CalJEM PEARLS

Ultrasound-Guided Deep Brachial and Basilic Vein Cannulation in the Emergency Department

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INTRODUCTION

Intravenous (IV) access is a common and essential emergency department procedure, which may be challenging in certain patients. Populations notorious for difficult IV access include injection drug users, diabetics, obese patients, or those in hypoperfusion states. Central venous catheter placement becomes the default solution when attempts at peripheral access prove unsuccessful. Yet, many patients do not meet general indications for central venous access, often only requiring brief administration of fluid or medication prior to discharge. Central venous catheterization may also be technically difficult, time consuming, and is associated with a variety of mechanical, thrombotic, and infectious complications.

Deep brachial catheterization offers an alternative method of obtaining IV access. However, landmark-based approaches to the deep brachial vein resulted in frequent complications, including brachial artery puncture, paresthesias, and failure to catheterize the vein.[1] Recently, a novel approach was described using ultrasound to guide deep brachial cannulation. This approach resulted in a 91% success rate, with far fewer complications.[1] Our objective in this CalJEM article is to describe this ultrasound-guided technique, identify the appropriate patient population and indications, and review some shortcomings of the procedure.

METHODS

In general, the ultrasound-guided deep brachial line is used for patients with the following characteristics:

--Require IV access
--Lack discernable IV sites/fail previous IV attempts
--Do not require central venous access

Keyes et al. enrolled 101 ED patients who failed two IV attempts; 50% of the enrolled patients were injection drug users and 20% were noted to be obese. It was also noted that 8% of lines infiltrated or failed within one hour after cannulation; we feel that patients who are admitted or require long-term access should receive a second line.

The materials required for the procedure are the same as standard peripheral IV starts with the exception of 2 items: the ultrasound and the catheter itself. The ultrasound most commonly used at Alameda County Medical Center Emergency Department is the SonoSite *TITAN*. The high resolution 7.5 MHz linear probe should be selected for vascular procedures. Due to the depth of the deep brachial vein, a 1.8", 18- or 20-gauge Angiocath™ IV catheter should be used.

Step 1: Prepare the patient

In order to expose the ulnar aspect of the arm, we have the patient lie in slight Trendelenberg, with their target arm abducted to 90 degrees and flexed at the elbow. The tourniquet is then applied and the skin is cleaned. A small amount of local anesthesia is appropriate.

Step 2: Localize the deep brachial vein with ultrasound

Sterile or K-Y ultrasound jelly is applied to the distal arm, approximately 2-5 cm proximal to the elbow. The linear transducer is then applied. The deep brachial vein is identified as the compressible vascular structure adjacent to the pulsatile and noncompressible deep brachial artery. The basilic vein is identified as a more superficial compressible vascular structure lateral (radial) to the deep brachial vessels. See figure 1.

Step 3: Place the catheter

With the ultrasound probe centered over the target vein, a second person, either nurse or physician, inserts the catheter, using the center of the probe as a guide. The vein can be seen to deform under the pressure of the needle, and spring back when the superficial wall is pierced. A flash of blood should also enter the barrel of the angiocath. See figure 2.

Keyes et al reported a 91% success rate for this procedure in "difficult stick" patients—those who had 2 previous unsuccessful IV start attempts. Seventy-three percent of patients had successful placement on first pass, with only a 2% rate of arterial puncture and 1% rate of paresthesias.[1]

The major caveat associated with the ultrasound-guided deep brachial line procedure is its vulnerability. Keyes et al. reported an 8% incidence of catheter failure after an hour of use. These lines tend to infiltrate or be pulled out easily. The authors hypothesized that this problem is caused either by the proximity of the intravenous sites to the biceps muscle and tendon, or because in very large patients the catheter was too short. Another drawback is that the procedure is most typically performed with two providers. It can be done by a single provider, but patient compliance, adequate anesthesia, and operator familiarity become increasingly important.

CONCLUSION

The ultrasound-guided deep brachial line has become an important option in obtaining intravenous access in our "difficult stick" patients. The deep brachial vein can be easily localized using ultrasound, resulting in a high degree of success, as well as a low complication rate. Furthermore, invasive, time consuming central venous access can be avoided in patients who do not

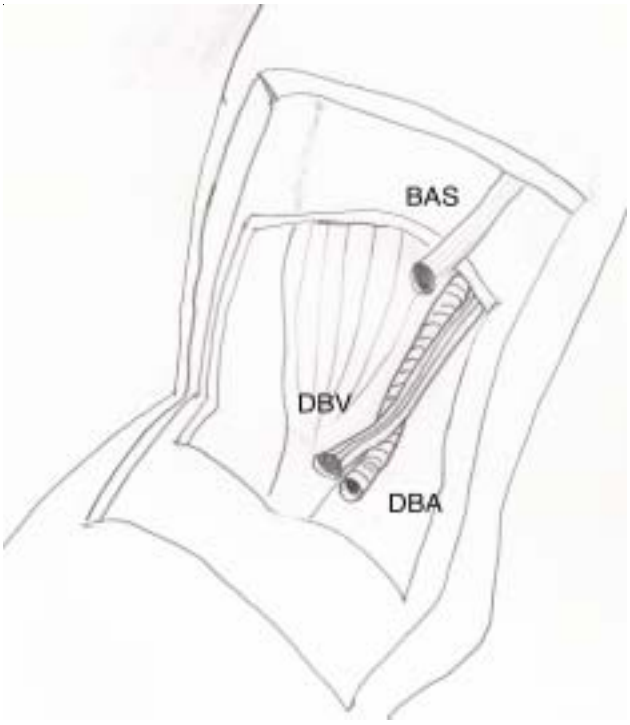

Figure 1. Deep brachial and basilic vein anatomy.

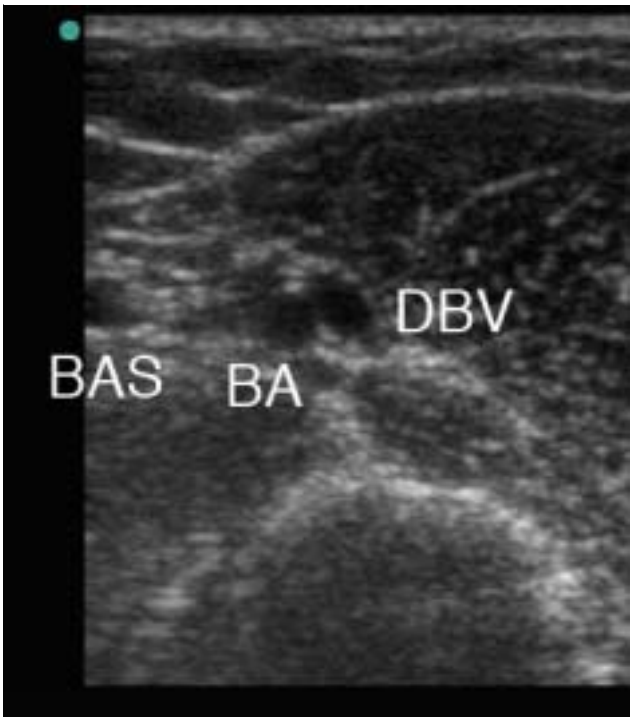

Figure 2. Vein localization by ultrasound.

require CVP monitoring or repeated blood draws, etc. The key points in using deep brachial lines are as follows:

--Special equipment includes high frequency linear transducer and 1.8 inch catheter
--Expose the ulnar aspect of the arm
--Identify the deep brachial vein by its oval shape and compressibility
--The line fails in 8% of patients after 1 hour – plan accordingly

REFERENCE

1. Keyes LE et al. Ultrasound-guided brachial and basilic vein cannulation in emergency department patients with difficult intravenous access. *Ann Emerg Med* 1999;34(6):711-4.