FELLOWS CORNER

Catheter ablation for persistent atrial fibrillation in a patient with extensive lipomatous hypertrophy of the atrial septum: 3D electroanatomic mapping for ideal procedure planning and performance in abnormal atrial anatomy

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We report the case of a 78-year-old woman presenting for radiofrequency catheter ablation (RFA) for persistent atrial fibrillation (AF). Routine preprocedural computed tomography (CT) angiography (Somatom Definition Flash; Siemens AG, Erlangen, Germany) of the left atrial (LA) anatomy was performed to visualize pulmonary veins and exclude the LA thrombus, incidentally revealing a large lipomatous tumor (approximately 5.9 × 4.3 × 2.1 cm) extending from the superior to the inferior vena cava, covering almost the entire interatrial septum and separating both atria by more than 3 cm. As the tumor was not encapsulated, lipomatous hypertrophy of the atrial septum (LHIAS) was diagnosed. Because the tumor neither impaired hemodynamics nor compressed the surrounding vascular structures, the patient was scheduled for RFA. Using the EnSite X mapping system together with the HD Grid mapping catheter (Abbott Medical, Minneapolis, MN), a 3-dimensional map of the right atrium (RA) was created and matched with the CT data for this challenging septal anatomy (Figure 1A, 1B). Despite this tumor-associated deformation of the RA septum, a fluoroscopy and LA pressure–guided single transseptal puncture (TSP) with double access to the LA was successfully performed (Figure 1C–1F), as previously described.[1,2] Circumferential pulmonary vein isolation at an antral level, omnipolar technology–guided focal ablation of complex fractionated atrial electrograms, and an anterior line were performed, leading to intraprocedural AF termination. The procedure time was 167 minutes (fluoroscopy time: 8 minutes, dose area product: 232 cGy·cm^2, radiofrequency time: 29 minutes). No AF recurrence was observed after 4-month follow-up.

WHAT WE LEARNED FROM THIS CASE

- Preprocedural imaging is useful in detecting abnormal anatomy and when combined with 3-dimensional (3D) cardiac electroanatomic imaging allows ideal procedure planning and successful ablation. This 3D visualization of biatrial anatomy offers a helpful approach to guide transseptal puncture (TSP) in abnormal anatomy in which a usual pulldown maneuver of the needle from the superior vena cava into the fossa ovalis guided by fluoroscopy alone might result in complication or inability to complete the procedure.
- This especially accounts for centers in which intracardiac echocardiography– and transesophageal echocardiography–guided TSP is not routinely available.
- Usage of 3D electroanatomical maps is feasible and safe for TSP, decreasing radiation exposure and the need for transesophageal echocardiography/intracardiac echocardiography without relevant additional efforts.

LHIAS is more frequent in patients with advanced age, atrial arrhythmias, and obesity.[3] Although usually a benign lesion, LHIAS can induce superior vena cava obstruction, altered P-wave configuration, AF, multifocal atrial tachycardia, premature atrial contractions, and atrioventricular block.[4-8] Postulated mechanisms for cardiac arrhythmias include conducting pathway defects and myocardial fibrosis from fat deposition.[3]

For symptomatic patients only, resection is the recommended option.[3] LHIAS was found to interfere with TSP by impairing maneuverability of catheters and devices

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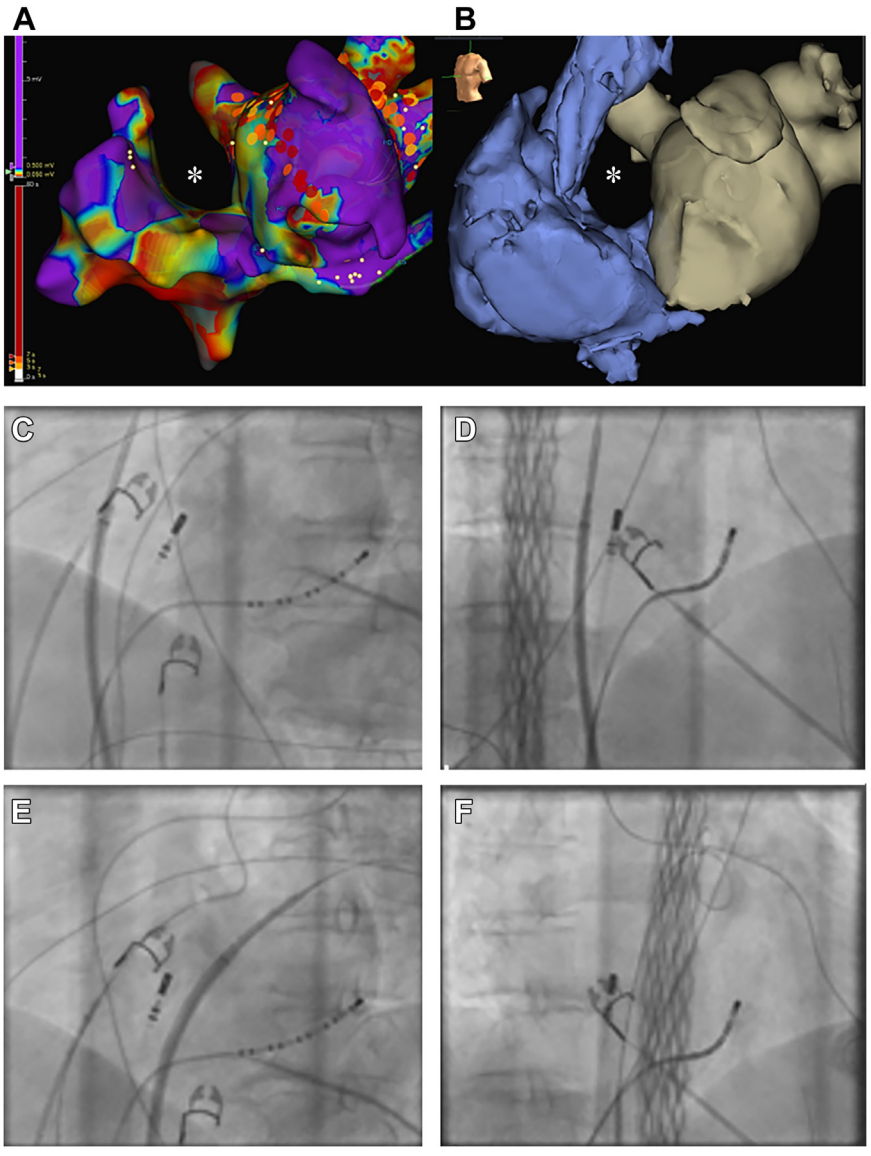

Figure 1 Left anterior oblique (LAO) view in NavX EnSite X: 3-dimensional (3D) map of right atrium (RA) and left atrium (LA) created during atrial fibrillation and matched with the 3D anatomy gained from computed tomography data. **A:** Voltage map (voltage scale 0.05–0.5 mV). **B:** Corresponding segmentation of computed tomography data. **C–F:** LA pressure and fluoroscopy-guided transseptal puncture (TSP): an octopolar mapping catheter (Bard Electrophysiology EP XT) placed into the coronary sinus. The 3D electroanatomic map of the RA combined with biatrial computed tomography scan segmentation allowed placement of a standard quadrupolar ablation catheter (Flexability) into the supposed area of the fossa ovalis to mark desired location of TSP. LAO 45° fluoroscopic view **(C)** and right anterior oblique (RAO) 38° fluoroscopic view **(D)**, both ahead of the pulldown maneuver of the TSP needle from the superior vena cava into the fossa ovalis. The aorta and coronary sinus catheter and spine served as anterior and posterior landmarks, respectively. The TSP needle, dilatator, and deflectable 8.5 (inner/11.7F outer diameter) sheath (Agilis) were then advanced into the LA. Fluoroscopic view after TSP from LAO **(E)** and RAO **(F)** views: the guidewire was placed into left superior pulmonary vein and the sheath (Agilis) was then pulled back into RA. The ablation catheter (Flexability) was placed into LA via single TSP following the guidewire.[1,2]

traversing the thickened area, causing the needle to enter the epicardial space and provoke pericardial effusions,[9] and failure of TSP caused cessation of a planned cryoablation in a 73-year old woman.[8] These problems could be overcome by careful preprocedural imaging and—if available—procedural intracardiac echocardiography (ICE).[9] ICE and transesophageal echocardiography can be used to detect septal abnormalities and cardiac tumors.[9] Nevertheless, in experienced centers, TSP is considered safe under fluoroscopy and pressure monitoring without routine use of the rather expensive and not broadly available transesophageal echocardiography and ICE.[10] Usage of 3D electroanatomical maps allows anatomic visualization with high level of accuracy and is feasible and safe for TSP, decreasing radiation exposure and the need for transesophageal echocardiography/intracardiac echocardiography.[11-13]

In this challenging septal condition of large LHIAS, preprocedural 3-dimensional segmentation of CT datasets combined with advanced 3-dimensional electroanatomic mapping using NavX EnSite X system allowed successful TSP and RFA.

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