Saphenous Vein Cutdown

Pre-Lab Packet

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October, 1999

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Introduction

The first detailed description of the saphenous vein cutdown at the ankle was published by Kirkham in 1945. Following its introduction, venous cutdown enjoyed widespread use. However, recently its use has declined, most likely due to the preference of many clinicians to perform central venous cannulation. In addition, adult intraosseous infusion devices recently developed may offer an even quicker and safer means for establishing venous access in patients with poor peripheral venous access sites. Nevertheless, the cutdown remains an excellent method of obtaining venous access in several emergency clinical situations.[3]

Indications

There are no absolute indications for venous cutdown, simply because several options for venous access usually exist, including peripheral, external jugular, central venous, and intraosseous access. However, there are several situations when more preferred access techniques are problematic and venous cutdown may be appropriate .

1. Venous access in infants.
2. Hypovolemic shock with peripheral venous collapse.
3. Intravenous drug users whose peripheral veins are thrombosed and obliterated.
4. Cardiac arrest without IV, IO, or ET access routes for medications.
5. Morbidly obese patients without alternative access routes.
6. Burn patients with massive escharification.
7. Cancer patients undergoing chemotherapy whose veins have become sclerosed.

Although venous cutdown may provide an alternative route for intravenous access in these problematic patients, it is virtually never the preferred method.

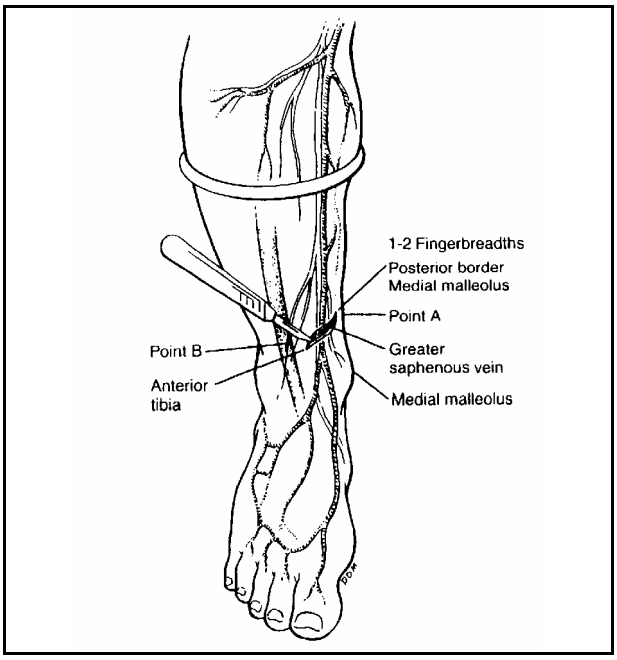
Contraindications

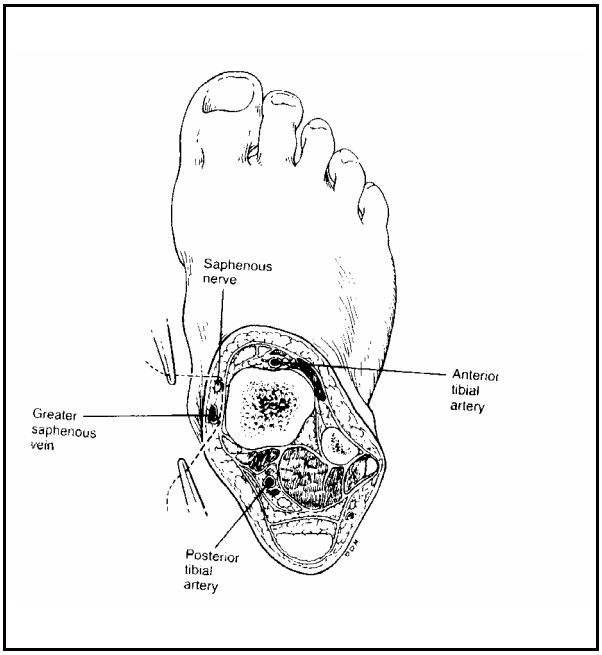
Percutaneous alternatives should be exhausted or contraindicated prior to contemplating venous cutdown. Although there are no absolute contraindications, relative contraindications include:

1. Cellulitis at the cannulation site.
2. Impaired wound healing.
3. Injury to the vessel proximal to the access site.
4. Candidates for coronary bypass surgery where saphenous vein cutdown will render the vessel unsuitable for grafting.
5. Unstable fractures proximal to the access site.
6. Situations in which the time required to perform the technique (usually 5-6 minutes) will inappropriately delay treatment.

Anatomy

Detailed knowledge of anatomy is critically important to the success of this procedure. The greater saphenous vein is the longest vein and runs subcutaneously throughout much of its course. It is most easily accessible at the ankle but may also be cannulated above the knee and below the femoral triangle. The greater saphenous vein begins at the ankle, where it is the continuation of the medial marginal vein of the foot. The vein crosses 1 cm anterior to the medial malleolus and continues up the anteromedial aspect of the leg (Figure 1). At the level of the malleolus, the vein lies adjacent to the periosteum and is accompanied by the relatively insignificant saphenous nerve, which if transected causes sensory loss in a small area along the medial aspect of the foot (Figure 2). At the ankle, the vessel can be exposed with minimal blunt dissection. The vein's large diameter and the fact the vein can be accessed while the MAST is in place are other advantages of the distal saphenous cutdown site. The vein's superficial, predictable, and isolated location has made the distal saphenous vein the classic pediatric





cutdown site.

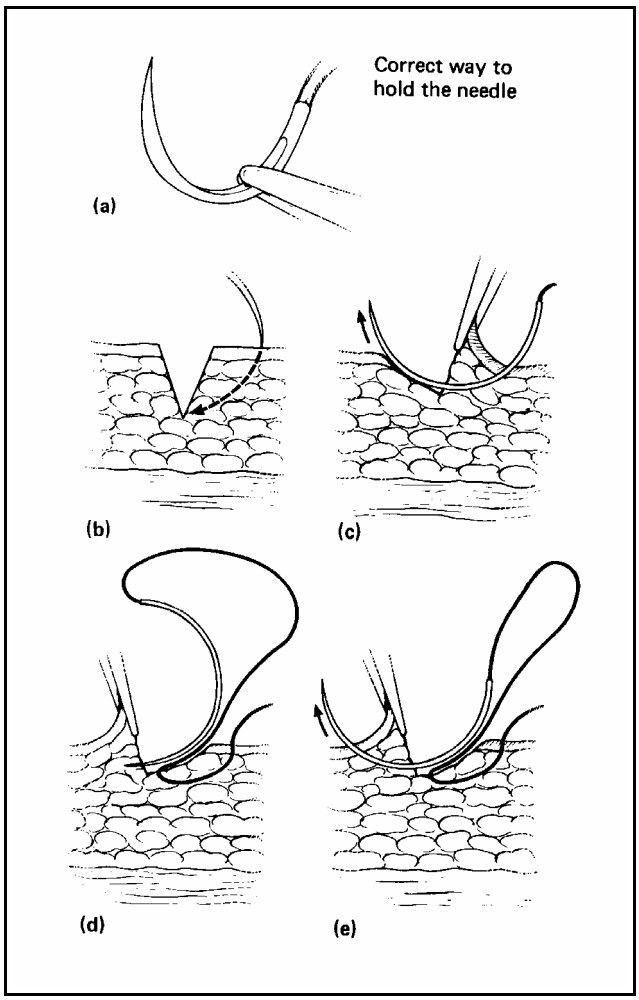
Figure 1. Figure 2.

Complications

1. Local hematoma.
2. Infection
3. Sepsis
4. Phlebitis
5. Embolization
6. Injury to associated structures.
7. Deterioration of an unstable patient during a time-consuming cutdown attempt.

Suturing Technique

Once the cutdown is performed and the infusion flowing, the incision must be closed. Consequently, a basic knowledge of suturing technique is necessary. Although there are many suturing materials and techniques, only the simple interrupted suture and instrument tie will be discussed. This is the most commonly used technique in emergency medicine.



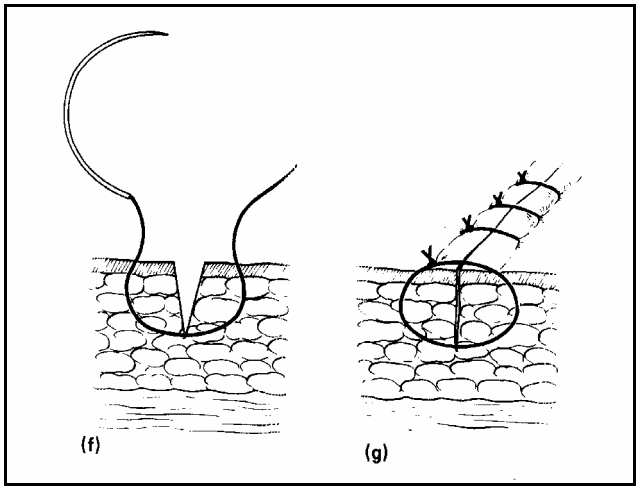
The equipment used for placing simple interrupted sutures include a needle holder, 4-0 silk suture on a curved atraumatic needle. Silk suture material is used because of its strength and ease of use. However, silk sutures are non-absorbable and must eventually be removed.

The needle is held in the needle holder at a point approximately three-quarters of its length away from the needle tip (Figure 3a). The needle itself is then at a right angle to the jaws of the needle holder. With the needle holder in the operators right hand the tip of the needle should be pointing to the left.

A curved needle should enter the skin so that its tip is perpendicular to the skin (Figure 3b). This will result in the needle running to the required depth and its natural curvature will bring it into the wound as the operator gently supinates the hand holding the needle holder. It is the angle at which the needle enters the skin and the subsequent rotation which will determine the depth and the point of exit that the needle will take from the edge of the wound. Lifting the skin edge with forceps will help obtain the correct entry of the needle through the skin (Figure 3c).

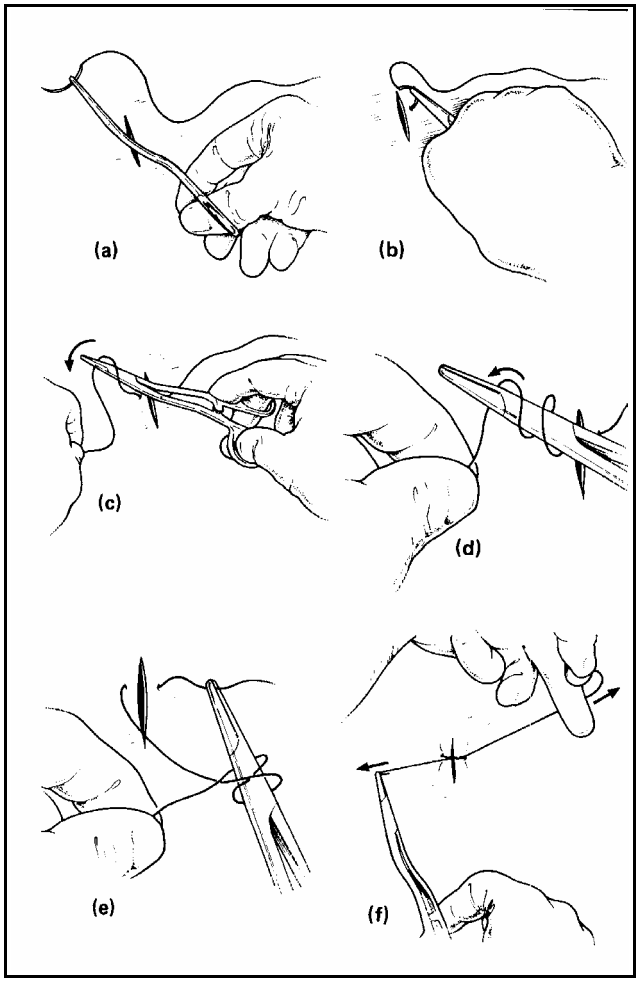
It is always a temptation to introduce the needle on one side of the wound and then try to run the needle across the wound so that it exits on the opposite side, thus making one bit suffice for the suture. In many cases this is adequate, but if the wound is fairly large or deep, then the stitch will tend to be superficial and it will leave a dead space below it. There is also a danger, that in an effort to pass the needle all the way across the wound, the needle may be pushed and levered so that it breaks. A further problem can be that if only the tip of the needle breaks through the skin on the opposite side of the wound and it is grasped by the needle holder, the cutting edge of the needle may be damaged. It is far wiser to take a large wound in two bites; one bite with the needle entering the skin on one side of the wound, and removing it at the bottom of the wound; and the second bite reintroducing the needle on the opposite side of the wound (Figure 3d) and pushing it out through the skin (Figure 3e)

When a suture is made, the distance between the wound edge and the point of entry of the needle should be the same as between the wound edge and the exit point of the needle. The depth to which the needle has gone should be the same on both sides of the wound (Figure 3f). When the stitch is made, the suture should be tied, either with the aid of forceps or with a surgeon's knot (Figure 3g). The suture should not be too loose, nor should it be too tight. A tight suture will cause skin necrosis and this will be made worse by the fact that the wound tissues will swell after the suturing.



Individual sutures must be placed at even distances from each other, so that the wound is symmetrical in respect of the spacing of the sutures. As well as each of the sutures being symmetrical in its distance across the wound, all sutures should be of similar tension. The knots should be laid on one side of the wound.

After inserting the suture (Figure 4a and 4b), the needleholder should be in the right hand. The end of the suture with the needle attached is held in the left hand. Place the needleholder on top of the strand of suture held in the left hand (Figure 4c). Loop the suture material around the tip of the needleholder twice (Figure 4d). Pick up the free end of the suture with the needleholder (Figure 4e). By slipping the loops off the end of the needleholder draw this end through the loops. This produces the first "half hitch". Tighten down the "half hitch" so that the wound edges are gently approximated. This involves crossing your hands, left in front of right (Figure 4f).



Now uncross your hands and this rotates the "half hitch" through 180 degrees and locks the "half hitch." (Figure 4g). Let go of the end of the suture with the needleholder. Place the needleholders under the strand held in the left hand (Figure 4h). Loop the suture material around the tip of the needleholder once (Figure 4i).

Figure 4

Then repeat as in 3 above to produce the second
"half hitch" (Figure 4j).

Tighten the knot, but do not pull it so hard that the skin edges are crushed together (Figure 4k). If using a smooth suture material then put a further "half hitch" on the knot to keep it tight. Cut the ends to the required length (about 1 cm unless).

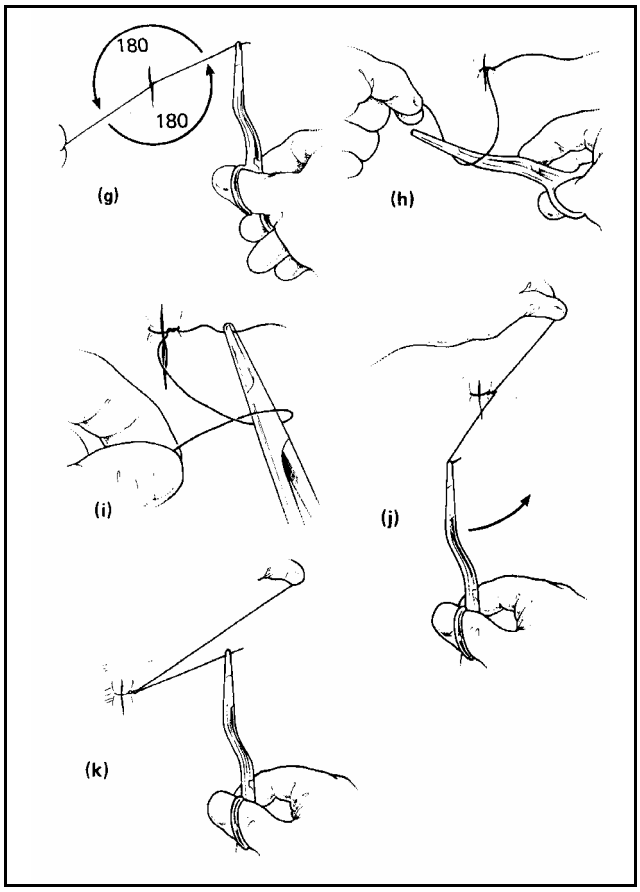


Table 1.

Materials Required for Venous Cutdown
Curved Kelly hemostat
Scalpel with number 11 blade
Small mosquito hemostat
4-0 silk suture ties
Antibiotic ointment
Gauze sponges
Intravenous catheter
1-inch tape
Antiseptic prep

Cutdown Technique

The materials necessary for venous cutdown are listed in Table 1. Even in emergency situations, reasonable precautions should be taken to prevent infection. The area of the skin incision should be widely prepared with an antiseptic solution and then draped. A tourniquet placed proximal to the cutdown site helps in the visualization of the vein.

In the conscious patient, the site is infiltrated with 1 percent lidocaine. Approximately two finger breadths cephalad to the medial malleolus, incise the skin over the entirety of the flat tibial edge
(about 3 cm). The incision should involve

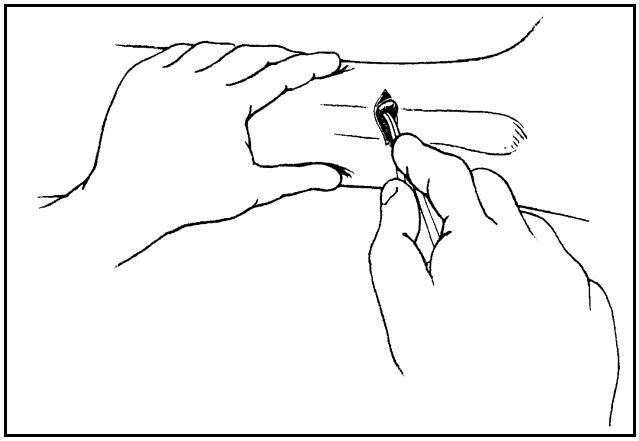


Figure 5.

all layers of the skin but should not enter significantly into the subcutaneous tissue; the vein is often just subcutaneous. Subcutaneous fat should bulge from the incision.

Using a curved hemostat pointing downward, scrape along the tibia and pick up all the tissue contained within the incision (Figure 5). The hemostat is then rotated 180 degrees so that the tip points upward and is opened widely, spreading the tissue apart. This should help isolate the saphenous vein from the saphenous nerve and other fibrous strands of subcutaneous tissue. The saphenous vein stands out particularly well against the dark background of the hemostat and is easily dissected out and isolated (Figure 6). This is particularly advantageous in the severely hypovolemic patient in whom it is often difficult to differentiate among the empty vein, saphenous nerve, and underlying periosteum.

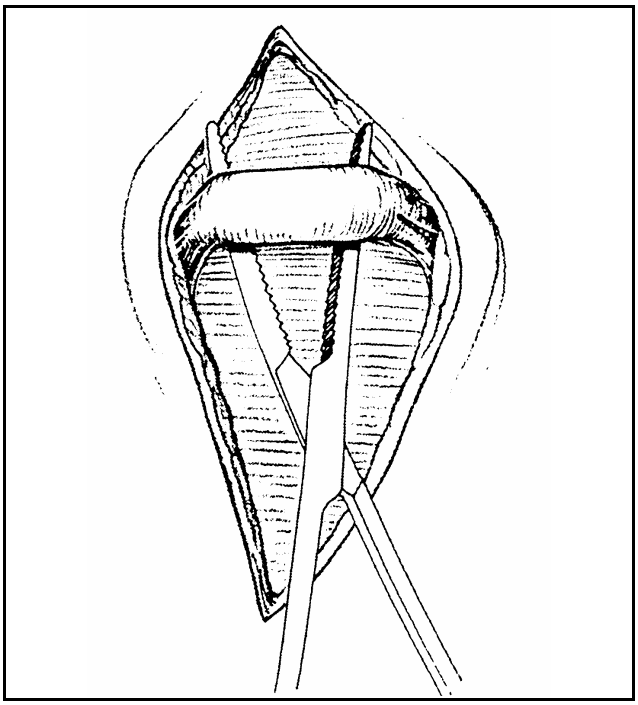


Figure 6.

Once the saphenous vein has been isolated, a standard over-the-needle IV catheter is introduced through the skin approximately 1 cm below the edge of the incision. The catheter is then introduced into the vein under direct vision (Figure 7a). If rapid volume resuscitation is the goal, a large catheter (10, 12, or 14 gauge) should be passed. Alternatively, a large bore catheter may be placed using a guide wire, dilator, and sheath system. The catheter is then slowly advanced into the vessel. Once placed within the venous lumen, the catheter's position is checked by aspiration to confirm placement. The cannula is then connected to the intravenous solution administration set. The wound is then closed with silk sutures and the cannula is securely affixed to the skin with tape and dressings following application of an antibiotic ointment (Figure 7b). Finally, the ankle is immobilized to prevent line displacement.

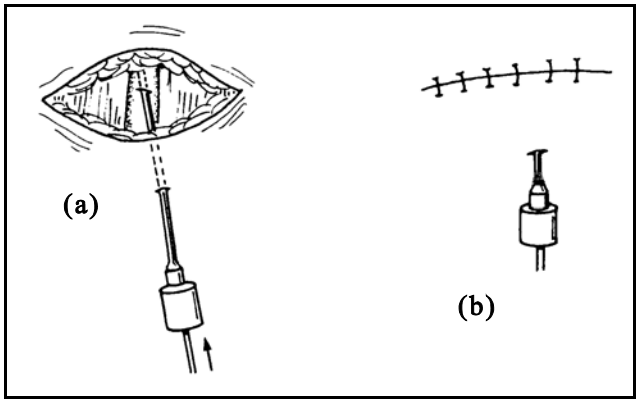


Figure 7.

Venous Cutdown Skill Sheet	Possible Points	Points Awarded
Checks selected IV fluid for proper fluid, clarity and expiration date.	3	
Sets up equipment and prepares infusion set.	3	
Places tourniquet proximal to site.	1	
Uses body substance isolation precautions.	2	
Identifies proper anatomical site for incision.	4	
Prepares site with antiseptic solution.	3	
Drapes the area with fenestrated drape.	1	
Verbalizes infiltration of 1% lidocaine in conscious patient.	3	
Makes an approximately 3 cm transverse incision over the vein.	4	
Using closed, curved hemostats pointed downward, places tip into the anterior aspect of the incision down to the tibia and scrapes along the tibia from anterior to posterior, picking up the vein, nerve, and subcutaneous tissues.	5	
Rotates hemostats 180 degrees and opens hemostats widely to spread tissues and isolate the saphenous vein.	3	
Inserts over-the-needle catheter through skin approximately 1 cm from inferior border of the incision.	2	
Under direct vision, inserts the catheter into the vein.	1	
Threads catheter and removes stylet.	1	
Properly disposes of stylet.	1	
Connects syringe to catheter and verifies intralumen position by aspirating blood.	2	
Releases tourniquet.	1	
Connects IV tubing and verifies patency of infusion.	1	
Sutures the incision using simple interrupted sutures.	5	
Places antibiotic ointment over incision and IV puncture site.	1	
Dresses incision and IV puncture site with sterile dressing.	1	
Securely tapes catheter and IV tubing in place.	1	
Immobilizes ankle to prevent line displacement.	1	

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TOTAL SCORE	50	

Critical Criteria

_____ Failure to establish a patent infusion within 6 minutes.
_____ Failure to take body substance isolation precautions prior to making incision.
_____ Contaminates equipment or site without appropriately correcting the situation.
_____ Any improper technique resulting in the potential for air embolism or infection.
_____ Failure to assure correct catheter placement before attaching administration set.
_____ Failure to dispose of sharps in proper container.
_____ Failure to properly suture and dress the incision.

Bibliography

1. Kirkham, JH: Infusion into the internal saphenous vein at the ankle. Lancet. 2:815-817, 1945.
2. Dronen, SC: Venous Cutdown. In Roberts,J and Hedges:, J Clinical Procedures in Emergency Medicine (ed 3). Philadelphia, WB Saunders, 1998.
3. Wax, P and Talan, D: Advances in cutdown techniques. Emergency Medicine Clinics of North America. 7(1):65-82, 1989.
4. Ferguson, D and Lord, S: Practical Procedures in Accident and Emergency Medicine. Butterworths Publishing, London, 1986.
5. McIntosh, B and Dulchavsky, S: Peripheral vascular cutdown. Critical Care Clinics. 8(4):807-818, 1992.
6. Simon, R and Brenner, B: Emergency Procedures and Techniques (ed 2). Williams and Wilkins, Baltimore, 1987.
7. Klofas, E: A quicker saphenous vein cutdown and a better way to teach it. Journal of Trauma. 43(6):985-987.