Implantation of Leadless Pacemaker via Left Subclavian Vein

Kenneth Kita
Rahul Doshi

Introduction: Leadless pacemakers, by standard, are deployed via the femoral vein. There have been instances of device deployment via right internal jugular vein when femoral vein access is unavailable. We present implantation via the left subclavian vein.

Methods: 25 year old male with Down’s Syndrome, congenital aortic stenosis, aortic coarctation, atrial septal defect (ASD) and history of a Ross procedure with ASD and coarctation repair. At the age of 5, he received an epicardial pacemaker for complete heart block (CHB). The patient later received a dual chamber transvenous pacemaker in 2009 (age 15), followed by a generator change in 2018 which was complicated by pocket infection. The patient had sinus rhythm with CHB and no underlying escape rhythm. EP consultation at an outside facility recommended extraction of the transvenous system, and implantation of a leadless pacemaker. In the EP lab it was noted that a wire could not be passed up to the heart from the right femoral vein. Venogram in the lab revealed occlusion of the left and right external iliac veins, and the lower half of the inferior vena cava (IVC) could not be visualized. Further delineation with CT angiography revealed chronic occlusion or atresia of the left and right external iliac veins with extensive collateral circulation in the pelvis and inguinal regions, and chronic occlusion of the infrarenal IVC. The patient was subsequently referred to our facility for higher level of care. At our facility, the patient underwent device extraction and leadless pacemaker implant under general anesthesia. First, access was obtained via the right internal jugular vein and two sheaths were placed. Through a 6Fr sheath, a temporary pacing wire was advanced to the right ventricular (RV) apex. Next, a stiff 0.035 guidewire was passed down to the IVC as far as possible via an 8Fr sheath to maintain access for an endovascular occlusion balloon in the event of a superior vena cava (SVC) tear during extraction.

Result: Attention was next focused on the device pocket. Incision immediately produced purulent drainage. The generator and leads were freed from the pocket. With laser assistance, both atrial and ventricular leads were extracted. Intra-procedure transesophageal echocardiogram confirmed absence of pericardial effusion. Left subclavian vein access was maintained with a stiff 0.035 inch guidewire, which was advanced down to the level of IVC occlusion. The 27Fr delivery sheath and dilator was advanced to the lower right atrium. The pacemaker delivery system was introduced through the sheath, and used to cross the tricuspid valve, where the device was positioned and deployed in the mid RV septum. Capture thresholds were consistently below 1.0 mV.

Conclusion: Leadless pacemaker implantation can be safely and feasibly done via subclavian vein approach from the same location as infected device removal and extraction.