Procedures in Family Practice

Teaching Venous Cutdown Techniques with Models

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A venous cutdown may be required in emergency situations in order to establish an intravenous line. Subclavian vein catheterization is now widely used, but may result in significant complications and is often inappropriate when a safer distal vein cutdown could be performed. Inanimate models can be used to teach this valuable technique and have the advantage of availability for repeated practice.

Establishing an intravenous line is frequently required in emergency situations. If an intravenous line cannot be established percutaneously, and if a subclavian (or internal jugular) catheterization is not appropriate to the clinical situation, a venous cutdown is indicated and can be a lifesaving measure. With the popularity of subclavian vein catheterization has come a decrease in the use of venous cutdowns. Subclavian vein catheterization, however, may result in significant complications and is often inappropriately used when a safer distal vein cutdown could be performed. Expertise in venous cutdowns is important, as it may be required of the family physician in emergency situations. In addition, if one can perform a venous cutdown, very little additional skill is necessary to perform an arterial cutdown.

Teaching this skill can present problems. In urgent clinical situations, the time delays involved in teaching may be unacceptable. The use of animal models may be unacceptably expensive and distasteful. It may not be possible with animal models to perform the cutdown technique often enough to retain the skill. To overcome these problems, inanimate models are utilized in the teaching of this technique.

Methods

Cutdown models are made out of wood, .25-inch Penrose drains, 3-inch Webril,* and Microfoam surgical tape** to simulate the medial aspect of the leg and ankle.

The Penrose drain simulates the saphenous vein; the Webril, subcutaneous tissue; and the tape, the skin. The wood model is simply a 2×4×12-inch wood block to which is glued a wood carving simulating the medial surface of the tibia and malleolus (Figure 1). The ends of the Penrose drain are passed through drill holes and attached to a groove on the undersurface of the model. The holes are positioned so that the drain is in a proper "anatomic" relationship to the "medial malleolus." Webril and tape are applied, and the ankle is drawn to complete the model. Appropriate surgical materials and instruments (4-0 silk suture, scalpel blades, scalpel handle, forceps, scissors, curved hemostats, and intravenous plastic catheters) are provided.

Prior to use of the model, residents are in-

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**Microfoam surgical tape, Medical Products Division/3M, St. Paul, Minnesota

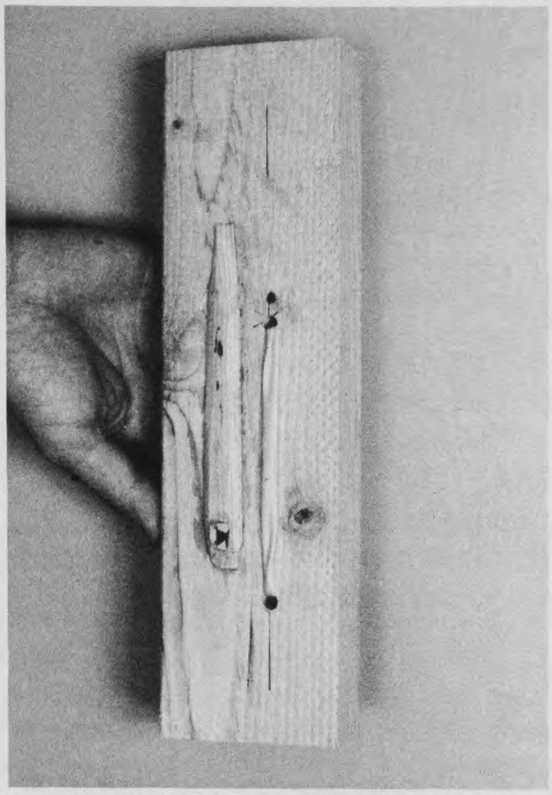

Figure 1. Model prior to application of "subcutaneous tissue" and "skin"

structed in the advantages of a cutdown over a subclavian catheterization in certain situations. During cardiopulmonary resuscitation, attempting a subclavian or internal jugular vein catheterization may interfere with or interrupt basic resuscitation. For patients with significant underlying pulmonary disease, a pneumothorax resulting from attempted central vein catheterization may be life threatening. Injuries in which the skin of the neck and shoulders is contaminated may prevent placing a subclavian line. Air embolism, catheter embolization, infiltration of fluid into the mediastinum or pleural cavities, and hemothorax from an injured vein or adjacent artery have occurred. A catheter tip in the atrium or ventricle may induce dysrhythmias and may result in perforation. Thus, if a central line carries no advantage for a particular patient, a safe peripheral vein should be cannulated, and a cutdown is a means to accomplish this.

Several sites are appropriate for catheterization via a cutdown. The saphenous vein at the ankle has been considered the vein of choice when time is essential, but its use should be limited to emergencies because of the risk of phlebitis. The cephalic vein at the wrist may be used when the saphenous vein is not suitable and a central line is not required. The basilic vein proximal and medial to the antecubital space can be used when it is desired to advance a catheter into the subclavian vein or superior vena cava. Other sites may be used, but these sites, together with appropriate use of subclavian or internal jugular vein catheterization or both, provide sufficient flexibility for most clinical situations.

Common sites for an arterial cutdown are the radial artery at the wrist and the dorsalis pedis artery. When the radial artery is used, Allen's test should be performed. If an arterial cannula cannot be successfully placed percutaneously, then a cutdown may be required. It is best to place a cannula either by direct puncture or with only a small arteriotomy. Another difference is that one should not ligate the artery, as this will make it unlikely for the pulse to return and will increase the possibility of significant bleeding when the cannula is removed.

After a discussion period, residents proceed following step-by-step written instructions (Appendix) similar to the technique described by Zimmerman[1] and catheterize the model vein (Figure 2). The residents repeat the procedure until performance can be accomplished easily without the instructions.

Comment

Although a cutdown is a simple procedure, lack of experience with it may result in a physician's being unwilling or unable to perform it in a clinical situation, with the patient compromised from lack of an intravenous line or unnecessarily subjected to the risks of subclavian (or internal jugular) catheterization. Models can be used to teach the technique of cutdown performance and can be used as often as a resident desires to gain confidence with the technique. One individual has performed successful cutdowns clinically with previous training and experience using only such models. The use of the model has been uniformly well received by residents, but the crucial test will be whether residents will be able to perform cutdowns in appropriate clinical situations. Models can be used to teach this valuable, but too often neglected, skill.

Reference

1. Zimmerman CE: Techniques of Patient Care—A Manual of Bedside Procedures, ed 2. Boston, Little, Brown, 1976

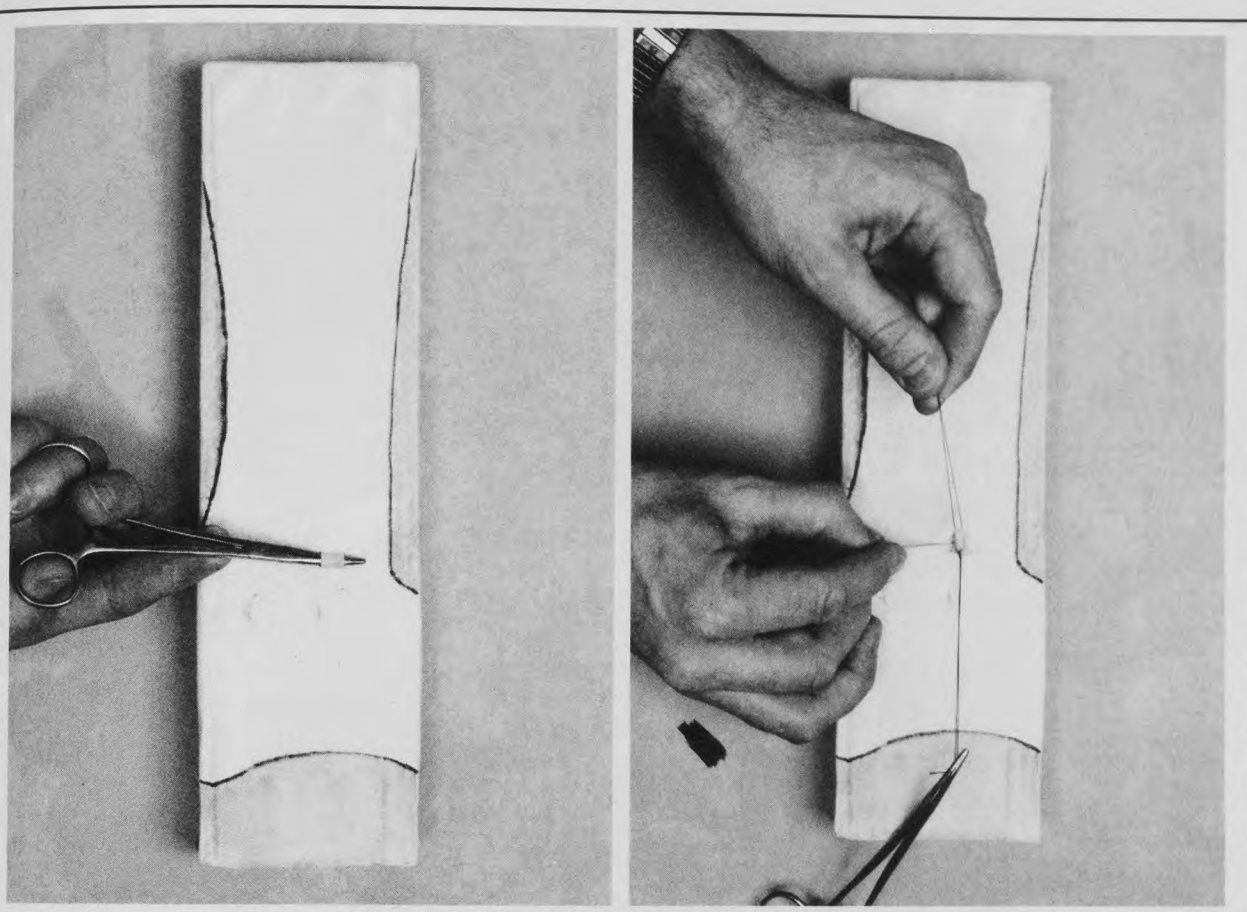

Figure 2. Two of the steps involved in catheterizing the "vein"

APPENDIX

Venous Cutdown Instructions

1. Externally rotate the ankle. Cleanse and drape the area.
2. Make a horizontal skin incision, 2 cm cephalad and 1 cm anterior from the greatest bulge of the medial malleolus.
3. Once through the skin, deep dissection should be blunt, and the jaws of the curved hemostat spread parallel to the long axis of the vein. A tourniquet may be used to help identify the vein but should be removed before the venotomy.
4. Sweep the vein forward into the incision with hemostat.
5. Pass a 4-0 silk suture beneath the vein as distal as possible, and use this as a retractor to bring the vessel into the incision.
6. Free at least 2 cm of vein and pass another silk suture beneath it at the proximal end of the dissection.
7. Tie down the distal silk suture and use the weight of a hemostat to maintain tension of this ligature. It may be necessary to clip hemostat to the silk suture and towel to keep ligature taut.
8. Select a site near the distal ligature to open the vein.
9. Use an unmounted No. 11 blade facing up to cut horizontally through the vessel. If the vein is large enough, it can be directly catheterized without a venotomy.
10. Introduce the catheter and tie down the proximal ligature around the vein and catheter, taking care not to occlude the latter by tying it too tightly. It may be necessary to cut a bevel or to cut off the sharp point of the catheter tip. It may also be necessary to stretch the venotomy with tips of mosquito hemostat, and to use vascular forceps to hold the vein when introducing the catheter.