

Short Report



Novel Technique to Facilitate Defibrillator Lead Implantation via Cephalic Vein Cutdown by Means of a Reference Catheter and a Specially Designed Long Sheath

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The cephalic vein is recommended as the access route for an implantable cardioverter defibrillator lead to avoid complications associated with subclavian vein puncture; however, cephalic vein cutdown is not necessarily preferred, mainly because of procedural complexity. To facilitate cephalic vein cutdown, we have devised the following method. An 8Fr catheter is placed in the cephalic vein over a guidewire inserted percutaneously from the left peripheral cephalic vein. The catheter, which is palpable beneath the skin prior to incision, indicates the location of the cephalic vein, facilitating its isolation. A specially designed 9Fr tear-away sheath-dilator unit is used to place leads. With its long-tapered and curved tip, the unit is easy to insert, even when the cephalic vein is stenotic or tortuous. The 30-cm-long sheath reaches the right atrium, and thus the lead is advanced directly to the right atrium without risk of vascular injury. This technique may be feasible in the majority of patients and can even be used by inexperienced implanters.

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Implantable cardioverter defibrillators (ICDs) have become standard therapy for high-risk survivors of life-threatening tachyarrhythmia. As the number of ICDs implanted has increased worldwide year by year, complications related to the ICD system are not uncommon.¹⁾ Lead fracture is the major and most frequent complication¹⁾ that has the potential for catastrophic consequences,^{2,3)} and cephalic vein access is strongly recommended to avoid this complication.^{1,4)} Cephalic vein cutdown

can also be done free from almost every subclavian vein puncture-related complication, including pneumothorax, hemothorax, trauma to the cervical plexus, and injury to the subclavian artery. However, the cephalic vein cutdown failed in approximately 30% and 40% of single and dual lead implants, respectively, even when performed by experienced implanters.⁵⁾ Accordingly, we devised a technique by means of a reference catheter and a specially designed long sheath to facilitate cephalic vein

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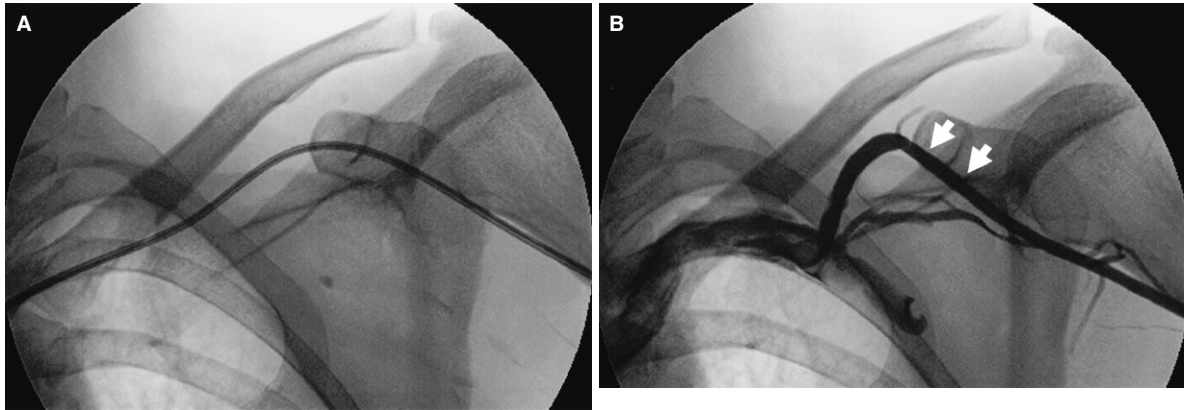


Figure 1

An 8 Fr reference catheter placed percutaneously in the left cephalic vein (A). The location of the cephalic vein in the deltopectoral region is clearly indicated by the catheter, which is not only visible fluoroscopically but also palpable beneath the skin prior to incision, which secures easy isolation of the vein. The venogram is shown for comparison (B). Arrows indicate the cephalic vein.

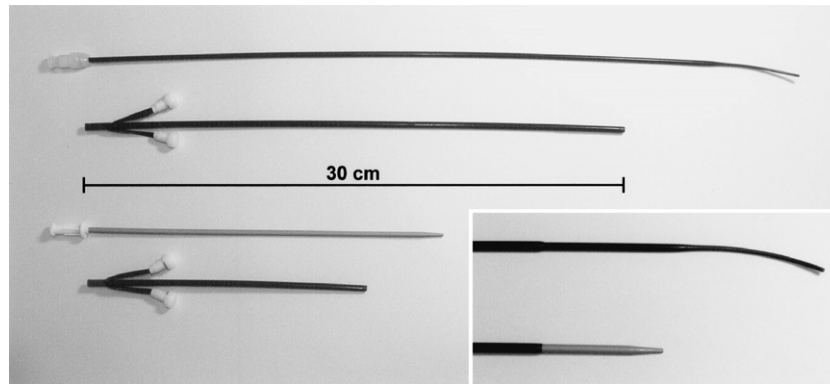


Figure 2

A specially designed 9 Fr tear-away sheath-dilator unit (PEEL-AWAY, C-PLVW-9.0-38-30-VAD5; COOK, Bloomington, IN) (above) compared with a 9 Fr sheath-dilator unit commonly used for a pacemaker lead (PEEL-AWAY, C-PLI-9.0-38-X-1; COOK) (below). The tip of the 30-cm-long sheath reaches the right atrium; thus, the ICD lead can be advanced directly to the right atrium without risk of vascular injury. The curved and long-tapered tip of the unit makes it easier to advance the unit into the cephalic vein, even when the vein is stenotic or tortuous; it also makes it easier to insert the sheath for the second lead in the vein after placing the ICD lead (lower right).

cutdown. Here we describe the technique.

Technique of Cephalic Vein Cutdown

The procedure is done under local anesthesia with a patient placed in a supine position at the cardiac electrophysiology laboratory. The patient's chest and left upper extremity are prepped and draped in a sterile fashion. The peripheral cephalic vein is detected in the left upper extremity, mostly in the antecubital region, and an 8 Fr sheath is placed in the vein. A 0.035-inch 150-cm flexible guidewire (Terumo, Tokyo, Japan) is inserted through the sheath and advanced under fluoroscopy guidance to the sub-

clavian vein, superior vena cava, and right atrium to confirm vein access. An 8 Fr reference catheter (Sones coronary catheter; Medtronic, Minneapolis, MN) is advanced to the right atrium (Figure 1). The catheter indicates the location of the cephalic vein. The catheter is identified before skin incision not only by fluoroscopy but also by palpating the deltopectoral region, which facilitates isolating the cephalic vein. After a 7-cm incision is made in the infraclavicular location, the subcutaneous tissue is dissected directly to the cephalic vein; the vein in the deltopectoral groove is isolated with the reference catheter and guidewire inside. The isolation is done easily within 5 min following incision.

The reference catheter is removed, leaving a guidewire in the vein. The distal portion of the guidewire is withdrawn through a nick in the isolated cephalic vein, with the guidewire's proximal portion left in the right atrium. The cephalic vein is ligated distally. A specially designed 9 Fr tear-away sheath-dilator unit (PEEL-AWAY, C-PLVW-9.0-38-30-VAD5; COOK, Bloomington, IN) is advanced into the cephalic vein over the guidewire. This sheath-dilator unit has two advantages over the one commonly used in placing pacemaker leads (Figure 2). First, the taper of the tip is long and curved, so that the unit can be advanced easily, even when the vein is stenotic or tortuous. Second, the sheath is 30 cm long, which allows the tip of the sheath to reach the right atrium. Thus, the ICD lead, which is larger in diameter and less flexible than a pacemaker lead, can be advanced directly to the right atrium without risk of vascular injury. For patients who required an atrial lead, an 11 Fr sheath is used for the ICD lead. A dilator of the sheath is withdrawn, with a guidewire remaining in the sheath. The ICD lead is inserted, and then the sheath is peeled away. The ICD lead is placed, the appropriate sized sheath is inserted over the retained guidewire, and an atrial lead is placed. The long-tapered tip of the sheath-dilator unit makes it easy to advance the system into the vein in which the ICD lead has been placed.

Discussion

There appear to be two main reasons for failure of the cephalic vein cutdown procedure.⁶⁾ First, the cephalic vein may not be identified or may be destroyed during dissection. Second, the cephalic vein may be too tortuous or small to allow the advancement of leads. Clearly, the method described here secures isolation of the cephalic vein. Because the reference catheter is palpable during dissection, one cannot miss the cephalic vein. A guidewire alone may serve as a marker under fluoroscopy; however, it is much easier to isolate the vein with a directly palpable 8 Fr catheter as a reference. This is especially true when the patient is well-built and the cephalic vein is deep beneath the skin. To overcome the problem of a small or tortuous

cephalic vein, a guidewire and introducer system is now widely used.⁶⁾ However, it may be difficult to insert or advance a guidewire into an isolated cephalic vein in some cases, and a venogram is necessary to identify venous anatomy.⁶⁾ In this regard, our method should also be a complete solution. A guidewire initially placed in a cephalic vein from the left upper extremity serves as a guide when cannulating the sheath, saving troublesome wire insertion from an isolated cephalic vein. To further secure placement of leads, a specially designed long sheath-dilator unit is of great use as described above.

The method may require extra-cost for a guidewire, a reference catheter, and sheaths when compared with the conventional cutdown technique, which seems to be the only disadvantage of the method.

In conclusion, the cutdown technique by means of a percutaneous reference catheter and a specially designed long sheath safely facilitates dual ICD leads placement via the cephalic vein. This technique is feasible in the majority of patients even when practiced by inexperienced implanters and should allow clinicians to avoid potentially hazardous subclavian puncture.

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