Intracardiac Echo Imaging Guided Ablation of Cavotricuspid Isthmus-dependent Atrial Flutter

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ABSTRACT. Cavotricuspid isthmus-dependent atrial flutter is an arrhythmia that is frequently encountered in the electrophysiology laboratory, and can be successfully ablated with conventional mapping and ablation techniques. In difficult cases, use of intracardiac echo imaging can be invaluable in guiding the ablation. We report a case of common right atrial flutter that was ablated successfully using real-time intracardiac echo imaging.

KEYWORDS. right atrial flutter, intra cardiac echo imaging.

A 78-year-old man with a history of pulmonary fibrosis and persistent atrial flutter was referred to the electrophysiology laboratory for elective radiofrequency ablation of the arrhythmia. He presented with fatigue, exertional dyspnea, and severe global left ventricular dysfunction with an ejection fraction of 20% documented by echocardiography. Surface electrocardiogram (ECG) leads showed flutter wave morphology consistent with typical right atrial flutter.

Atrial flutter ablation was performed under conscious sedation with intravenous midazolam and fentanyl. The patient was adequately anti coagulated with warfarin, and a therapeutic INR of 2.4 was recorded on the day of the procedure. A multipolar catheter (Biosense Webster Ismus Catheter, Diamond Bar, CA) was placed in the right atrial isthmus, with the distal electrodes in the proximal coronary sinus. A 3.5-mm irrigated tip ablation catheter (Biosense Webster Thermocool SF) was advanced into the right atrium through a long SL-1 sheath. The baseline rhythm was atrial flutter at a cycle length of 247 ms. Activation and entrainment mapping with the Carto system confirmed the diagnosis of cavotricuspid isthmus (CTI)-dependent atrial flutter. Isthmus ablation at a power setting of 30–40 W was performed with no significant change in the cycle length of the tachycardia.

At this point, a long 11F sheath was introduced into the left common femoral vein. A 10F intracardiac echo (ICE) catheter (Siemens Accunav) was advanced into the right atrium. Imaging revealed a thick, prominent eustachian ridge (Figure 1). Ablation on the ridge itself and the CTI with ICE imaging to verify catheter tissue contact (Figure 2) once again had no significant effect on the tachycardia. The ablation catheter was then curved tightly and maneuvered into the recess at the floor of the Eustachian ridge (Figures 3 and 4). The electrograms recorded at this site are shown in Figure 5. Ablation at this site with gradual pull back of the catheter under continuous ICE imaging slowed and subsequently terminated the tachycardia (Figure 6). Bidirectional isthmus block was then confirmed using standard pacing criteria.

ICE imaging to guide catheter ablation of arrhythmias, although well established, is under-utilized. In difficult cases, ICE imaging is ideally suited for evaluating the anatomy of the targeted cardiac region, verifying catheter tissue contact during RF energy delivery, monitoring potential ablation related complications and minimizing radiation exposure to both patient and the operator. Right atrial isthmus ablation, guided by three-dimensional (3D) transesophageal echo, and 3D ICE imaging have been reported previously. These reports demonstrate the clinical utility of real time imaging with significant reductions in fluoroscopy and procedure times. Direct visualization of the anatomical characteristics of the CTI improved the ability to achieve isthmus block in “ablation-resistant” cases. Undoubtedly, cost considerations limit the routine use of advanced imaging in most laboratories. In selected “difficult to terminate” atrial flutter or “can’t
Figure 1: Intracardiac echo view of the right atrial isthmus region showing a prominent eustachian ridge with the ablation catheter at the tricuspid valve annulus.
Figure 2: Ablation catheter on the eustachian ridge.
Figure 3: Ablation catheter flexed and at the floor of the eustachian ridge.
Figure 4: Intra cardiac echo view of irrigated radiofrequency energy delivery at the floor of the prominent eustachian ridge.
Figure 5: Electrograms recorded on the distal ablation electrode from the floor of the Eustachian ridge.
achieve” isthmus block cases, ICE imaging is certainly helpful as exemplified by our case report.

References

Figure 6: Termination of atrial flutter with radiofrequency energy delivery at the floor of the eustachian ridge.