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Case Report: Ultrasound guided saphenous vein cannulation in infants

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Introduction:
Peripheral intravenous access in infants can be a challenging task for even experienced physicians. The traditional approach is to look for anatomical landmarks like the medial malleolus and attempt cannulation anterior to it. The presence of subcutaneous fat can make vein palpation and visualization difficult, which is worsened if the patients have edema or multiple previous attempts at placing an intravenous (i/v) catheter. Ultrasonographic guidance can greatly improve the success rate in patients who have a history of difficult peripheral intravenous access thus not only saving operating room time, but also unnecessary blind attempts or placement of a central venous line.

Technique: Real time ultrasound guidance was performed using a Sonosite Titan (Brothell, WA) 5-10 MHz linear transducer probe. A tourniquet was applied at the level of the distal thigh. A single operator two-hand technique was used with the ultrasound probe being held in the non dominant hand. The saphenous vein was identified at the level of the mid calf using the ultrasound. At this level, the vein is easily compressed by applying pressure on the transducer. The depth and location of the vein is then noted carefully and the skin prepped with alcohol or betadine. The ultrasound probe is placed again to view a transverse image of the vein in the middle of the screen. Then, the probe is rotated 90 degrees to view the vein along its length or in the longitudinal plane. Local anesthetic is given subcutaneously and an i/v cannula inserted at a 30 degree angle to the skin. The catheter is advanced under real time sonographic guidance to traverse the fascia and puncture the vein. As soon as venous flashback is seen, the cannula is threaded over the needle and advanced into the vessel. The entire length of the cannula can be seen inside the lumen of the vein; hence any coiling or kinking of the catheter can be identified. Difficulty in threading the cannula through the skin and fascia can be encountered due to two reasons. Firstly, if there is not enough length of the catheter inside the vein, the cannula may kink in the subcutaneous tissue. Secondly, coiling of the catheter can occur against a valve in the saphenous vein, in which case it can be pulled back and renegotiated under direct vision. Unlike the basilic vein in the upper extremity, the saphenous vein at the level of the calf is not accompanied by any artery; hence accidental damage to other vascular structures is unlikely.

Discussion: Ultrasound guidance for central venous access has been well studied in both the pediatric and adult patient subgroups (1, 2) showing improved success rates and decreased complications compared to a traditional landmark approach. The utility of ultrasound in the placement of peripheral venous access has great potential. Although there have been reports on ultrasound guided cannulation of the brachial and cephalic veins of the upper extremity in adults (3, 4), there is a paucity of such studies in children. Ultrasound guided saphenous vein cannulation has not been studied in the pediatric population. Below the knee, the great saphenous vein can easily be visualized as it originates from the medial marginal vein of the foot and ascends along the medial aspect of the leg. We chose this site because the vein is easy to access and is usually patent here even if it is thrombosed at the ankle. Secondly, the possibility of catheter dislodgement due to ankle movement is minimal at the mid calf level. The longitudinal view of the vein is preferred over a transverse one to allow easy visualization of the advancing needle in real time. We have used these lines for short term access in the perioperative period with no complications so far.

References:
1. Randolph AG. Et al., Crit Care Med 1996
2 Levyi G. et al., Pediatr Anaesth, 2005
3. Sandhu et al., Br J Anaesth 2003
4. Keyes et al., Ann Emerg Med. 1999