Ultrasound Versus the Landmark Technique: Internal Jugular Vein Cannulation in an Intensive Care Unit

Babu Raja Shrestha, MD
Gautam B, MD
Department of Anesthesiology and ICU
Kathmandu Medical College
Kathmandu, Nepal
INTRODUCTION

• common procedure during the management of patients in the intensive and critical care units.

• landmark method is still the technique of choice in many critical care units.

• required for fluid therapy, total parenteral nutrition, administration of cardiotonic vasoactive drugs and for continuous haemodynamic monitoring
With the evolution of newer technology, the blind technique is gradually being replaced by under-vision ultrasound assisted CVC
Objective

The main purpose of this study was to compare the landmark and USG techniques for CVC with regards to:

- Success rate
- Time taken to accomplish the procedure
- Incidence of complications
- Ultrasound Rescue in failed in conventional landmark method.
Methods: This is a prospective randomized comparative study on 120 patients requiring central venous cannulation

- Ethical approval and consent obtained
- The study comprised of two groups: ultrasound and landmark groups, each consisting of 60 patients.
- Exclusion: Age less than 17 yrs and Coagulopathy, infection at the site
Ultrasound

Portable ultrasound:
Superficial linear probe
Freq : 8 MHZ (Toshiba)
Length: 6.5 cm
Ultrasound Group

Transducer placed perpendicular to the vessel at the apex of the triangle formed by two heads of SCM and clavicle on the right side

Oval hypoechoic compressible nonpulsating structure lateral to the common carotid artery

Out of plane method and Scheldinger Technique
Figure 2. IJV in the supine head-down position with a distended larger-diameter IJV
## Demography

<table>
<thead>
<tr>
<th></th>
<th>USG GROUP</th>
<th>LANDMARK GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AGE ,yrs,mean ± SD</strong></td>
<td>39 ± 15</td>
<td>38 ± 15</td>
</tr>
<tr>
<td><strong>SEX (M:F)</strong></td>
<td>31:29</td>
<td>27:33</td>
</tr>
<tr>
<td><strong>MECHANICAL VENTILATION</strong></td>
<td>43%</td>
<td>47%</td>
</tr>
<tr>
<td>Outcome measures</td>
<td>USG group</td>
<td>Landmark group</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>---------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Time taken, min, mean (range)</td>
<td>5.0 (2 - 12)</td>
<td>8.0 (4 - 15)</td>
</tr>
<tr>
<td>1st attempt, n (%)</td>
<td>38 (63 %)</td>
<td>19 (32 %)</td>
</tr>
<tr>
<td>2nd attempt</td>
<td>17 (28 %)</td>
<td>21 (35 %)</td>
</tr>
<tr>
<td>3rd attempt</td>
<td>3 (5 %)</td>
<td>13 (22 %)</td>
</tr>
<tr>
<td>No. of attempts (SD)</td>
<td>1.53 ± 0.725</td>
<td>2.0 ± 0.80</td>
</tr>
<tr>
<td>Overall success</td>
<td>58 (97 %)</td>
<td>53 (88 %)</td>
</tr>
<tr>
<td>Overall failure, n (%)</td>
<td>2 (3 %)</td>
<td>7 (12 %)</td>
</tr>
<tr>
<td>IJV diameter, (mm)</td>
<td>11.20 ± 1.46</td>
<td></td>
</tr>
<tr>
<td>Supine vs. head down</td>
<td>15.05 ± 1.49</td>
<td></td>
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<tr>
<td>Complications, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carotid artery puncture</td>
<td>2 (3 %)</td>
<td>6 (10 %)</td>
</tr>
<tr>
<td>Hematoma</td>
<td>1 (2 %)</td>
<td>5 (8 %)</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Haemothorax</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Catheter related infections</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>
**DISCUSSION**

- 1st attempt success 63% of patients in the USG and 32% in the landmark group in our study
  
  (comparable to the study performed by Denys BG et al).

- Cannulation of the IJV was successful in 97% in the USG group and in 88% in landmark technique in the current study.
  
  (comparable with Palepu GB et al., 98%)
Execution time

5 min vs 8 min (skin puncture to blood aspiration in catheter)

The time consumed for successful cannulations in various studies are different depending upon the number of cases and the expertise of the performers.

Definition of Execution time different in different study

(skin to vein puncture time, not cannulation, Denys BG)
Carotid puncture rate and hematoma were more frequent in the landmark group than in the USG-guided group, p < 0.05 (3% vs 10%)

Carotid puncture: 10-13%   Landmark
8% USG group

(Manfred M BMJ, 2002; 14: 1373-4)
Probable cause of high failure rate in Landmark Group

A short neck, an anteriorly-located vein and a collapsed vein due to hypovolemia could have been the main causes of failure rates and a low success rate at the 1st attempt (31.56 %) in the landmark group in this study.
Limitations

Patient-related factors like Body Mass Index, length and thickness of the neck, and compliance of the patients to the procedure were not included. In addition to these factors, the inability to study the incidence of vascular thromboses is another weakness of the present study.
CONCLUSIONS

USG-guided CVC of the right IJV:

1. Increases success rate

2. Decreases the time required for cannulation

3. Reduces the complications

4. Useful alternative to an unsuccessful cannulation using the landmark technique.


