

Femoral Venous Cutdown

Alexander Mina and Britney L. Grayson

Introduction:

When central venous access is needed in a neonate who is not a candidate for umbilical cannulation, a femoral venous cutdown is a reasonable option.

In preparing for surgical venous access in a neonate, take extra care to avoid hypothermia. Performing the procedure on a overhead heated neonatal bed is one way to preserve heat, as is using a space heater at a safe distance (>1.5 meters) from the infant. Full barrier precautions (cap, mask, sterile gloves, sterile gown and full body drape) have been shown to reduce the risk of central line associated bloodstream infection. As intubation is avoided whenever possible, it is helpful to have an assistant in the room to aid in immobilizing the legs of the patient. Infiltrated local anesthetic is used in addition to oral dextrose solution to calm the infant.

The surgeon will require 2 fine smooth forceps, 3 mosquito hemostats, one 4-0 absorbable stitch, one 3-0 nonabsorbable stitch, a needle driver, suture scissors, an 11-blade scalpel, and the intravenous line to be placed. To tunnel the line, a frazier tip suction is helpful. For neonates weighing 600-999 grams, a 1.5 – 2 Fr catheter is suitable. For 1000 to 1500 g, a 2 – 2.5 Fr catheter may be used. For neonates larger than 1500 g, a 3 Fr catheter is best used.

Femoral venous cutdown proceeds in the following steps

- Securing the infant, preparing and draping
- Infiltration of local anesthetic
- Cutdown, identification and isolation of the femoral vein
- Insertion of the cannula, including tunneling
- Securing the cannula and closing the skin

Steps:

1. Warm the operating theatre, with a goal temperature of 25-28°C.
2. The patient should be connected to a monitor and the anesthetist (or other assistant) prepared with dextrose solution to be given per oral on a gloved finger. The infant's arms can be swaddled. Alternatively, a very small infant can be secured with tape.



This 800g neonate is secured to the bedsheet with tape. Dextrose solution on a gloved finger is used to calm the infant. The room is warmed and no sedation is given.

3. Aseptic technique is observed with bilateral groins and legs of the patient prepared and draped, to the knees.

Take caution using 2% chlorhexidine on infants weighing less than 1 kg or who are <32 weeks corrected gestational age as it can cause skin burns. We recommend the use of 0.5% chlorhexidine for these smallest infants.

4. Palpate the artery to identify the location of the medially adjacent vein. Infiltration of 0.25% bupivacaine up to 0.5 ml intradermally is sufficient and safe for every neonate.



Palpate the femoral artery pulsation. In infants weighing less than 1kg, it may be difficult or impossible to feel this pulsation. Note that the prepared area allows access to both groins, all the way down to the knees to allow the catheter to be tunneled.

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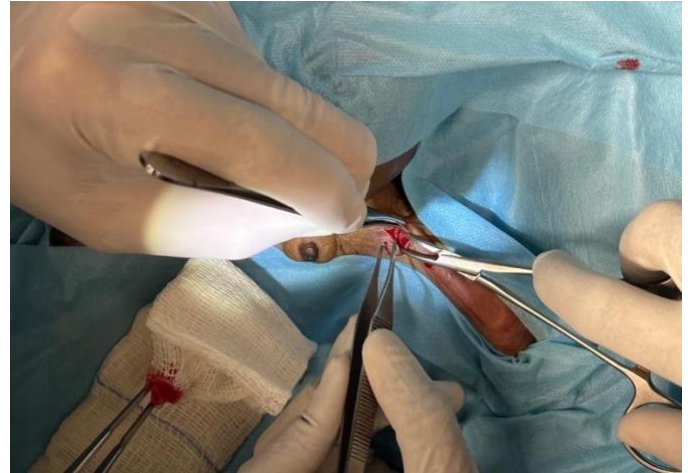
Inject 0.25% bupivacaine up to 0.5mL about 1cm below the inguinal ligament

- Using the 11-blade, carefully make a 1 cm incision overlying and perpendicular to the vein, approximately 1 finger breadth beneath the inguinal ligament.

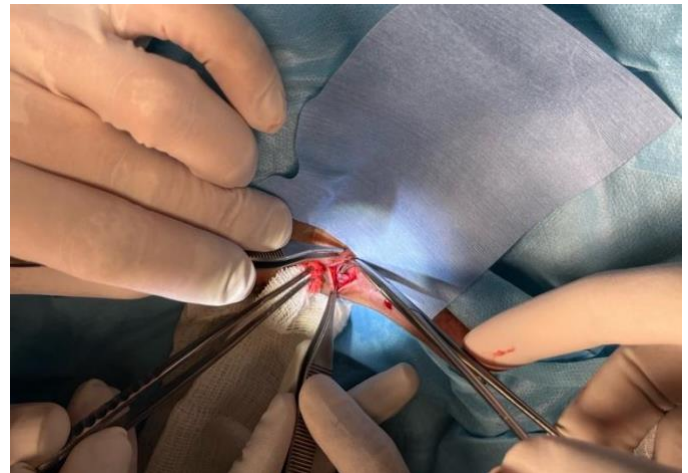


The incision is carefully made, only through the skin and no deeper.

- Using blunt dissection, spread the subcutaneous tissues until the femoral neurovascular bundle is identified. Dissect and isolate the vein, being careful to avoid the more lateral femoral artery and nerve. The vein is the most medial structure in the neurovascular bundle.



Gently dissect below the skin and locate the femoral vessels. The vein will be the most medial structure, though this anatomy may be confusing in the smallest of infants.



Once the vascular structures are seen, dissect very carefully using a fine mosquito hemostat or fine right-angle clamp until the femoral vein is isolated from the artery.

- Pass a small absorbable tie proximal and distal to the planned venotomy site and secure the untied ends with mosquito hemostats.

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Pass a fine tie underneath the dissected vein at both the proximal and distal ends of the dissection.

8. If tunneling, next make a stab incision on the anteromedial thigh, just above the knee. Pass a Frazier tip suction from the groin incision down through the knee incision and then pass the venous line into the suction catheter and pull through to the groin, creating a subcutaneous tunnel.

Even if a long tunnel is not possible (due to catheter length,) we still recommend tunneling the catheter at least 1 cm away from the groin incision site. This can easily be done with a mosquito hemostat.



Dissect bluntly in the space where the catheter will be tunneled.



Pass the fragile catheter in an atraumatic manner by placing a fine tip (Frazier) suction in the dissected space, cutting the skin over the tip with a scalpel, and passing the catheter through the suction.

9. Trim the catheter to the desired length. We measure it from the groin incision to 1 cm above the umbilicus and then cut at a 45 degree angle to facilitate its entry into the vessel.



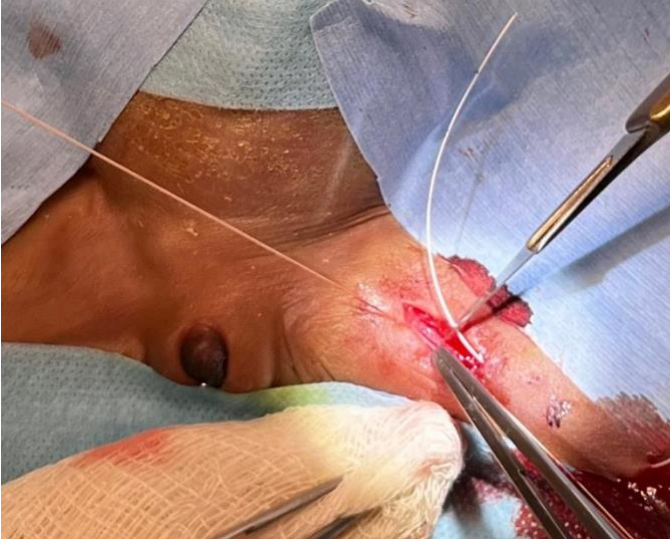
With the catheter passed fully through the subcutaneous tunnel, measure its edge at the level of the umbilicus and cut it at a 45 degree angle with a scalpel blade. The part that will be removed is grasped, to prevent damage.

10. With your assistant elevating the mosquito hemostats and your non-dominant hand gently holding the anterior wall of the vein, turn the 11-blade up and make a venotomy in the transverse orientation ~50% of the circumference of the

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vein. Place the scalpel down, pick up a smooth forceps and gently feed the catheter into the vein.



Make a transverse venotomy through 50% of the circumference of the vein using a scalpel blade.



Carefully pass the catheter into the vein.



Confirm that the catheter is patent and in the vein by aspirating it gently. You may get only a small amount of blood in the hub of the catheter.

11. Tie the proximal and distal absorbable sutures that were secured by the mosquito hemostats and ensure hemostasis is achieved.
12. Secure the line at the exit point with the prolene suture and then close the groin incision in layers— one simple interrupted absorbable stitch to reapproximate the fat layer over the vein and then either running or interrupted absorbable stitches in the skin, taking care to not puncture the catheter.



The catheter secured in place and the skin incision closed. Some catheters will have a channel to accommodate the suture at the hub, others (like this one) will not.

13. Place a sterile dressing over the exit site of the line. Label with the date and time of dressing placement.

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14. An abdominal x-ray should be obtained prior to use to confirm appropriate placement.

Pitfalls

- Hematoma formation may occur if bleeding is not controlled prior to closing the skin.
- Limb edema may develop as a result of ligating the distal femoral vein. A crepe bandage can be gently applied to assist in venous drainage. Capillary refill of the limb should be closely monitored at the foot. Some surgeons remove the ties after catheter insertion and do not ligate the vein at all.
- Line thrombosis or occlusion may occur due to the small diameter of the lumen. The best way to avoid this is to keep continuous fluids running, at the lowest rate possible on the pump. If absolutely necessary, 50 units/ml heparin can be injected only to the level of the blockage. Do not attempt to “power flush” rather, allow the heparin to dwell before aspirating it out and then flushing the line.
- Transection of the vein during venotomy may occur. If cannulation is not possible, tie off both ends of the vein.
- Infection can occur at any time. Infections at the insertion site are often treated with antibiotics and topical wound care. Central line associated bloodstream infections can lead to serious sepsis. Any febrile infant with central venous access should have blood cultures drawn immediately.
- Damage to surrounding structures – femoral artery and femoral nerve, both of which are located laterally to the vein

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