

# Safe and easy method with little modification in technique is useful for successful internal jugular vein cannulation on same side even after intra-arterial puncture without using ultrasound guidance in adult cardiac patients

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## ABSTRACT

**Background:** The modification in technique is useful for successful right-sided internal jugular vein (IJV) cannulation on the same side even after intra-arterial puncture without using ultrasound guidance in adult patients. **Materials and Methods:** This study was carried out in total 160 adult patient from American Society of Anesthesiologists Grade II to III patients male ( $n = 95$ ) and female ( $n = 65$ ) who underwent cardiac surgery where cannulation was done on right sided by triple lumen catheter (7 French) using Seldinger technique. **Results:** Majority of patients were cannulated successfully by Seldinger technique with single or double attempt except for five patients in which arterial puncture occurred. All five patients were cannulated successfully on the same side with this modified technique without any significant major complications. They were managed by application of blocker at the end of arterial needle puncture without removing it. In our routine practice, we were used to removing this needle and applying compression for few minutes to prevent hematoma formation after an arterial puncture. In this study, cannula was used as a marker or guideline for the relocation of IJV on the same side and recannulation was performed by changing the direction of needle on same side lateral to the previous one and without going towards the same direction to prevent the arterial puncture again. **Conclusion:** Most simple and useful modified technique for institutes where the complications are most common with trainee doctors and in hospitals where there is no advanced facility like ultrasound-guided cannulation available. By this modification, it will be time saving, very comfortable, and user-friendly technique with high success rate.

**Key words:** Cardiac surgery; Internal jugular vein cannulation; Seldinger technique

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## INTRODUCTION

The central venous cannulation which is a blind procedure was first introduced in 1966, and usually, it is carried out on right sided of neck based on anatomical landmark theory.<sup>[1]</sup> This right-side cannulation is having a high success rate ranging from 85 to 95% because of our routine practice and the situation of anatomical structures in the neck. The usual complication rate is 6–12% of which the

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rate of intra-arterial puncture is 2–3%.<sup>[2]</sup> This rate of complication is dependent on various factors such as site, size of cannula, use of check puncture technique with 23 gauge needle, number of attempts, expertise and skill of consultants, availability of facility such as ultrasonography (USG) guidance, attempt by junior or seniors, and use of various different approaches for IJV cannulation.

The success rate of internal jugular vein (IJV) cannulation is inversely proportional to, and its complication is directly proportional to the number of attempts.

The cannulation is routinely carried out using Seldinger technique and anatomical landmark method which is a triangle formed by the meeting point of two heads of sterno-cleido-mastoid muscle and base is formed by clavicle.<sup>[3]</sup> Sometimes, we feel the carotid artery pulsation and the puncture site is decided just lateral to the pulsation in obese patients or in a patient with thyroid swelling where disease is under control.

The use of this central venous cannulation is very important in all major surgeries for hemodynamic monitoring as well as to give intravenous drugs, total parenteral nutrition, or infusion of fluids such as crystalloid or colloids including blood and its products.<sup>[4]</sup>

## MATERIALS AND METHODS

With the consent of all the patients and the permission from ethics committee of Institute, we carried out this study in total 160 adult cardiac patient with mean age of 46.32 years with 13.41 standard deviation (SD), American Society of Anesthesiologists Grade II to III, nondiabetic and nonhypertensive - male 95 (59.37%) and female 65 (40.62%) [Table 1]. Patients underwent almost all routine cardiac surgeries during the last 6 months by triple lumen catheter insertion [Figure 1 and Table 2]. All the patients were assessed for the status of carotid artery, atherosclerosis by Doppler study and procedure was not conducted in patients with carotid atherosclerosis.

All the patients were cannulated for right sided IJV cannulation after giving general anesthesia according to our standard protocol of induction (midazolam, fentanyl, and vecuronium bromide according to body weight dose calculation). All were positioned in 15–30° trendelenburg position with the head turned to the left side and cannulation was performed by maintaining

**Table 1: Demographic data**

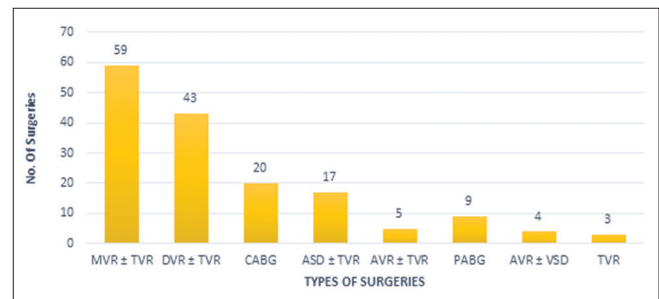
	Mean±SD	Range
Age (years)	46.32±13.41	18-62
Weight (kg)	-	38-86

SD: Standard deviation

**Table 2: Types of surgery**

Name of surgery	Numbers	Percentage
MVR±TVR	59	36.87
DVR±TVR	43	26.87
CABG	20	12.5
ASD±TVR	17	10.62
AVR±TVR	5	3.12
PABG	9	5.62
AVR±VSD	4	2.5
TVR	3	1.87

TVR: Tricuspid valve replacement, AVR: Aortic valve replacement, VSD: Ventricular septal defect, CABG: Coronary artery bypass grafting, PABG: Pulmonary artery bypass grafting, ASD: Atrial septal defect



**Figure 1: Types of surgery**

strict aseptic precautions throughout the procedure. This cannulation was done as per anatomical landmark and using Seldinger technique [Figure 2].

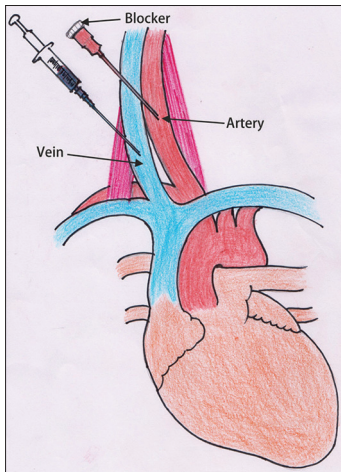
The cannulation was performed by a senior resident under supervision and by the consultant when they failed to locate the vein after 2–3 trials or immediately once complication such as arterial puncture happened.

## Statistical method

Data are presented as mean ± SD and number of patient presented with (n). P value was considered statistically when <0.005.

## RESULTS

We were successful in 155 (96.87%) patients for right sided IJV cannulation out of 160 patients with a single or a double attempt. In five patients (3.13%) we had intra-arterial puncture during this cannulation which was managed by our mentioned modified technique. In this technique, we did not remove the cannula/

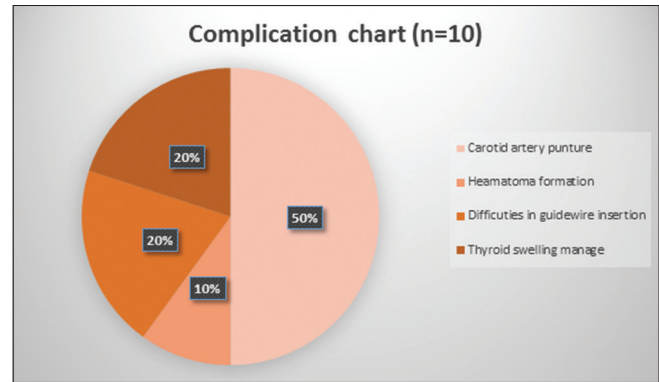


**Figure 2:** Modified technique of internal jugular vein cannulation in case of arterial puncture

needle (16 gauge) but kept this cannula *in situ* and applied a blocker at the distal open end to prevent the external bleeding. All extra care was taken for security and stability of this needle so that if arterial puncture was to happen it would prevent accidental misplacement and bleeding which will be helpful to prevent hematoma formation. We took another needle or cannula (16 gauge) and relocated the IJV by puncturing in a lateral direction to this cannula without going in the same direction to prevent the repeated intra-arterial puncture [Figure 2]. We achieved successful venous cannulation on the same side in all five patients even after arterial puncture. In all these five patients, we applied compressive sticking plaster to prevent rebleeding which may happen after giving partial or full dose of heparin in the intraoperative period. All patients were observed for hematoma formation till IJV cannula was removed in surgical intensive care unit and confirm the position of triple lumen in all the patients by X-ray chest anterior-posterior in the postoperative period which is a routine protocol in our institute. We also monitored these patients for detection of any other complications like pneumothorax etc., [Figure 3 and Table 3].

## DISCUSSION

In our routine practice, we are managing these kinds of complications by removing the cannula or needle and applying appropriate pressure at puncture site for 10–15 min or till it hemostasis. Sometimes it is a very difficult to relocate IJV on the same site due to hematoma formation or disturb anatomy due to it. This is also very difficult situation if you do not have facility of USG machine where one can get the guideline to detect the IJV under its guidance.



**Figure 3:** Complications

**Table 3: Complications**

Complications	Numbers	Percentage
Carotid artery puncture	5	50
Hematoma formation	1	10
Difficulty in wire insertion	2	20
Management of thyroid swelling	2	20

Using this technique, we found the prevention of hematoma formation, it is time saving and very easy to relocate the IJV on the same site without help of USG machine with high success rate.

The right IJV is preferred due to large diameter and straight course to right atrium than the left IJV. An alternative technique is available like left sided IJV cannulation or right/left femoral artery cannulation, but left sided IJV needs requires more skill and technical expertise. This insertion may be difficult due to the anatomical course on left side and high chances of complication like-arterial puncture or trauma to the thoracic duct.<sup>[4-6]</sup> By changing the site and place does not guarantee for possibility of intra-arterial puncture of arterial puncture and if same complications happens in alternative technique then there has to be some alternative or modification which can help us in difficult situations. In cardiac surgery there are lots of innovation such as minimal invasive surgeries, transcatheter aortic valve implantation, or thoracotomy, but there is a limitation for cardiac anesthetist to get femoral site for central venous cannulation. Because of this limitation, there is a need of some kind of modification that is needed to overcome such kind of problems on any site. This technique is very well useful where the facility of USG machine is not available which is expensive, time consuming, requires skill and expertise and in emergency situation due to limitation of time factor.

This technique is more advantageous if IJV cannulation is required under local anaesthesia where it is difficult

to apply appropriate pressure after arterial puncture in a patient who is conscious but uncooperative or is in semiconscious state. Prevention of intraarterial puncture requires proepr positioning of the patient and identification of proper anatomical landmarks for IJV cannulation. Use of check puncture technique by 24 G needle 1.5 inch for location of IJV is essential, whwenever ultrasound guided IJV cannulation is not available.

## CONCLUSION

This is most easy and useful modified technique in teaching institutes where this type of complication is common with trainee doctors and in the place where the facility of USG machine is not available. This technique will be helpful to prevent hematoma formation, is time saving, very comfortable, smooth as well as user-friendly to perform with high success rate.

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## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Sznajder JI, Zveibil FR, Bitterman H, Weiner P, Bursztein S. Central vein catheterization. Failure and complication rates by three percutaneous approaches. *Arch Intern Med* 1986;146:259-61.
2. McGee DC, Gould MK. Preventing complications of central venous catheterization. *N Engl J Med* 2003;348:1123-33.
3. Tempe DK, Virmani S, Agarwal J, Hemrajani M, Satyarthi S, Minhas HS. The success rate and safety of internal jugular vein cannulation using anatomical landmark technique in patients undergoing cardiothoracic surgery. *Ann Card Anaesth* 2013;16:16-20.
4. Hermosura B, Vanags L, Dickey MW. Measurement of pressure during intravenous therapy. *JAMA* 1966;195:181.
5. Ishizuka M, Nagata H, Takagi K, Kubota K. Right internal jugular vein is recommended for central venous catheterization. *J Invest Surg* 2010;23:110-4.
6. Sulek CA, Blas ML, Lobato EB. A randomized study of left versus right internal jugular vein cannulation in adults. *J Clin Anesth* 2000;12:142-5.