The transfemoral approach for cardiac resynchronization therapy

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Cardiac resynchronization (CRT) is a well-established treatment for heart failure and standard superior implantation has a high success rate with acceptable risk profile. When the superior approach is not feasible, surgical epicardial leads are considered. We present a case of transfemoral CRT as a viable alternative to surgical systems and discuss implant factors including lead choice and deep vein thrombosis.

Cardiac resynchronization therapy (CRT) is associated with morbidity and mortality benefits in patients with heart failure and broad QRS on optimal medical therapy. When subclavian leads are not feasible, surgical epicardial leads are considered. However, surgical leads

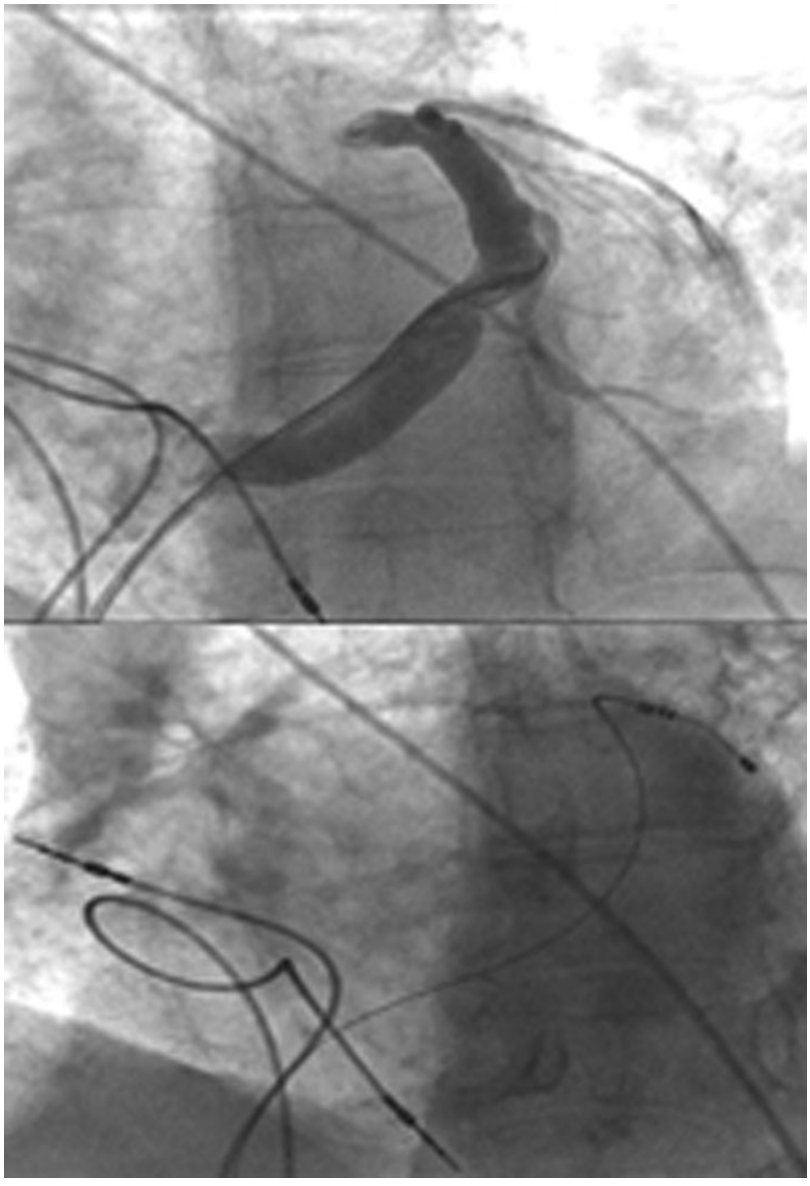

Figure 1 Upper panel: Anteroposterior projection of coronary sinus venography demonstrating lateral target branches. Lower panel: Left anterior oblique projection of final lead positions in the right atrium, right ventricle, and lateral branch of coronary sinus.

require general anaesthesia and thoracotomy and are associated with increased length of hospital stay.[1] We present a case where CRT is successfully implanted via the right femoral vein (RFV) in a 62-year-old lady with no subclavian venous access due to previous radiotherapy for breast cancer.

Under general anaesthesia, three standard RFV introducer sheaths were inserted below the inguinal ligament. Coronary sinus (CS) cannulation was achieved with a 63 cm Swartz SL3 sheath (St Jude Medical, Inc.) which was exchanged over a wire for an 11 F sheath and a 65 cm Attain Select-II 90° sub-selector catheter (Medtronic, Inc.). An 88 cm 4196 Attain Ability lead (Medtronic Inc.) was positioned in a basal-lateral CS vein with excellent pacing parameters and no phrenic nerve stimulation at high output. 65 cm active-fixation leads were sited in the right ventricular (RV) apex and right atrial appendage with good pacing parameters and stability. All leads were tunnelled over the inguinal ligament, secured to the rectus muscle in the right lower abdominal quadrant and connected to a CRT generator. The patient was discharged the following day and commenced on warfarin to prevent deep vein thrombosis (DVT), which was considered a risk with three RFV leads.

The patient initially experienced symptomatic improvement but then suffered displacement of both ventricular leads associated with clinical deterioration. Lead revision was organized and, using a similar technique to the original implant, the RV lead exchanged for an 85 cm active-fixation lead and the CS lead exchanged for an 88 cm StarFix lead (4195, Medtronic, Inc.) which has deployable lobes to actively secure position in the vein. Following lead revision, the patient gained significant improvement in functional status and remains well with stable lead parameters after 2-year follow-up. To our knowledge, this is the first reported case of the use of a Starfix lead in transfemoral CRT.

Transfemoral bradycardia pacing is well described although this route is not commonly employed for CRT, possibly due to concerns over left ventricular (LV) lead displacement. Precise incidence of transfemoral LV lead displacement is unknown but successful use of passive LV leads via the RFV is described.[2] Until further data are available suggesting unacceptable displacement rates with passive LV leads, we do not advocate routine use of active-fixation LV leads for transfemoral CRT as extraction of these leads is more complicated and remains a major limitation of this technique.[3] Displacement rates of transfemoral active-fixation RV leads is low but particular attention to lead length is required to minimize displacement risk. A further limitation to transfemoral pacing is the possible increased risk of device infection compared with the pectoral approach.

Deep vein thrombosis is not described in a series of 27 patients receiving transfemoral pacemakers but none of these patients had three ipsilateral RFV leads and the incidence of DVT with transfemoral CRT is unknown.[4] We elected to initiate anticoagulation as primary prophylaxis for DVT although further studies are required to quantify the risk of thrombosis.

In summary, transfemoral CRT is a viable alternative to surgical epicardial systems when subclavian access is not feasible. Indications for transfemoral pacing include occluded subclavian veins or superior vena cava (SVC), multiple SVC leads, and pectoral tissue unsuitable for device burial (*Figure 1*).

Conflict of interest: none declared.

References

1. Mair H, Sachweh J, Meuris B, Nollert G, Schmoeckel M, Schuetz A *et al.* Surgical epicardial left ventricular lead versus coronary sinus lead placement in biventricular pacing. *Eur J Cardiothorac Surg* 2005;**27**:235–42.
2. Yousef Z, Paul V, Levya F. Cardiac resynchronisation via the femoral vein: a novel method in cases with contraindications to the pectoral approach. *Europace* 2006;**8**:144–6.
3. Cronin EM, Ingelmo CP, Richard J, Wazni OM, Martin DO, Wilkoff BL *et al.* Active-fixation mechanism complicates coronary sinus lead extraction and limits subsequent reimplantation targets. *J Interv Card Electrophysiol* 2013;**36**:81–6.
4. Mathur G, Stables RH, Heaven D, Ingram A, Sutton R. Permanent pacemaker implantation via the femoral vein: an alternative in cases with contraindications to the pectoral approach. *Europace* 2001;**3**:56–9.