

# Cardiac Tamponade after Removal of a Temporary Pacing Wire for Transcatheter Aortic Valve Implantation: A Case Report

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## INTRODUCTION

Transcatheter valve interventions have transformed the management of valvular heart disease from surgical to endovascular-based therapy.<sup>1</sup> Among these interventions, transcatheter aortic valve implantation (TAVI) has become a widely accepted treatment strategy for patients with severe aortic stenosis who are not eligible for surgical valve replacement because of their high-risk profiles.<sup>2</sup> Although numerous technical improvements have been implemented to simplify the procedure, reduce the incidence of complications, and be compatible with or even superior to the conventional surgical aortic valve replacement (SAVR), temporary pacing by using a right ventricular lead remains mandatory to ensure transient hypotension and low cardiac output while performing predilatation of the aortic annulus and accurately position and deploy the valve. Temporary pacing is also crucial as a backup pacing device if complete atrioventricular block develops after TAVI. Implanting a temporary pacing wire requires additional venous vascular access and a pacing lead, both of which may generate complications. This report presents the successful treatment course of a patient who developed cardiac tamponade after the removal of the temporary pacing wire for TAVI.

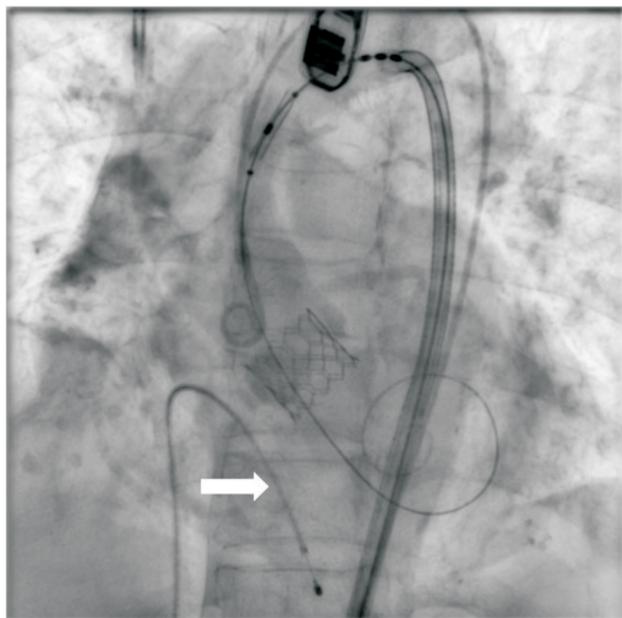
## CASE

An 87-year-old woman with a history of hypertension was admitted to our ward because of heart failure. Her clinical manifestations included chest tightness, orthopnea, and leg edema. Chest radiography revealed cardiomegaly with marked calcification over the aortic annulus, and echocardiography demonstrated severe aortic stenosis. Cardiac catheterization revealed severe aortic stenosis (aortic valve area: 0.6 cm<sup>2</sup>) with a mean pressure gradient of approximately 70 mmHg and normal coronary angiography results. The logistic EuroSCORE of predicted mortality is 10.84%. TAVI was performed because of the patient's advanced age and high surgical risk. During bilateral common femoral artery cannulation with ProGlide vascular closure devices (Abbott Vascular Devices, CA, USA), a temporary pacing wire (Pacel bipolar pacing catheter, St. Jude Medical, MN, USA) was inserted in the right ventricular wall via the right femoral vein by making an ultrasound-guided puncture. A 23-mm balloon-expandable valve (Edwards Sapien 3; Edwards Lifesciences, CA, USA) was deployed under rapid pacing at a rate of 160 beats/min (Figure 1). The procedure was successful, and the patient's hemodynamic status throughout the procedure was stable. No immediate postoperative complications were noted, and the patient was admitted to the intensive care unit with a postoperative mean pressure gradient of < 10 mmHg. Two days later, before she was transferred to the general ward, the temporary pacing wire was removed, which resulted in bradycardia and hypotension consistent with cardiogenic shock. Bedside echocardiography revealed pericardial effusion with compression of the right ventricular wall. Considering the possibility of cardiac tamponade, emergency pericardiocentesis was performed. Approximately 200 ml of dark red blood was aspirated immediately, and a drainage tube was placed in

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**Figure 1.** A 23-mm balloon-expandable valve was deployed under a rapid pacing induced by temporary pacing wire (white arrow).

the pericardial cavity (Figure 2). The patient's hemodynamic status stabilized and her blood pressure quickly became normal. Computed tomography demonstrated an intact aortic annulus, and the implanted valve was in the appropriate position. The cause of cardiac tamponade was attributable to tearing and perforation of the right ventricular wall while placing the temporary pacing lead. Conservative treatment was performed, and the patient had an uneventful recovery course thereafter. Five days later, she was discharged after the drainage tube was removed under improved functional status.

## DISCUSSION

The emergence of TAVI provides a feasible, low-risk alternative for frail and older patients who are considered poor candidates for surgery. The placement of a temporary pacing wire is considered a routine in most transcatheter valve procedures to facilitate controlled or rapid ventricular pacing during balloon expansion or valve deployment. Compared with SAVR, TAVI has the drawback of higher rates of conduction disturbance and permanent pacemaker implantation (17% in TAVI vs. 5% in SAVR).<sup>3,4</sup> The temporary pacing wire is typically kept in place after TAVI and may be removed several days



**Figure 2.** The dark red blood was drained via the catheter placed within the pericardial cavity.

later if no subsequent conduction disturbance occurs. The devil is hidden in the details. This report highlights the possibility of life-threatening cardiac tamponade that could result from a minor procedure, such as removing the pacing lead.

Safely performed implantation of the temporary pacing wire is the best means of avoiding perforation of the ventricular wall during TAVI. According to previously published reports, right ventricle (RV) perforation may be completely avoided by pacing the septum rather than the apex or free wall of the RV.<sup>5-7</sup> The ideal pacing position over the septum of the right ventricular outflow tract should be confirmed to eliminate the risk by real-time transesophageal echocardiography or fluoroscopy during the procedure.<sup>8</sup> An excessively long pacing lead under tension should also be avoided because it may generate additional force leading to perforation.<sup>9,10</sup> Alternative techniques including partial inflation of the preformed balloon-tipped catheter pacing lead and temporary rapid ventricular pacing through a left ventricular

super-stiff wire may also reduce RV perforation risk if they can achieve stable pacing. The number of TAVIs performed are expected to increase. Thus, careful monitoring of every detail during the perioperative period is key for substantially improving TAVI outcomes, and the TAVI team must be vigilant in recognizing and diagnosing possible perioperative complications.

## LEARNING POINTS

The exact incidence of intrapericardial bleeding after temporary pacing wire removal has not been investigated. However, it should not be overlooked because it may result in life-threatening cardiac tamponade, which occurred in the current case. The ideal pacing position should be confirmed to eliminate the risk of RV perforation by real-time transesophageal echocardiography or fluoroscopy during the procedure. An excessively long pacing lead under tension should also be avoided because it may generate additional force leading to perforation. Alternative techniques including partial inflation of the preformed balloon-tipped catheter pacing lead and temporary rapid ventricular pacing through a left ventricular super-stiff wire may also reduce the risk of RV perforation. Awareness of the potential risk of cardiac tamponade and timely evaluation of hemodynamic changes after removing a pacing wire are highly advised. Early and adequate drainage of pericardial blood was the key to survival in this scenario.

## CONFLICTS OF INTEREST

All the authors declare no conflict of interest.

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