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Entrapment of a Multipolar Mapping Catheter in a Mitral Valve Prosthesis

Mitral Kapak Protezinde Çok Kutuplu Haritalama Kateterinin Tuzaklanması

CASE IMAGE
OLGU GÖRÜNTÜSÜ

Electroanatomic mapping is crucial in the ablation of complex atrial arrhythmias. The PentaRay® NAV eco catheter (Biosense Webster, CA, USA), featuring five flexible splines embedded with microelectrodes, offers high-resolution mapping but poses a risk of entrapment in mechanical mitral valves, due to its multi-spline design.

We report the case of a 74-year-old woman with coronary artery disease, prior coronary artery bypass grafting (CABG) and mechanical mitral valve replacement, who was referred for atrial fibrillation ablation. During mapping with a PentaRay catheter near the posteroinferior mitral annulus, resistance was encountered. Cine fluoroscopy revealed entrapment of a spline in the valve, resulting in leaflet obstruction and hemodynamic instability. Manual manoeuvres—including counterclockwise rotation of the PentaRay hub and advancement or withdrawal of the sheath over the catheter shaft—failed to release the catheter. It was eventually withdrawn with force (Videos 1 and 2), which restored valve function but caused rupture of a spline (Video 1, Figures 1 and 2). The ruptured fragment embolized while preparations were underway to retrieve it with a snare. Fluoroscopy localized the embolized catheter in the left hemithorax. Angiography ruled out pulmonary embolization, suggesting localization within the thoracic vasculature (Video 1). Echocardiography confirmed normal valve function. The procedure concluded without further complications and the patient was discharged after 48 hours of observation. Follow-up imaging later identified the fragment in a distal intercostal artery (Figure 2, Video 3).

Figure 1. Ex-vivo catheter image showing four normal splines and one ruptured spline.

Intra-procedural best practices include avoiding direct catheter advancement toward the mitral orifice, using long steerable sheaths for better control, employing real-time multi-view fluoroscopy or echocardiography and considering single-tip or single-spline catheters, or high-density basket catheters, when appropriate. Time spent near high-risk areas such as the posterior mitral annulus should be minimized. Electroanatomic systems with valve contouring and intracardiac echocardiography can further enhance procedural safety.

If entrapment occurs, initial management should prioritize hemodynamic stability and cessation of all catheter manipulation. Gentle sheath advancement or catheter rotation under imaging guidance may resolve the entrapment. Forceful withdrawal should be a last resort, particularly in the setting of hemodynamic compromise. It is essential that electrophysiology lab staff are trained to recognize and respond promptly to catheter entrapment scenarios.

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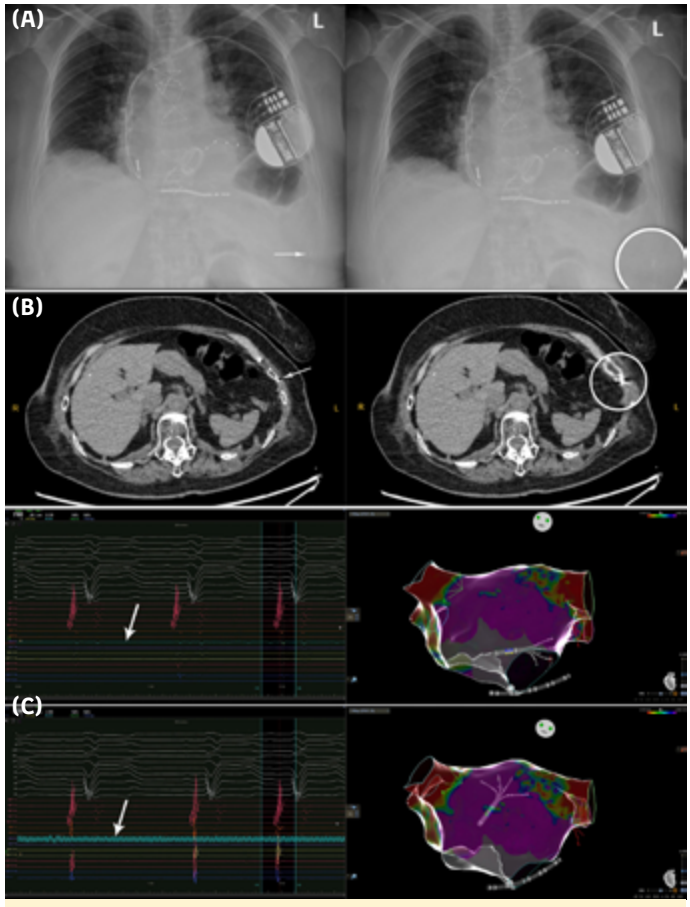

Figure 2. Teleradiograph showing the embolized segment (arrow) near the distal left rib cage in normal (left) and magnified (right) images (A). Computed tomography showing the embolized segment (arrow) in the distal portion of the intercostal artery in normal (left) and magnified (right) axial images. 3D mapping showing all five splines, with at least one located at the orifice of the mechanical valve and far-field atrial and ventricular signals on intracardiac electrograms (arrow) (upper). 3D mapping showing four splines in the left atrial cavity and continuous artifact recording in bipole 5-6 (arrow), with normal electrograms in the remaining electrodes (lower).

This case highlights a rare but potentially life-threatening complication associated with the PentaRay catheter in patients with mechanical mitral valves. Preventive imaging and meticulous procedural planning are critical. A structured retrieval strategy may eliminate the need for surgical intervention and ensure patient safety.

Ethics Committee Approval: This is a single case report, and therefore ethics committee approval was not required in accordance with institutional policies.

Informed Consent: The patient provided written informed consent for the publication of this case report and any accompanying images. All identifiable information has been anonymized to protect patient privacy.

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Video 1. Fluoroscopic images demonstrating PentaRay entrapment in the mechanical mitral valve, attempts at release, subsequent rupture and embolization of a spline (arrows), and angiography for embolized segment localization (PA, Pulmonary artery; PV, Pulmonary vein).

Video 2. 3D mapping showing five splines with at least one at the valve orifice, and far-field atrial and ventricular signals without artifact on intracardiac electrograms (arrowheads) (upper) and, 3D mapping showing four splines in the left atrial cavity, with continuous artifact recording in bipole 5-6 (arrowheads), while the other electrodes show normal electrograms (lower).

Video 3. Serial computed tomography images showing the embolized segment (arrows) to the intercostal artery, at the posterior aspect of the left distal rib cage, in axial (left) and sagittal (right) views.