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Mapping and ablation of complex left atrial tachycardia using an automated high resolution mapping algorithm

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Background: Precise activation mapping of complex left atrial tachycardia (LAT) to identify a critical isthmus (CI) as target for successful ablation is challenging. We evaluated the feasibility and utility of a new automated LAT mapping algorithm (NavX Precision® Automap) to identify the CI in patients with LAT.

Method and results: In 20 patients that underwent LAT ablation, 3D Mapping was performed using a 14 pole spiral catheter (Orbiter PV, Boston Scientific) and the NavX Precision® Automap LAT mapping algorithm. We identified a focal/local (n=11) or a macro re-entry (n=9) as tachycardia mechanism. Activation and voltage mapping as well as analysis of propagation maps were used to identify critical sites of AT initiation and perpetuation. The target region was chosen based only on acquired LAT and propagation maps without further conventional mapping strategies (such as entrainment). In 17/20 of ATs (85%), AT termination occurred directly with ablation at identified critical sites. Mean AT mapping time was 509±147.8 seconds, mean number of mapping points was 1129.4±749.9. Total radiofrequency application time was 29.5±19.6 minutes; total procedure time was 112.3±39.7 minutes, fluoroscopy dose was 404.2±673 cGy cm^2. No complications occurred.

Conclusion: The automated NavX Precision Automap LAT mapping algorithm precisely identified a majority of LAT circuits in patients undergoing LAT ablation. The algorithm provided a fast and safe tool contributing to a better understanding of the AT mechanism without the need of entrainment with the risk of AT termination or degeneration.

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Long-term clinical outcome of repetitive activation pattern identification and ablation in persistent atrial fibrillation patients

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Background/Introduction: A novel mapping system has been developed to facilitate identification of repetitive activation patterns (RAPs) or focal impulses (FIs) for persistent AF (PsAF) ablation.

Purpose: To assess if accurate identification of ablation targets using this novel mapping system leads to successful acute AF termination and long-term freedom from AF recurrences in PsAF patients.

Methods: This prospective, multicenter (4 sites) feasibility study enrolled PsAF patients with follow-up at 3, 6, and 12 M. The novel mapping system was used to identify RAPs/FIs was performed using a 64-pole multielectrode basket catheter. RAPs/FIs were ablated to achieve normal sinus rhythm (SR) or organized atrial tachycardia (AT), followed by standard pulmonary vein isolation (PVI) and/or other ablations. Patients without SR at the end of the procedure were cardioverted. Twelve-month effectiveness was evaluated via freedom from documented AF recurrence.

Results: The study enrolled 70 patients (age, 60.8±8.9 y; 77.1% men; LA diameter, 46.3±5.0 mm; median [IQR] symptomatic PsAF duration, 6.0 [3.0–10.0] months), of whom 64 underwent guided ablation using the novel mapping system and comprised the safety and effectiveness cohort. The mean±SD number of RAPs/FIs identified per patient was 7±4.5 (n=64), of which 98.7% were ablated. Acute success (SR/organized AT) was achieved in 40.6% (26/64) patients after overall ablation procedure (prior to cardioversion). By Kaplan-Meier analysis, 12-M documented freedom from all AF and symptomatic AF was 66.7% (95% CI 55.5–77.9) and 79.3% (95% CI 69.4–89.2), respectively. Patients with acute success had higher 12-M freedom from documented AF (80.4% vs 57.4%, p=0.018). Six primary AEs were reported (9.4%) in 6 patients: groin hematoma (2), complete heart block (1), pericardial effusion causing tamponade (1), pericarditis (1), and pseudoaneurysm (1).

Conclusion(s): Our results demonstrate feasibility of the novel mapping system for global activation mapping during PsAF ablation, with acceptable safety and good 12-M success. Patients with acute success have significantly lower 12-M AF recurrence rates.

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Renal function stratification and outcomes following catheter ablation of patients with atrial fibrillation

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Background: Chronic kidney disease (CKD) has been associated with incident atrial fibrillation (AF) and its arrhythmia outcome, but data from Asian cohorts are limited.

Purpose: To investigate the association of CKD and the arrhythmia outcome of AF ablation.

Methods: We studied 1410 consecutive patients (mean age 57.2±11.6 years; 68% male) with non-valvular AF undergoing radiofrequency (RF) or cryoballoon ablation. The relationships of AF recurrence post catheter ablation (CA) with categories of CKD (normal: estimated glomerular filtration rate (eGFR) ≥90 ml/min/1.73m^2, mild CKD: eGFR 60–89 ml/min/1.73m^2, moderate CKD: eGFR 45–59 ml/min/1.73m^2 and severe CKD <45 ml/min/1.73m^2) were analyzed.

Results: During a mean follow up of 20.7±8.8 months, 18.6% with paroxysmal AF (PAF) and 50.2% with non-paroxysmal AF (NPAF) had AF recurrence. On multivariate analysis, eGFR (HR 0.97, CI 0.96–0.97) was an independent risk factor for AF recurrence, with a good predictive value (Area Under the Curve, AUC 0.74; 95% CI 0.72–0.77. P<0.01). A cut-off value of eGFR for AF recurrence was 82.5 ml/min/1.73m^2. In relation to CKD categories, AF recurrences were 11.5%, 29.3%, 72% and 93.3%, respectively. Compared to the normal eGFR group, there were a stepwise increased risk of AF recurrence with mild (HR 3.30, CI 2.55–4.26, P<0.01), moderate (HR 9.43, CI 6.76–13.16, P<0.01) and severe (HR 12.35, CI 6.93–21.99, P<0.01) CKD.

AF recurrent risk and CKD categories

CKD Categories	Estimated GFR (ml/min/1.73m^2)	Adjusted HR (95% CI)	P value
Normal*	≥90	1.00	–
Mild	60–89	3.30 (2.55–4.26)	<0.01
Moderate	45–59	9.43 (6.70–13.16)	<0.01
Severe	<45	12.35 (6.93–21.99)	<0.01

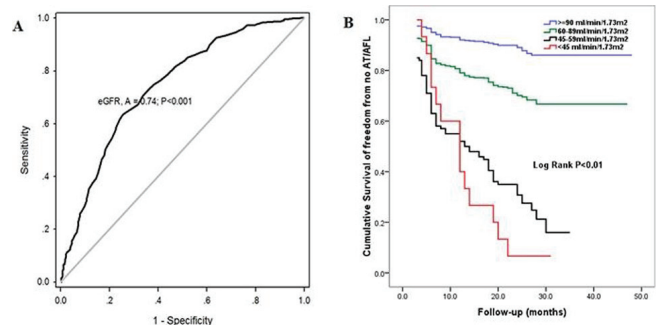*Reference group. GFR, glumerular filtration rate; HR, hazard ratio; CI, confidence interval.

Figure A shows the area under curve of estimated glomerular filtration rate for predicting AF recurrence post catheter ablation; B demonstrates Kaplan-Meier curves of four CKD categories free from AT/AFL post catheter ablation.

Conclusion: In a large cohort of Asian patients with AF, renal dysfunction increased the risk of AF recurrence post CA. AF recurrence gradually increased with worsening kidney function in this cohort.

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Long term outcomes of catheter ablation of atrial fibrillation in very young adults

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Background: Catheter ablation (CA) is a major therapeutic cornerstone in the management of patients with symptomatic atrial fibrillation (AF). However, outcome data in very young adults are still limited.

Purpose: We sought to assess safety and long-term outcomes in patients under 40 years old undergoing CA for AF.

Methods: In this prospective registry, consecutive patients under 40 years old underwent their first CA at our center. A challenge test with high-dose isoproterenol infusion (20–30 μg/min for 10–15 min) was performed at the end of each procedure to check for pulmonary vein (PV) reconnection and induce latent non-PV triggers. The end-point was freedom from atrial arrhythmia recurrence (AF, atrial flutter, or atrial tachycardia >30 s duration) following a period of 12-weeks which was assumed as blanking period. Clinical evaluation, 12-lead electrocardiogram and 7-day Holter monitoring were carried out at each follow-up visit scheduled at 3, 6, 9, 12 months after each procedure and then every 6 months. Additionally, all patients received an event recorder for the first 5 months following the procedure and were asked to record any symptomatic event or make 2–3 recordings per day on 3–4 days per week to detect any asymptomatic episode of AF.