

Imaging in Cardiology – Atrial Lead Implantation During Atrial Flutter

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Case Report

A 69-year-old man was symptomatic for syncope due to brady- and tachyarrhythmias. His previous medical history revealed no major abnormalities except for these arrhythmias and a long history of dizzy spells. He was admitted to the hospital for pacemaker implantation. The patient was on acetylsalicyl acid (100 mg), but this was discontinued three days prior to pacemaker implantation. Because of symptomatic sinus bradycardia and low ventricular rates during atrial flutter, a DDDR pacemaker was indicated. The ventricular lead was a tined lead (Synox SX60-BP, Biotronik, Germany), and the atrial lead was a new screw-in lead with an active screw (Elox EX53-BP, Biotronik). Before implantation, the ECG showed a typical atrial flutter with a low ventricular rate of 75 beats/min. The atrial flutter frequency was 300 beats/min (Figure 1, left part). The atrial lead tip was positioned in the appendix of the right atrium and fixated by screwing the tip into the atrial myocardium. The advantage of the screw is that it provides good tip contact with the atrial myocardium. However, this can be assessed normally (during sinus rhythm) by the occurrence of an ST-elevation lesion potential and a low pacing threshold. In this particular case, the unipolar intracardiac ECG, which was derived from the tip, did not show any sign of lesion potential during the atrial flutter (Figure 1). The P-wave (or flutter wave) amplitude was 1.1 mV during the tachycardia.

Overdrive pacing can be performed with a pacing system analyser (ERA 300 B, Biotronik). The first attempt was started at a rate slightly higher than 300 beats/min, and with each new attempt the rate was increased by 20 beats/min. Output settings were 5.0 V and 0.5 ms. Overdrive pacing at a rate of 380 beats/min terminated the flutter, and after a short, intermittent period of atrial fibrillation the rhythm converted into sinus rhythm

(Figure 1, middle part). In general, capture at the atrial level during fast pacing can be observed by a change in atrial deflections, as shown in this case, and a higher or lower ventricular rate, while the ventricular rate was stable (75 beats/min) during the spontaneous tachycardia (Figure 1, middle part). Subsequently, both the pacing threshold and impedance could be measured: 1.0 V at 0.5 ms and 396 Ω , respectively. The P-wave amplitude during sinus rhythm was between 3.7 and 4.3 mV. Furthermore, the intracardiac ECG during sinus rhythm showed a marked ST-elevation (Figure 1, right part).

Conclusion

Atrial fibrillation or atrial flutter during implantation should not hamper or preclude the implantation of an atrial lead [1]. Intraoperative conversion of atrial fibrillation may be time consuming. Therefore, a well-positioned lead (confirmed by fluoroscopy) with adequate sensing may be acceptable if the pacing threshold and lesion potential cannot be determined during implantation. In case of atrial flutter, as shown here, the arrhythmia can be overdriven, but there is a high risk of acceleration into atrial fibrillation. The sensing signals during atrial fibrillation or flutter should be at least ≥ 1.0 mV to ensure good lead positioning and to prevent atrial sensing dysfunction [2,3]. The DDD pacemaker should have the capability to program an automatic mode switch [4].

References

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Figure 1. Continuous recording of overdrive pacing of atrial flutter during pacemaker implantation: A typical flutter is present on the left side of the ECG. The flutter waves are clearly seen in leads II, III, and aVF. The leads marked as V1 and V6 are similar and reflect the unipolar electrogram recorded from the distal atrial electrode (screw). After three QRS complexes, overdrive pacing starts. Capture resulted in a different atrial ECG pattern and a low ventricular rate due to concealed conduction into the AV-node. In the middle part of the ECG, atrial fibrillation is present. In the limb leads as well in the intracardiac lead, a changing atrial activation pattern is visible. The short period of atrial fibrillation ended before the occurrence of a ventricular couplet. One spontaneous, atrial beat is then followed by atrial pacing. However, paced and non-paced atrial activation show a large and striking ST-elevation.

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