

Comparing 1st Pass Success Rate and Number of Attempts for Internal Jugular Vein Cannulation by USG Guided Approach: Short Axis versus Long Axis Technique

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ABSTRACT

The study was carried out in 80 patients admitted in ICU and OT at IGMC Shimla. Patients were divided into 2 groups:- group A (short axis) and group B(long axis) of 40 patients each. Internal jugular vein cannulation was done under USG guidance using the two techniques. We were successfully able to cannulate all the patients. We obtained vascular access with higher first pass success and less number of needle passes using short axis approach compared to long axis.

Keywords: internal jugular vein cannulation, USG guided approach, short axis versus long axis technique, Central vein catheterization

INTRODUCTION

Central vein catheterization is an integral part of invasive monitoring and management in the modern era. It is the standard clinical method for monitoring central venous pressure, therapeutic interventions like securing vascular access for administration of vasoactive drugs or to initiate rapid fluid resuscitation. The internal jugular vein route for central venous access has been described as early as in 1966 by Hermosura¹ and coworkers. IJV cannulation using USG guidance has become a common practice as it provides improved safety profile². It has been found that USG

guidance could improve the success rate, reduce the number of needle passes and decrease complications³.

The use of ultrasound converts a blind procedure into a procedure under vision, improving the success. 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 visualize the entire length of the needle as it punctures the target vessel. Using the long axis view, information regarding the location of the carotid artery relative to the internal jugular vein may be lost.

MATERIAL AND METHODS

The proposed 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 their 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 the following information:-

- First pass success
- Total number of needle passes (number of times needle was withdrawn and redirected).

OBSERVATION AND RESULTS

Comparison of first pass success:

In both the groups, our success rate of IJV cannulation was 100% in all the patients. From both the groups, 48.8% (39) patients were cannulated in first attempt. In group A first attempt success was achieved in 72.5% (29) patients, while in group B first attempt success was achieved in 25% (10) patients, p value of 0.000 which was found to be statistically significant. Thus the first pass success rate was significantly higher in group A (short axis) comparing to the group B (long axis). This may be because in short axis view both the artery and vein are seen simultaneously on the screen and thus during cannulation, hand eye coordination becomes much easier enabling high first pass success rate in cannulation.

Comparison of number of needle attempts for CVP insertion:

In group A, first attempt cannulation was successful in 72.5% (29) patients, while second attempt was needed in 27.5% (11) patients. No third attempt was needed in group A patients. The mean number of needle attempts was 1.27 ± 0.45

Whereas in group B, first attempt cannulation was successful in 25% (10)

patients, second attempt in 50% (20) and third attempt was needed in 25% (10) patients. Mean number of needle attempts was 2.00 ± 0.72 . This difference was found to be statistically significant (p value < 0.0001). Thus the mean number of needle passes was significantly lesser in the short axis group when compared to the long axis.

DISCUSSION

The number of needle passes was significantly lower and the 1st pass success rate was significantly higher in the short axis view as compared to the long axis. This may be because in short axis view both the artery and vein are seen simultaneously on the screen and thus during cannulation hand eye coordination becomes much easier enabling high first pass success in cannulation. While long axis view needs more hand eye coordination as single vessel is seen and cannot be compared with the adjacent vessel. Some time is consumed to confirm whether the vessel is an artery or vein. Therefore the long axis approach becomes technically more difficult.

Our study is similar to the study done by Chittoodan S et al⁴. In their study, 98% of the patients of short axis group were cannulated in 1st attempt, while 78% of the patients of long axis group were cannulated in 1st attempt. Remaining patients required 2nd attempt. No third attempt was required. While in our study, 3rd attempt was required in 25% patients of long axis group.

Our study is also in accordance to the study done by Chaudhary S et al⁵ They found that in short axis approach 19 out of 25 patients (76%) and in the long axis approach 23 out of 25 patients (92%) were successfully cannulated in 1st attempt. While 2nd attempt was needed in cannulating 2 patients in long axis approach and 6 patients in short axis approach. These findings were comparable to our study.

Similarly a study was conducted by Tammam TF⁶ et al in 90 patients in which they compared USG guided short axis and long axis view with the landmark technique. This study revealed no major difference in

short axis (1.13) and long axis (1.17) for mean number of attempts but for the landmark technique, number of attempts were 2.47 ($p < 0.001$) much higher than USG guided approaches.

Our study is also in accordance with the study done by Blavias et al⁷. In their study, mean number of attempts in short axis was 4.18 and in long axis was 5.76. Though it was statistically not significant (p value 0.490) but was similar to our study in which also mean number of needle prick attempts were more in long axis compared to short axis view.

In a study conducted by Shreshta S et al⁸, 37(90.2%) patients of the short axis group were cannulated in 1st attempt while 4(9.8%) patients needed 2nd attempt. In the long axis group, 38(92.7%) patients were cannulated in 1st attempt, 3(7.3%) patients required 2nd attempt. This difference was not statistically significant. While in our study, we found statistically significant difference between the 2 groups in terms of first pass success and total number of needle passes.

CONCLUSION

In our study, all the patients from both the groups were successfully cannulated. Thus the incidence of successful cannulation was 100%. The first pass success rate was found to be significantly higher in short axis group compared to long axis group. Also the mean numbers of needle attempts were found to be less in short axis group compared to the long axis group. We obtained vascular access with higher first pass success and less number of needle attempts using short axis approach compared to long axis.

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