COMPLEX CASE STUDY

Late Recovery of Atrioventricular Nodal Function Following Pacemaker Placement for Postoperative Complete Heart Block

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ABSTRACT. Complete heart block (CHB) is a recognized possible complication after aortic and mitral valve surgery. Recovery of atrioventricular (AV) nodal function is less likely the further a patient is out from the initial operation. We report a case of AV nodal conduction recovery with a long PR interval occurring 5 months following aortic and mitral valve replacement that was complicated by intraoperative CHB.

KEYWORDS. complete heart block, postoperative, atrioventricular nodal function, pacemakers.

Introduction

Complete heart block (CHB) following aortic valve surgery, mitral valve surgery, and coronary artery bypass grafting has an incidence up to 8.5%. CHB occurring early in the postoperative period is often due to local edema and usually resolves within 7 days. Pacemaker placement is indicated in cases where CHB does not resolve in a reasonable time period postoperatively and/or when a reversible cause cannot be identified. Multiple case series have affirmed that pacemaker dependency in patients with CHB increases with time from the initial operation. We present a case of a patient who recovered the ability to conduct through the atrioventricular (AV) node with a prolonged PR interval of approximately 400 ms 5 months after developing CHB during aortic and mitral valve replacement for endocarditis.

Case report

A 20-year-old Caucasian man with congenital aortic bicuspid valve presented to the hospital after several weeks of fevers, dyspnea, and fatigue that were not improving despite an outpatient course of antibiotics. Physical examination revealed tachycardia, tachypnea, inspiratory crackles, and trace lower extremity edema. Pulmonary edema was appreciated on chest X-ray, and a subsequent echocardiogram revealed evidence of aortic and mitral valve endocarditis, an aortic paravalvular abscess, and an ejection fraction of 40–45%. These findings were confirmed on transesophageal echocardiogram along with the presence of severe aortic insufficiency and moderate mitral regurgitation.

The following day the patient underwent aortic and mitral valve replacement with mechanical valves manufactured by St. Jude Medical, Inc. (St. Paul, MN) and an aortic root patch annuloplasty with bovine pericardium. CHB developed intraoperatively, necessitating placement of an epicardial pacing wire. The patient suffered two episodes of ventricular tachycardia, secondary to an R-on-T phenomenon, on postoperative day 2 and was successfully defibrillated. An echocardiogram conducted on postoperative day 4 revealed that his ejection fraction had decreased to 10–15%.

Fourteen days following surgery he remained in CHB with a junctional escape (Figure 1). A biventricular pacemaker was placed because of concerns regarding an excessive lifetime burden of right ventricular pacing due to his young age at implantation. The option of a biventricular implantable cardioverter-defibrillator was discussed but was not implanted, as it was felt that his ejection fraction was likely to recover.

The patient continued to be in CHB during a follow-up visit in the pacemaker clinic 3 months later. A trans-thoracic echocardiogram conducted at that point revealed that his ejection fraction had increased to 35%. Unfortunately, the patient had developed diaphragmatic stimulation that could not be circumvented with...
reprogramming. Thus, the patient was reprogrammed to right ventricular pacing only.

On return to the pacemaker clinic at next follow-up, approximately 5 months after the initial implantation, the patient was found to have the electrocardiogram (EKG) shown in Figure 2 when pacing was inhibited. Unlike the EKG shown in the immediate postoperative period (Figure 1), the new EKG revealed a wide complex tachycardia with left bundle branch block and deep T-wave inversions, which were likely “memory T waves.” The patient was asymptomatic and hemodynamically stable in this rhythm. P waves were not clearly visualized.

Interrogation of his device was performed. Atrial activity within the T wave with a fixed relationship to the V was intermittently sensed by the device, suggestive of sinus rhythm with left bundle branch block. Programmed electrical stimulation via his device was then performed. The Wenckebach cycle length was 520 ms, and the AV node effective refractory period was 475 ms at a drive train of 550 ms.

Discussion

The postoperative development of CHB is more often noted following aortic valve replacement, but it is also a recognized complication of mitral valve surgery and coronary artery bypass grafting. Surgery of the aortic valve is in particular proximity to the conduction system, and the removal of calcium or valvular debris, insertion of deep stitches, and local edema may all disrupt conduction. Furthermore, aortic regurgitation results in fibrous thickening of the endocardium of the ventricular septum, which may lead to subsequent impingement of the underlying conduction tissue and may have a particularly increased association with AV block. Owing to several studies demonstrating the possibility of recovery of AV nodal function in the postoperative period, the American College of Cardiology/American Heart Association guidelines state that permanent pacemaker implantation is indicated for third-degree and advanced second-degree AV block associated with postoperative AV block that is not expected to resolve. In the case of our patient, his pacemaker was placed 14 days postoperatively after no signs of recovery of AV nodal function were appreciated. Our patient had both aortic and mitral valve endocarditis in addition to an aortic paravalvular abscess with severe aortic regurgitation, which may be associated with increased underlying conduction system damage. In the vast majority of previously cited cases of recovery of AV nodal function, pacemakers had been placed in the early postoperative period. At a follow-up visit 5 months postoperatively, AV nodal conduction in our patient was restored but with impaired conduction times.
References


Figure 2: Electrocardiogram in clinic 5 months after device placement with pacing inhibited.