

Complications during Ultrasound Guided Internal Jugular Vein Cannulation in ICU and OT Patients

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ABSTRACT

This study was carried out in 80 patients admitted in the ICU and OT of IGMC Shimla. They were divided into 2 groups of 40 patients each. Internal jugular venous cannulations were done using ultrasound guided techniques (short axis and long axis view). The complications encountered during cannulation were noted. All the patients from both the groups were successfully cannulated by the operator under ultrasound guidance. Artery punctures occurred in 3 patients which was successfully managed and the cannulations were reattempted and were successful. None of the cannulation was abandoned.

Keywords: ultrasound guided internal jugular vein cannulation, central venous pressure, internal jugular vein cannulation

INTRODUCTION

Internal jugular vein cannulation is a standard clinical method for monitoring central venous pressure, securing vascular access for administering vasoactive drugs, initiate rapid fluid administration. The common complications during central venous access include accidental arterial puncture, hematoma, pneumothorax, catheter related blood stream infections¹. The overall incidence of mechanical complications ranges from 5-19%². The incidence of pneumothorax described in literature is around 1 to 6%³. The infectious complications have been reported in the

range of 5 to 26%⁴. There have also been devastating complications which include accidental puncture of the pulmonary arteries or pericardial tamponade during central venous catheterization⁵.

The use of ultrasound however converts a blind procedure into a procedure under vision, reducing the complication rates markedly. Ultrasound imaging of the internal jugular vein may be oriented along either short axis or long axis. In the short axis approach, both artery and vein can be seen simultaneously and minimum probe adjustment is required. While in the long axis, the operator can visualise the entire length of the needle as it punctures the target vessel.

MATERIAL AND METHODS

The study was carried out in 80 patients admitted in ICU and operation theatres at IGMC Shimla. The patients with indication of CVP catheter insertion and giving consent themselves or by relatives were included in the study. Patients were randomized into 2 groups based on a random allocation number table. Keeping upto 95% confidence levels and 80% power of study, sample size for each group was calculated to be 40. Group A – short axis USG guided approach; Group B- long axis USG guided approach. Patients with distorted neck anatomy, previous neck surgery, prior IJV cannulation, BMI>30/<18 were excluded from the study.

Before cannulation, the baseline vitals of the patients were recorded. After ensuring adequate sedation and analgesia, cannulation of the right IJV was performed using Seldinger technique under USG guidance with either of the technique as per the group of the patient. While cannulation was being performed, an observer unskilled in ultrasound guidance who was unaware of the group allocation observed the procedure and recorded for any complications.

OBSERVATION AND RESULTS

In our study, inadvertent arterial puncture occurred in 3.8% (3) patients. When the artery puncture occurred, the

needle was removed and the insertion site was compressed for 5 minutes. Later the cannulation was reattempted and it was followed by no further complications. All these 3 patients belonged to group B (Long axis). Thus 7.5% (3) patients of the group B had arterial puncture. This was found to be statistically insignificant (p value 0.132).

None of the patients in our study had any pneumothorax as real time USG guided cannulation was done with proper visualization of the surrounding anatomical structures.

Also there was no wound sepsis in any patient as proper aseptic measures were taken before attempting cannulation.

COMPARISON OF ARTERIAL PUNCTURE

| | | | GROUP | | Total | P value |
|-------------------|----------------|----------------|--------|--------|-------|---------|
| | | | A | B | | |
| ARTERIAL PUNCTURE | nil | Count | 40 | 37 | 77 | 0.132 |
| | | % within GROUP | 100% | 92.5% | 96.25 | |
| | yes | Count | 0 | 3 | 3 | |
| | | % within GROUP | 0.0% | 7.5% | 3.8% | |
| Total | Count | 40 | 40 | 80 | | |
| | % within GROUP | 100.0% | 100.0% | 100.0% | | |

DISCUSSION

In our study inadvertent arterial puncture occurred in 3 (7.5%) patients of the long axis group while no patient in the short axis group had arterial puncture or any other complication. This may be attributed to the fact that there would be no arterial puncture if both the artery and vein are seen simultaneously as in short axis view. But using long axis view, the location of the carotid artery relative to the internal jugular vein may be lost and thus correct identification of the single vessel becomes difficult.

Our study was similar to the study done by Chittoodan S⁶ in which 4% of the patients in the long axis group had inadvertent arterial puncture. This was explained by the fact that the operator in their study had less experience in long axis approach cannulation compared to short axis view.

Our study was however dissimilar to the study done by Chaudhary MS et al⁷. In this study, 4 out of 25 patients in short axis

group had arterial puncture. There was no arterial puncture in the long axis group.

Similar study was conducted by Tammam TF et al⁸ in which only one patient in the short axis group and 7 cases in the landmark technique had artery punctures. One patient in the long axis group had pneumothorax. While in our study, 3 patients from the long axis group had artery punctures. None of the patient had pneumothorax. This difference can be explained as their study was performed by well trained anesthetists, nephrologists with ten years experience in IJV cannulation and our study was performed by 2nd and 3rd year residents under the supervision of consultants.

Another study was done by Michael B Stone et al⁹ in which they found that USG guided cannulation by short axis approach may lead to posterior wall punctures as operator may lose the track of the needle and cause artery puncture.

CONCLUSION

In our study, we were able to cannulate all the patients using USG guidance. Although complications have occurred in three patients but this number was small enough to be statistically significant as per the sample size. This is explained by the fact that we have done internal jugular vein cannulations under ultrasound guidance (short axis view and long axis view) in our patients. Ultrasound definitely proves to be highly useful in IJV cannulations by significantly decreasing the number of complications.

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Ethical Approval: Approved

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