Techniques to Improve Your Vascular Access Ultrasound Skills

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Learning Objectives

• Discuss the use of ultrasound to obtain peripheral access
• Discuss the use of intraosseous catheters to obtain vascular access
• Identify advantages of NIR technology for peripheral venous access
• Discuss problems related to difficult vascular access and ways to help meet your needs

Disclosures

No off label use

Consultant for Bard, Christie Medical, B. Braun, Teleflex

Vascular Access Master

Ultrasound
Near Infrared
Intraosseous
Why this is so Important

• It helps put you in charge
• Allows you to see what your eyes and fingers can’t find
• May help improve efficiency
• DVA is common
• Patient Satisfaction
• Professional Satisfaction

Difficult Vascular Access

• Could be Peripheral, Central, Arterial
• Dependent on factors and dynamic
  – Patient Condition
  – Clinician’s Skill & Luck
  – Equipment Availability
• Easier to describe than define

Why is DVA Growing?

• Hospitalized patients sicker
• People living longer
• Increased use of Peripheral Meds
• Failure to prospectively manage vascular access
• Knowledge gap
DVA PEDIATRICS

- < 6 months
- < 2 - 3 years of age
- Obesity in children
- Dark skin tones
- Edema
- Inability to cooperate

Use of Ultrasound for Difficult Vascular Access

KEY U/S POINTS

- Everyone’s Comfortable
- Optimize Image, Light Touch
- Asepsis
- Shallow Angle of Entry
- Needle Tip Tracking
- 2 Centimeters
- Document Position

How many of you regularly use ultrasound for difficult peripheral IV access?
Patience
• It takes time to achieve proficiency
• To understand ultrasound anatomy
• To develop manual dexterity

Practice
• Use routinely—not just in difficult IV access
  – Start with easier: older children or adult
• Develop efficiency:
  – Develop a rapid access to US machine
  – Have all equipment at stand-by
  – Anticipate needing the machine
  – Pre-scan to find best before you sterilize the site(s)

Optimal Position
• Patient
  – Immobilize or support extremity
  – Make sure comfortable
  – Make sure sustainable
• Screen
  – Operator face the screen neutral position
**Optimal Position**

- **Operator**
  - Do: Arm/hand rest on the patient/bed
  - US barely touching skin
  - Do not: bear your weight on the US probe

**Probe Movements**

- Sliding
- Pressure
- Angling
- Tilting

**Most important to keep track of needle tip at all times!**

**Optimal Probe Position**

- **Angle of Incidence**
  - = the angle at which US beam strikes target
  - Max energy reflected when Incidence = 90°

- **Sonographic Anatomy**
  - Hyperechoic – “white”
    - Vessel wall
    - Nerve
    - Fascia
    - Bone borders
  - Hypoechoic – “Black”
    - Fluid (blood)
  - Below bone is shadow
Acoustic Impedance is important!

- Suboptimal contact with skin affects impedance, which affects image quality
- Air bubble in cover disrupts acoustic energy
- Insufficient gel: Poor probe--skin contact

Thick layer of gel may help reduce compression of superficial vessels

But is a mess when trying to secure a PIV after gaining access

Out-of-Plane vs. In-Plane

Which is better?

“Out of Plane”
Needle is perpendicular to footprint of probe
Problems with Out-of-Plane:
- Hard to know where the needle tip is
- Can't tell needle alignment with vessel
- Requires 3-D planning and reaction

In-Plane:
Needle is parallel to footprint of probe
Problems with In-Plane
- Vessels are not always straight
- Difficult to keep in line with vessel and probe
- Requires a steady hand and subject
Needle angle of approach
Peripheral Vein

30-45 degree

5-15 degree
2 cm
Insertion Process with Needle Tip Tracking

Always Scan First

Identify Optimal Segment

Plan Catheter Position
Plan Catheter Diameter

Need 1 : 3 Ratio

Plan Catheter Length

2 cm

Plan Catheter Length

2 cm

Plan Catheter Length

2 cm
Find Optimal Insertion Site

Place Needle Into Skin = to Depth of Vein from Transducer

Slide Transducer back to Needle Tip to Identify, Then away & advance Needle

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Advance Needle and Find Tip Again

Advance Needle and Find Tip Again
Advance Needle Again and Find Tip Again

Advance Needle Further and Repeat
U/S Summary

- Practice on phantoms
- Light touch, limit compress
- Scan vein for linearity
- Keep track of needle tip
- Use low angles of insertion
- Have at least 2 cm in vessel

Thank You Questions?

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