Interatrial Conduction Block in a patient with Mitral Annular Flutter and Atrial Fibrillation: Implications of underestimating the true AF burden in patients with implantable Devices

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ABSTRACT. This is a case report of a patient with complex atrial arrhythmias and an implantable pacemaker. During mapping of the atrial flutter a 2:1 interatrial block was seen which was being classified as sinus tachycardia by the pacemaker diagnostics. The flutter was mapped and ablated successfully around the mitral valve annulus and ring. Pulmonary vein isolation was also performed using the cryoballoon for concomitant atrial fibrillation (AF). This report highlights the possibility of underestimating the true AF burden by implantable devices with advanced atrial disease and multiple atrial tachyarrhythmias.

KEYWORDS. atrial fibrillation, atrial flutter, cardiac pacing, catheter ablation, intracardiac electrophysiology, mapping.

Introduction

We describe a 64-year-old male with symptomatic atrial fibrillation (AF) who was considered for pulmonary vein isolation. The patient had a complex cardiac surgical history with a second aortic valve replacement for aortic stenosis and a mitral valve ring for severe mitral regurgitation. The patient had an implanted permanent pacemaker for periods of sinus arrest. Pacemaker interrogation revealed episodes of AF with increasing AF burden. No atrial flutter was noted on pacemaker interrogation.

On the day of the procedure, a 12-lead electrocardiogram showed atrial flutter. Intracardiac electrograms showed an atrial flutter with distal coronary sinus (CS) being earlier than proximal CS. Pacer interrogation at the same time revealed an A sense V sense rhythm of 606 ms. When a Livewire Duodecapolar catheter (St. Jude Medical, St. Paul, MN) was introduced the right atrial cycle length was 606 ms (the same as pacemaker interrogation). The simultaneous left atrial cycle length was 303 ms (Figure 1 A,B). Flutter was mapped to around the mitral valve ring with breakthrough in the posterior wall going across the left atrial roof (Figure 2). As the clinically documented atrial arrhythmia was AF, a decision to isolate the pulmonary veins was made. Entrainment of the atrial flutter was not attempted at this stage. Isolation of pulmonary veins was done using the 28-mm Arctic Front Advance Cardiac CryoAblation (Medtronic Inc., St. Paul, MN). The flutter continued without any change in cycle length or activation. A left atrial roof line was created using a St. Jude Medical (St. Paul, MN) contact force catheter as part of the AF ablation strategy we employ. The flutter continued without any change. Next, a mitral valve isthmus line was created from the left lower pulmonary vein to the mitral annulus. This was extended anteriorly around the mitral valve ring. The ablation line was then extended towards the left inferior pulmonary vein when flutter terminated (Figure 3). Of the measurements obtained in sinus rhythm, the interval between the onset of the P wave and atrial activation in the distal coronary sinus recording was 220 ms, indicative of significant inter atrial conduction delay.

The authors report no conflicts of interest for the published content. Manuscript received September 27, 2015, final version accepted October 20, 2015.

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Discussion
This case illustrates 2:1 interatrial block in the presence of a diseased atrium and significant interatrial conduction delay. As a result, the atrial flutter was not detected by the implanted pacemaker with the atrial lead in the right atrium. AF with a shorter atrial cycle length was correctly classified by the device as the high rate atrial event contributing to the AF burden as detected by the pacemaker. Hence, the true atrial arrhythmia burden may have been significantly underestimated by the implanted pacemaker.

Significant intra- and interatrial conduction delay is often seen in patients with atrial tachyarrhythmias.1 There is also an association of AF with atrial flutter.2 This case illustrates that standard dual-chamber pacemakers and defibrillators may well be underestimating the true atrial arrhythmia burden in patients with atrial disease. Decisions on stopping anticoagulation based on device interrogation should take into account this important electrophysiologic phenomenon. This may not necessarily impact the detection of the AF burden by implantable loop monitors where AF detection is based on R-R irregularity as opposed to direct trial recordings. Appropriate detection of AF and flutter is also an integral part of devices capable of terminating the tachycardias.3 Though a curative approach to the management of atrial tachyarrhythmias with ablation will remain the treatment of choice, pacing therapy with left atrial pacing, dual atrial pacing, and pacing with antitachycardia pacing may be alternatives. Left atrial pacing may not only be valuable in assessing the true atrial

Figure 1: (a) Intracardiac recordings are shown. 1,2: distal CS; 9,10: proximal CS; electrocardiogram leads 11, aVF, V1 V5, Halo 1–8. The multipole catheter with the distal pole is in close proximity to the coronary sinus ostium and proximal pole close to the interatrial septum at the roof of the right atrium. (b) The left anterior oblique fluoroscopic projection of catheters and pacemaker leads are in place. A multipole catheter with the distal pole in the proximity of the CS ostium and the proximal pole at the roof of the right atrium. A transeptal sheath is in place with an ablation catheter projecting through the intra-atrial septum into the left atrium. A mitral valve ring is in place. There is an existing atrial pacing lead at the right atrial appendage and an existing ventricular pacing lead at the right ventricular apex. CS: coronary sinus.

Figure 2: A three-dimensional St. Jude Medical Ensite Velocity (St. Paul, MN) local activation timing map of the atrial flutter fused on a computed tomography image of the left atrium. This is a posterior/anterior view showing the leading wave front and the trailing wave front on the roof of the left atrium. Ablation lesions delivered are in brown.

Figure 3: A three-dimensional St. Jude Medical Ensite Velocity (St. Paul, MN) local activation timing map of the atrial flutter seen from a lateral, clock face looking from the left ventricle. A counterclockwise activation is seen around the mitral valve annulus. Ablation lesions are delivered from the left inferior pulmonary vein to the mitral valve annulus around the annulus then up to join the commencement of the lesions. The solitary last lesion was the lesion that terminated the atrial flutter.
arrhythmia burden but would be useful for AF prevention by reducing interatrial conduction delay. The phenomenon of interatrial conduction delay in a population with implantable pacemakers and pacemaker defibrillators may be far more prevalent than recognized and suggests different sites for atrial lead positioning such as the interatrial septum and the Bachman bundle.

References