Permanent Transfemoral Pacemaker: An Exceptional Approach

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Unavailability of appropriate venous access to the superior vena cava (SVC) for cardiac pacing remains a challenge to clinical practice. Patients are generally referred for epicardial lead placement with open thoracotomy. It is worth knowing the iliofemoral vein approach when other venous routes are inaccessible.

A 61-year-old black male patient with history of end-stage renal failure was referred for a permanent pacemaker because of symptomatic bradycardia. Echo showed left ventricular ejection fraction of 45%. The patient had failed bilateral arteriovenous fistula and he received hemodialysis via an indwelling Quintonatheter through the SVC from the right side. Figure 1a shows complete occlusion of the left subclavian and innominate vein in the venogram. To facilitate pacemaker lead insertion, the interventional radiology team performed balloon dilatation for recanalization. Those attempts, however, were unsuccessful. Although epicardial lead placement was proposed, a transvenous approach via the iliofemoral vein (Figure 1b) was believed to present far less risk for this patient.

The femoral vein approach has been underutilized and very few studies have been published. One of the potential complications is atrial lead dislodgment. Despite an approximate 20% dislodgement rate in an early single-center study using passive-fixation leads or early-generation active-fixation leads, a later series showed a dislodgement rate of 0% using active instead of passive-fixation leads. The newer-generation active-fixation leads, such as Medtronic model 5076 (Medtronic Inc., Minneapolis, MN), are generally associated with stable long-term pacing parameters. In this patient, the Medtronic CapSure-Fix Novus active-fixation lead (model 5076) was advanced to the right ventricular septum near the apex (Figure 1c, up arrow). A second Medtronic (model 5076) active-fixation lead was placed to the right atrium lateral wall (Figure 1c, down arrow). Both leads were secured to the muscular fascia above the inguinal ligament and a subcutaneous pocket was fashioned in the right lower abdomen. A Medtronic Enrhythm pulse generator (model P1501DR) was attached to the leads and placed in the pocket (Figure 1b). The atrial lead testing indicated a P wave at 0.6 mV with an impedance of 748 ohms and a stimulation threshold of 0.5 V at 0.5 ms. The ventricular lead parameters were R wave 2.1 mV, with a pacing threshold of 0.4 V at a pulse width of 0.5 ms and an impedance of 1072 ohms. During the follow-up, the atrial and ventricular lead impedance was 544 and 632 ohms, respectively. There were no complications at the last follow-up of 6 months.

The iliofemoral approach serves as an exceptional alternative technique when the SVC approach is impossible or suboptimal. SVC/subclavian obstruction, prior radiation therapy, mastectomy, burns, recurrent erosion, and congenital venous anomalies may preclude the conventional approach. Epicardial lead placement necessitates an open thoracotomy with its attendant increased risk and prolonged hospitalization and recovery. Video-assisted thoracoscopic surgery is another option for patients with adequate anterior-posterior...
chest diameter and no contraindication for reoperations. Moreover, epicardial leads require higher pacing thresholds which reduce pulse generator longevity. Although previously there were concerns regarding a higher rate of infection and femoral vein thrombosis, these were not validated in studies. The new-generation active-fixation lead significantly improves atrial lead dislodgement.

References


Figure 1: A. shows complete occlusion of the left subclavian and innominate vein in the venogram. To facilitate pacemaker lead insertion, the interventional radiology team performed balloon dilatation for recanalization. Those attempts, however, were unsuccessful. Although epicardial lead placement was proposed, a transvenous approach via the iliofemoral vein; B. was believed to present far less risk for this patient; C. Up Arrow, the Medtronic CapSure-Fix Novus active-fixation lead (model 5076) was advanced to the right ventricular septum near the apex; Down Arrow, A second Medtronic (model 5076) active-fixation lead was placed to the right atrium lateral wall.