

STUDY ON COMPARISON BETWEEN LANDMARK GUIDED (BRINKMAN'S TECHNIQUE) AND ULTRASOUND GUIDED INTERNAL JUGULAR VEIN CANNULATIONK. Vinod¹, Sashi Walling T²**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: Technique of cannulating the central veins, until recently has been based on landmark guided technique. Recently ultrasound machines with high frequency probes are being used to increase success rate and reducing complications. **OBJECTIVE:** In our study we compare landmark guided technique (Brinkman's technique)⁽¹⁾ with ultrasound guided technique. **STUDY DESIGN:** outcome was evaluated in terms of 1) Number of attempts 2) Access time 3) mechanical complications 4) success rate. **RESULTS:** Access time was reduced and high success rate was recorded in ultrasound guided group and the complication rate was considerably low in the same group. Hence ultrasound guided cannulation is comparatively superior to landmark guided cannulation.

KEYWORDS: Brinkman's technique, Landmark guided technique, Ultrasound guided technique, Internal Jugular Vein.

INTRODUCTION: Catheterization of internal jugular vein is commonly performed to obtain central venous access for hemodynamic monitoring, long term fluid administration, administering antibiotics, total parenteral nutrition and hemodialysis. Successful puncture of IJV is routinely achieved by using anatomical landmark on the skin surface and then passing the needs along the anticipated course of vein. Many landmark guided techniques are described since 1966.

High approaches:

1. Boulanger et al⁽²⁾ 1976.
2. Mostert et al⁽³⁾ 1970.
3. Vaughan and Weygand⁽⁴⁾ 1973.
4. Prince et al.⁽⁵⁾
5. Civetta et al⁽⁶⁾ 1972.
6. Brinkman and Costly⁽¹⁾ 1973.
7. Hall and Geefhuysen et al⁽⁷⁾ 1977.

Low approaches:

1. Jernigan et al⁽⁸⁾ 1970.
2. Daily et al⁽⁹⁾ 1970.
3. Rao et al.⁽¹⁰⁾
4. English et al⁽¹¹⁾ 1969.
5. Hall and Geefhuysen et al⁽⁷⁾ 1977.

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Complications including deaths are influenced by patient factors such as BMI, site used for cannulation and operator's experience.⁽¹²⁾ Several study have shown that USG guidance is beneficial in placing central venous catheters by improving the success rate, reducing the number of needle punctures and by decreasing complications. Also employment of ultrasound imaging may identify patients in whom consequence of complication could be more serious. Although USG method has been compared favorably with landmark technique its widespread use is hampered by the unavailability of equipment and lack of trained personnel. As it is one of the emerging technologies in our set up this study therefore was designed to compare the ultrasound guided approach with landmark guided approach of IJV cannulation.

MATERIALS AND METHOD: PATIENTS: This is a prospective study conducted from March 2014 to December 2014. Forty patients undergoing major gastrointestinal surgeries requiring CVP monitoring were included in the study. After obtaining written informed consent, patients were randomly assigned into two groups on a one to one ratio:

- a. Landmark guided group (LMG).
- b. Ultrasound guided group (USG).

The right IJV cannulation was attempted after inducing general anesthesia in both the groups.

Landmark Guided Method: Patients were placed in supine position with a slight head down tilt and face turned towards opposite side. The junction of the external jugular vein and sternomastoid muscle was noted. Under strict aseptic precautions, the skin was prepared with povidone iodine solution. A 22 guage finder needle with a 2cc syringe filled with saline was passed beneath the sternomastoid muscle with the needle directed towards the suprasternal notch. Return of venous blood back into the syringe by aspiration confirmed entry of needle into the vein. The finder needle was used as a guide for a 19 guage 10 cm cannulation needle which was connected to a 5 cc syringe filled with saline. Then the vein was cannulated by modified Seldinger's technique with a 16 cm 7 Fr triple lumen catheter.⁽¹³⁾

Real Time Ultrasound Guided Method: The neck was painted and draped with patient in supine position as described earlier. A standard two dimensional real time B mode imaging obtained with a portable unit and 7.5 MHz linear array ultrasound probe covered with gel and wrapped in a sterile sheath. The probe was placed above the junction of EJV and the sternomastoid. The depth, caliber, patency, compressibility of the IJV and presence of thrombi were noted. The cannulation needle was inserted beneath the sternomastoid under ultrasound guidance. The vein was cannulated by modified Seldinger's technique.

Successful placement was confirmed by a check x-ray.

Mechanical Complications were defined as:

1. Carotid artery puncture—defined as forceful pulsatile expulsion of bright red blood from the needle.
2. Hematoma.
3. Hemothorax.
4. Pneumothorax.
5. Catheter malposition.
6. Double wall puncture.

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Data Collection and Statistical Analysis: Forms containing patient's characteristics, method of cannulation and presence of risk factors for difficult cannulation were noted. The outcomes assessed were:

1. Access time-Time between skin penetration and aspiration of venous blood into syringe. It was measured in seconds.
2. Average number of attempts- Defined as separate skin punctures.
3. Rate of mechanical complications.

In case of multiple attempts the access time was calculated as follows. The time Interval of each attempt that is from skin puncture to withdrawal were added together to derive the fixed access time.

RESULTS: Baseline characteristics in either group were comparable with no significant difference in terms of age, gender, BMI, side of cannulation and risk factors for difficult cannulation. The results using the landmark technique are in sharp contrast to those obtained by ultrasound technique. The access time and number of attempts were significantly reduced with ultrasound guided technique. The rate of mechanical complications was higher in landmark guided group when compared to ultrasound group ($p < 0.05$).

Outcome measures in the ultrasound group versus the landmark group of patients.

Outcome measured	USG group	LM group
Access time(seconds)	9.85(+/-) 1.98	16.22(+/-) 2.37
Success rate	20(100%)	18(90%)
Carotid puncture	0(0%)	4(20%)
Double wall puncture	1(5%)	3(15%)
Hematoma	0(0%)	2(10%)
Hemothorax	0(0%)	0(0%)
Pneumothorax	0(0%)	0(0%)

Table 1

Group	Mean	SD	P value
US group	9.80	1.98	<0.001
LM	16.20	2.37	

Table 2: Access time

Group	No complications	DWP	Carotid puncture	Hematoma	Row total	P value
US group	19 95.0 63.3	1 5.0 25.0			20 50.0	0.027
LM group	11 55.0 36.7	3 15.0 75.0	4 20.0 100.0	2 10.0 100	20 50.0	
Column Total	30 75.0	4 10.0	4 10.0	2 5.0	40 100.0	

Table 3: Complications

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DISCUSSION: Landmark guided techniques have been associated with variable success rate and higher incidences of mechanical complications. This has been analysed and shown to depend upon two factors:

- i. Operators experience.
- ii. Patient factors.

In the study conducted by Dimitrios Karakitsos et al⁽¹³⁾ Access time in landmark group was 44.05 seconds compared to 17.1 seconds in ultrasound guided group. Success rate was 95.25% in landmark guided group compared to 100% in ultrasound guided group. The incidence of mechanical complications was 5-19% in landmark guided technique whereas the incidence in ultrasound guided group was less than 1%. The average number of attempts was 2.6 in the landmark guided group when compared to 1.1% in the ultrasound guided group. In the study conducted by Frantz.T.Gibbs et al⁽¹⁴⁾ the incidence of mechanical complications was 5% in the ultrasound guided group whereas the incidence of mechanical complications in landmark guided group was 40%. National Institute of Clinical Excellence⁽¹⁵⁾ (NICE) recommends that ultrasound guidance is mandatory for all central venous cannulation.

In the study conducted by Dr. R. M. Sharma⁽¹⁶⁾ the overall success rate in ultrasound guided group was 98% and complication rate was 2% and the success rate and complication rate in landmark guided group was similar to that seen in other studies. Real time ultrasound guided central venous cannulation provides the operator with visualization of the desired vein and surrounding structures prior to and during the insertion of the catheter. This method appears to improve the success rate and decrease the complication rate associated with central venous catheter placement. Hence the ultrasound guidance, definitely improves accuracy and reduces the complication and access time. The only drawback in its usage is lack of trained personnel and its availability.

CONCLUSION: Ultrasound guided technique for central venous cannulation is most accurate and safest technique as,

1. It improves success rate.
2. Reduces complications.
3. Reduces access time and number of attempts.
4. Helps in identifying thrombi.

BIBLIOGRAPHY:

1. Brinkman; A. J and Costley, D.O (1973) "internal jugular venipuncture" Journal of American Medical Association 223, 182. rakitsos et al- Re.
2. Boulanger. M. Delva, E. Maelleet, J.G and Payment B (1976). "Unenouvelle void d abord de la veins jugulaire interne" Canadian Anesthetist Society Journal 23, 609.
3. Mostert, J. W., Kenny, G. M., and Murphy, G.P (1970) "Safe placement of central venous catheter into internal jugular veins, Archives of Surgery, 101, 431.
4. Vaughan, R. W. and Weygandt, G.R (1973) "Relaible percutaneous internal jugular cannulation" Archives of Surgery 101, 534.
5. Prince S. R. Sullivan, R. L., and Hackel, A. (1976) "Percutaneous internal jugular vein cannulation in infants and children" Anaesthesiology, 44, 170.
6. Civetta, J. M. and Gobel, J. C. (1972) "Flow directed pulmonary artery catheterization in surgical patients" Annals of Surgery 176, 753.

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7. Hall, D. M. B and Geefhysen. J (1977) "percutaneous catheterization of internal jugular vein in infants and children". Journal of Pediatric Surgery 112-191.
8. Jernigan; W. R, Garden, W. C., Mahr M.M and Millburn (1970) "use of the internal jugular vein for placement of central venous catheter" Surgery, Gynecology and Obstetrics 130, 520.
9. Daily P. O. Griep, R. B., and Shumway, N. C. "Percutaneous internal jugular vein cannulation" Archives of Surgery, 101-534.
10. Rao, T. L. K., Wong A.Y., and Salem M.R (1977) "A new approach to percutaneous catheterization of internal jugular vein" Anaesthesiology 46-362.
11. English; I. C. W., Frew, R. M., Pigoh. J. F., and Zakim (1969) "percutaneous catheterization of internal jugular vein" Anaesthesia 24, 521.
12. Ayalon, A., Manner., H., Berlatzky, Y., and Schiller, M. (1978) "A live threatening complication of the infusion pump" Lancet 1, 853.
13. Dimitries Ka al time USG catheterization of IJV- A prospective comparison with the landmark technique in critical care patients- Critical Care 2006 17 November 2006-62.
14. Grants T. Gibbs M. D, FACEP, Michael C Murphy March (2006) US guidance for CVC placement. Hospital Physician March 2006 page no23-31.
15. National Institute for Clinical Excellence on the use of the ultrasound locating devices for placing center venous catheters. NICE technical report No. 49; 2002.
16. R. M. Sharma et al. Ultrasound guided central venous cannulation. MJA AFI 2006; 62: 371-372.



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AUTHORS:

1. K. Vinod
2. Sashi Walling T.

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Anaesthesiology, Shri Sathya Sai Medical College & Research Institute, Tamilnadu.
2. Assistant Professor, Department of General Surgery, Shri Sathya Sai Medical College & Research Institute, Tamilnadu.

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NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. K. Vinod
New No. 4, Old No. 32,
Second Main Road,
M.G.R Nagar, Velachery,
Chennai-600042.
E-mail: vinodkrishnagopal@gmail.com

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