

Techniques, Materials, and Devices

A Technique for Tunneling Central Venous Catheters

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ABSTRACT. Tunneling the central venous catheter from the venous insertion site in the subclavicular or cervical area to the exit site on the chest wall can be difficult, especially in small children with a very convex chest wall. We present a technique which avoids many of the problems encountered with previously described methods.

METHODS

After a satisfactory vein has been exposed by cutdown in the neck or a successful venipuncture in the subclavian vein has been performed, a curved tendon passer (Carroll Tendon Forceps, Curved Shank, Alligator Jaws, 80-3142, George Tiemann & Co., Long Island, NY) is introduced into the subcutaneous space from cephalad to caudad to a position medial to the breastline but within the brassiere line (Fig. 1). This is usually in the fourth intercostal space just to one side of the sternum. An incision is then made over the skin tented up by the tendon passer. The catheter is grasped and brought through the tunnel.

DISCUSSION

The tunneling of central venous catheters has become universally accepted. It is claimed that tunneling prevents sepsis,¹⁻³ but some authors dispute this.^{1,4-6} Most authors do agree, however, that tunneling secures the catheter.^{2,4} In addition, an exit site on the chest wall is easier to care for and more cosmetically acceptable than a site in the neck or in the immediate subclavicular area where venous access is obtained.

Methods for tunneling catheters can be divided into retrograde and antegrade. Retrograde methods involve making the venotomy and positioning the catheter correctly first, and then pulling the hub retrograde through the tunnel to the exit site. One retrograde method involves pulling the entire hub assembly through the tunnel.^{7,8} Peters and Belsham² modified this method by fashioning a protector to place over the hub so that it can be drawn retrograde through the tunnel with less trauma to the tissue and the hub. The most popular

retrograde method has been to remove the hub, pass the catheter retrograde using a variety of tunneling maneuvers (similar to those used antegrade), and reattach the hub after the catheter has been tunneled.¹⁰⁻¹² Keilly¹³ found that this method was associated with increased sepsis. Peters and Belsham² as well as ourselves have found that these detachable hub-catheter connectors are not durable.

The antegrade methods have gained considerable popularity with the introduction of the Broviac and Hickman catheters. This method allows the positioning of the cuff in the subcutaneous tunnel and maintains the integrity of the hub-catheter assembly. The objection to this method is that one must first cut the catheter to the appropriate length before passing it down through the vein, and, therefore, minor adjustments to the position of the catheter tip are difficult to make. If the cuff is placed extremely cephalad in the tunnel, there will be room to pull it back for positioning. We have found, however, that we cannot always be assured of passing a catheter into the subclavian vein when using the percu-

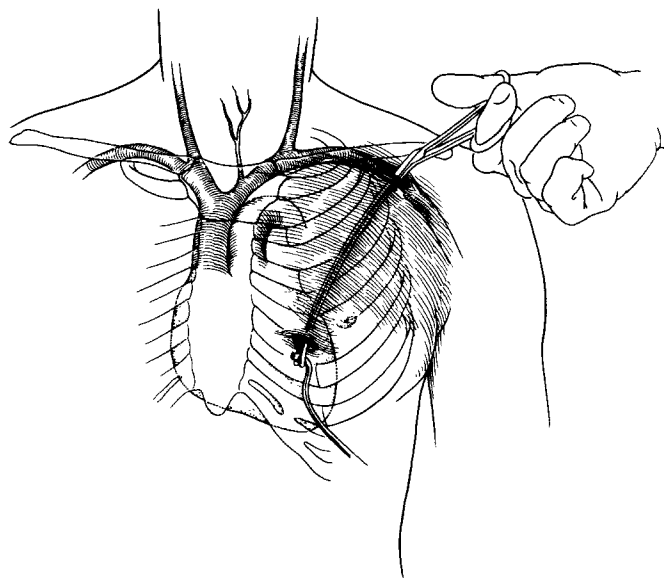


FIG. 1. Tunneling a central venous catheter from a subclavian insertion site using a curved tendon passer.

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taneous approach, so we do perform subclavian venepuncture prior to making the tunnel and positioning the cuff.

Many instruments have been proposed for fashioning the antegrade tunnel. This was initially done with a variety of clamps.^{14, 15} In children especially, the proximal portion of the hemostat dilates the tunnel unnecessarily. Hollow needles such as the Vim Silverman biopsy needle and the slotted split neurosurgical shunt-passing needles do not allow for passage of the Dacron cuff and make short tunnels with some risk of injury to the catheter. The rigidity of these instruments aims them toward the intercostal space, and makes it difficult to keep the tunnel truly subcutaneous. Peters and Belsham² use a malleable probe passed retrograde. They then cannulate the catheter with the tip of the probe, tie it in place, and bring the catheter through the tunnel. Raaf and Callery¹⁶ thread the catheter through the eye of a probe and pass this through the tunnel. While the need for a ligature adds only a short step, we have also had difficulty keeping the malleable probes from bending in the tunnel. The alligator-type foreign body forceps from the bronchoscopy set, the peritoneal shunt-passer,¹⁷ a straightened Frazier suction tip with a stylet,¹⁸ and a Portex epidural catheter tunneler¹⁹ are other rigid straight tunnelers which have been used.

The tendon passer is not only rigid and curved but the handle allows excellent control over the instrument. The tip of the instrument can thus be kept up toward the skin and not aimed toward the chest cavity. This allows a longer tunnel without unnecessary dilatation. Using this technique in more than 100 infants, children, and young adults over a 2-yr period, we have found this method to be swift, atraumatic, and reproducible.

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