Subclavian crush syndrome: a cause of pacemaker lead fracture

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Abstract
A 48-year-old male with a symptomatic 2:1 atrio-ventricular block and a dual-chamber pacemaker, implanted one year previously, was admitted due to a syncopal episode. Pacemaker malfunction was identified as the cause of syncope. Subclavian crush syndrome was the cause of the pacemaker malfunction. Its incidence, consequences and management are discussed in this report.

Keywords: Subclavian crush syndrome, pacemaker lead, lead fracture

Various techniques for pacemaker implantation are universally used. A number of different methods for venous access are used for permanent pacemaker implantation, of which subclavian vein puncture using Seldinger’s technique is the most frequent.1 Subclavian crush syndrome is a well-described cause of pacemaker lead failure. It usually occurs after medial intrathoracic puncture of the subclavian vein and results in damage to the pacemaker lead body by entrapment within the costoclavicular ligament and/or the subclavian muscle.2

We present a case of a subclavian crush syndrome that occurred one year after dual-chamber pacemaker insertion using the subclavian puncture technique.

Case report
A 48-year-old male with a prior history of positive serology for Chagas’ disease, symptomatic 2:1 atrio-ventricular block and a dual-chamber pacemaker (Identity DR 5386, St Jude Medical, atrial lead: Tendril 1688 TC, ventricular lead: Isoflex 1646 T), implanted one year ago, was admitted due to a syncopal episode. Cardiac monitoring evidenced pacemaker dysfunction and failure of capture (Fig. 1A).

Fluoroscopy revealed ventricular lead fracture below the clavicle (Fig. 1B, white arrow). A venography ruled out subclavian vein obstruction (Fig. 1B). The fractured lead was abandoned and a new ventricular lead was implanted with no complications, using the same vein and puncturing more distally. The patient was discharged the following day.

Discussion
Subclavian vein puncture is usually performed for pacemaker implantation. Although this approach offers high success rates and low incidence of major complications, it has been associated with lead fracture (coil fracture or insulation damage) at stress points in the costoclavicular region.1 Subclavian crush syndrome is a well-described cause of lead fracture, resulting from lead (or leads) entrapment between the clavicle and the first rib following subclavian vein puncture.1-4 Its prevalence is up to 7% depending on the series.1 Injuries are more frequent if both leads are introduced via a single venous puncture. Cephalic vein dissection has been demonstrated to reduce the prevalence of complications associated with subclavian vein puncture.

Magney et al. have described a modification of the usual technique in order to avoid entrapment of the leads in the subclavious muscle, the costocoracoid ligament, or the costoclavicular ligament (the catheters could be stressed with the movement of the ipsilateral upper extremity).3 This approach consists of introducing the lead or catheter into the subclavian vein near the lateral border of the first rib (extrathoracic segment). This type of placement avoids soft-tissue entrapment. Three years after this report, the same group reported a follow up on 461 patients who underwent pacemaker implantation using the described approach without having a single crush syndrome.6

In the presented case, there was not only compression of the electrodes between the clavicle and the rib, but also compression of the electrodes against each other, causing further erosion.

Conclusion
Subclavian crush syndrome is a well-known cause of lead damage. Subclavian punctures performed too medially may increase the risk of this complication. Proper pacemaker follow up should be done in order to minimise the consequences of lead failure, particularly in the setting of pacemaker dependency.

References