energy source.

Results
General observations
In 16 patients a total number of 19 atrial foci (13 right- and 6 left-sided) could be targeted during EPS. In the remaining patient FAT was not inducible. Acute success was achieved in 14/16 patients (87.5%) with a median number of 9 [1-31] RF and cryoablation lesions. Ablation was unsuccessful due to an epicardial location of a right atrial focus in one patient and due to the proximity of a focus to the HIS bundle in the remaining patient with cryoablation resulting in transient second-degree atrioventricular block. See Figure 3 for details on localization of foci and outcome of ablation lesions.

Procedural data
Mean procedure time was 210.4±78.1 minutes including a 30-minute waiting period, mean fluoroscopy time was 12.6±4.9 minutes.

Follow-up
After a mean follow-up of 44.3±30.8 months 4/14 patients (28.6 %) had recurrent FAT. Of these 4 patients 2 underwent repeated EPS with successful RF ablation and no recurrence on three months and 72 month follow-up, respectively. Overall, ultimate success was achieved in 12/16 patients (75 %) who received ablative treatment.

Conclusions
Compared to standard mapping, 3D non-fluoroscopic approach for pediatric FAT resulted in improved success rates and significantly reduced fluoroscopy times. 3D mapping and RF ablation provided improved clinical quality of care, therefore, this approach should be considered early in the course of treatment of this tachyarrhythmia.