AEM 2004

Time

Complications

Techs

Nurses

AEM 2007

Satisfaction

Confidence

Sticks
YOU + PATIENT
HEIGHT OF BED

NON-DOMINANT HAND

VIEW SCREEN EASILY
Needle tip visualization during ultrasound-guided vascular access: short-axis vs long-axis approach

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Abstract

Objectives: Ultrasound guidance for central venous catheterization improves success rates and decreases complications when compared to the landmark technique. Prior research has demonstrated that arterial and/or posterior vein wall puncture still occurs despite real-time ultrasound guidance. The inability to maintain visualization of the needle tip may contribute to these complications. This study aims to identify whether long-axis or short-axis approaches to ultrasound-guided vascular access afford improved visibility of the needle tip.

Methods: A prospective trial was conducted at a level I trauma center with an emergency medicine residency. Medical students and residents placed needles into vascular access tissue phantoms using long-axis and short-axis approaches. Ultrasound images obtained at the time of vessel puncture were then reviewed. Primary outcome measures were visibility of the needle tip at the time of puncture and total time to successful puncture of the vessel.

Results: All subjects were able to successfully obtain simulated blood from the tissue phantom. Mean time to puncture was 14.8 seconds in the long-axis group and 12.4 seconds in the short-axis group ($P = 0.48$). Needle tip visibility at the time of vessel puncture was higher in the long-axis group (24/39, 62%) as opposed to the short-axis group (9/39, 23%) ($P = 0.01$).

Conclusions: In a simulated vascular access model, the long-axis approach to ultrasound-guided vascular access was associated with improved visibility of the needle tip during vessel puncture. This approach may help decrease complications associated with ultrasound-guided central venous catheterization and should be prospectively evaluated in future studies.

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1. Introduction

Physicians use ultrasound to facilitate needle placement for a wide variety of procedures, including (but not limited to) central and peripheral venous catheterization, arterial catheterization, regional nerve blocks, paracentesis, thoracentesis, lumbar puncture, pericardiocentesis, and arthrocentesis. Multiple studies have demonstrated an improved success rate and a decreased complication rate for ultrasound-guided vascular access as compared to the traditional landmark technique [1-3]. Complications using ultrasound

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LONG

In plane

SHORrT

Out-of-plane
if you don’t slide or tilt probe away from you

Needle

Lose needle tip

Probe

Skin
ALWAYS
KEEP NEEDLE TIP
BETWEEN
YOU PROBE
A flash does not mean you are done.

Drop hand and advance.
CONFIRM WITH FLUSH
Be OK with failure
David Ortiz’s 54th home run, which set a single-season franchise record.
SNUG

TOURNIQUET 82% > BP CUFF 46%

AJEM 2014
SHALLOW
TREAT LONG CATHETER IVs LIKE PEDIATRIC IVs
CENTRAL

PERIPHERAL
US-GUIDED PERIPHERAL IV

80%

CENTRAL VENOUS ACCESS

ANN EM 2012
TURN HEAD AWAY
SCREEN IN FRONT OF YOU
#3

Redirections

Time

Posterior Wall

Punctures

Crit Care Med 2015
CANNULATE?
CANNULATE?
US vs LM for subclavian access

No difference in complications and no harm in success of studies.

4 studies

#4
Success

Go in-plane

Consider the subclavian
Thanks!

@ PeterEamonn
Subclavian Considerations.....

**RIGHT**
- lower pleural apex
- higher rate of vessel trauma
- higher rate of malposition

**LEFT**
- preferred for immediate cardiac access
- thoracic duct trauma
<table>
<thead>
<tr>
<th>Authors/publication</th>
<th>Type of study</th>
<th>Participants</th>
<th>Enrollment</th>
<th>Operators</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragou et al. 10</td>
<td>Prospective randomized single center</td>
<td>Mechanically ventilated and sedated patients in the medical ICU</td>
<td>LM group: N=201, US group: N=200</td>
<td>Multiple, with more than 6 years of experience in placement of central venous catheters</td>
<td>Increased success rate for experienced operators. Significantly decreased mechanical complications.</td>
</tr>
<tr>
<td>Alic, Y et al. 28</td>
<td>Prospective randomized single center</td>
<td>ICU patients (type of ICU not specified)</td>
<td>LM group: N=35, US group: N=35</td>
<td>One physician experienced in both techniques</td>
<td>No significant difference between success at first attempt, success, or complication rate between LM and US.</td>
</tr>
<tr>
<td>Palepu et al. 29</td>
<td>Prospective randomized single center</td>
<td>Combined medical and surgical ICU Patients</td>
<td>LM group: N=28, US group: N=17</td>
<td>Multiple operators with varying levels of experience</td>
<td>No significant difference between overall success at first attempt (p=0.23) or complication rate (p&gt;0.9).</td>
</tr>
<tr>
<td>Gualtieri et al. 30</td>
<td>Prospective randomized single center</td>
<td>Combined trauma, surgical and medical ICU Patients</td>
<td>LM group: N=27, US group: N=25</td>
<td>More than one operator with varying levels of experience</td>
<td>Increased success rate for inexperienced operators using direct US guidance. Reduced minor complications.</td>
</tr>
</tbody>
</table>

ICU, intensive care unit; LM, landmark; US, ultrasound