Original Article

Open Access

# A Comparison Of Internal Jugular Vein (DV) Cannulation By Usg And Anatomical Landmark Technique In Emergency Setting

Muhammad Omer Ajmal,[1] Muhammad Aslam Khan,[2] Zuraira Mujahid,[3] Rashid Minhas,[4] Aakif Yousaf,[5] Hafiz Muhammad Amjad[6]

**ABSTRACT**

**BACKGROUND & OBJECTIVE:** In recent times, using ultrasonography either in pre-insertion or in real time is accepted as remedy to reduce failure and malposition rate. It has been suggested that ultrasound guidance could improve the success rate, reduce the number of needle passes, and decrease complications. The objective of this study was to compare the technique for internal jugular vein cannulation by landmark (LM) and ultrasound guided (UG) in Emergency department patients.

**METHODOLOGY:** It was comparative study conducted at the Department of Anesthesiology, Sahiwal Teaching Hospital, Sahiwal from 22nd March 2023 to 21st September 2023.

A total of 130 patients of ≥18 years of age of either gender posted emergency surgeries were included. Skin inflammation or burn at insertion site, altered coagulation profile (platelet count<50,000 per cu mm, INR > 1.5), known bleeding disorders, prior catheterization, subcutaneous emphysema and patients undergoing radiation therapy were excluded. In group A, Ultrasonography-guided (UG) technique was applied. In group B, Anatomical landmark (LM) technique was applied. Standard triple lumen CVC was used for cannulation in all patients. The position of the CVC was confirmed by a chest radiograph at the end of the procedure. The real-time USG-guided technique was performed with a single dedicated USG machine and a 6-13 MHz linear probe for the entire duration of the study.

**RESULTS:** In this study, average number of attempts 1.79 ± 0.71 in land mark group (LM) and average number of attempts 1.32 ± 0.47 in Ultrasound guided group (UG). Access time was 164.51 ± 9.14 seconds in LM group and 87.32 ± 8.54 seconds in US group.

**CONCLUSION:** This study concluded that ultrasound guided (UG) technique for internal jugular vein cannulation is better (less number of attempts and access time) than landmark (LM) technique in Emergency department patients.

**KEY WORDS:** Internal jugular vein cannulation, Landmark (LM) technique, Ultrasound guided.

***How to cite:*** *Ajmal MO, Khan MA, Mujahid Z, Minhas R, Yousaf A, Amjad HM. A Comparison Of Internal Jugular Vein (DV) Cannulation By Usg And Anatomical Landmark Technique In Emergency Setting. J Allam Iqbal Med Coll. 2026; 24(3): 61-66*



## INTRODUCTION

Securing a central venous access is a fundamental clinical skill for managing patients in a wide variety of clinical situation in the operation theatre and the ICU for CVP monitoring, administration of fluids and cardiac supports, giving parenteral nutrition, hemodialysis, chemotherapy or due to difficulty in securing a peripheral venous access. Although a fairly common procedure, success in it requires knowledge of relevant anatomy, clinical condition and existing comorbidities also need to be kept in mind.[1-3]

The veins that are usually cannulated are the internal jugular veins (IJV) in the neck, the subclavian veins under the clavicles and the femoral veins under inguinal ligaments, depending on the situation, need, indication and patient characteristics.[4] Cannulation of the IJV is usually preferred because of its minimal complications, anatomical position and large diameter in the Trendelenburg position. Also, the minimal likelihood of an obstruction along its route to the right atrium facilitates the introduction of various sizes of catheters.[5] Traditionally, central venous catheterization is performed by using the anatomic landmark technique and there are many descriptions since 1966.[6] Although the anatomical landmark techniques have been validated by various studies, they present quite a few mechanical complications during insertion. These complications include accidental carotid artery puncture, local hematoma formation, surrounding tissue damage and pneumothorax. Injuries to the brachial plexus, recurrent laryngeal nerve, cervical sympathetic chain and tracheal puncture are other less frequently encountered complications.[7]

The benefits of ultrasound (US) guidance for locating the central veins was recognized as far back as 1978, the first report of ultrasound-guided CVC came into existence in 1987.[8] In recent times, using ultrasonography either in pre-insertion or in real time is accepted as remedy to reduce failure and malposition rate.[9] It has been suggested that ultrasound guidance could improve the success rate, reduce the number of needle passes, and decrease complications. The use of ultrasound enables visualization of the targeted venous vessel and its anatomical relationship with surrounding structures and with the needle for catheterization. It allows detection of

**Correspondence:**
Dr Muhammad Omer Ajmal
Associate Professor, Department of Anesthesiology, Sahiwal Medical College, Sahiwal.
Email: docomer786@gmail.com

* Received for Publication: June 18, 2026
* Revision Received: September 10, 2026
* Accepted for Publication: September 17, 2026

anatomical variations like vein and artery transposition and overlap.[10] The use of ultrasound also enables visualization of correct position of vein, its size, patency and eventual thrombosis, which is especially useful in patients with difficult anatomical characteristics such as morbid obesity, cachexia and scars on the skin at the puncture site.[11] Despite such advantages, ultrasound's widespread use has been hampered by the unavailability of equipment, added cost and the lack of trained personnel.[12]

In a study, Average number of attempts 1.42 ± 0.92 in land mark group (LM) and average number of attempts 1.08 ± 0.33 in Ultrasound guided group (UG).[13] Access time was 185 (97.36%) in LM group and 95 ± 136 in US group. Aim of the study to measure and compare the success rate, time to completion, number of central venous access attempts, and acute complications during IJV catheterization by the (LM) technique and real-time USG-guided (UG) technique in emergency department (ED) setting. Although several studies exist which compare real-time USG-guided IJV cannulation with the AL technique in different settings, only few of these studies have been validated in an ED setting.[13] Intention of conducting this study is to extrapolate the advantages of a portable USG device for central venous access in a resource-limited ED setting. The term "resource-poor or constrained setting" defines a locale where the capability to provide care for life-threatening illness is limited.[14]

## METHODOLOGY

A comparative study was conducted at the Department of Anesthesiology, Sahiwal Teaching Hospital, Sahiwal from 22nd March 2023 to 21st September 2023. Sample size was calculated using open-epi WHO calculator comparing two means, using Confidence interval = 95 %, power of study 80%**.** A Total 130 patients of either gender were selected and divided into two groups, each group consisting of 65 patients.

Inclusion criteria was:

- Adult patients with ASA Grade II and III posted emergency surgeries.
- Patients willing to enroll in the study.
- Patients with age ≥18.

Following cases were excluded

- Patients who do not give consent
- Skin inflammation or burn at insertion site
- Altered coagulation profile (platelet count<50,000 per cu mm, INR > 1.5)
- Patients with known bleeding disorders
- Prior catheterization
- Subcutaneous emphysema
- Patients undergoing radiation therapy.

In Anatomical landmark (LM) technique, apex of the triangle was formed by the two heads of the sternocleidomastoid muscle and the clavicle serves as a landmark. The IJV runs deep to the sternocleidomastoid muscle and then though this triangle before it joins the subclavian vein to become the brachiocephalic vein. After the landmarks are identified, sterile precautions were taken and local anesthesia was administered. The patient was placed in the Trendelenburg position with the head rotated 45° away from the site of cannulation. An 18G introducer needle was advanced past the apex of the triangle, in the direction of the ipsilateral nipple, at an angle of 20°. Once blood was freely aspirated, the syringe was removed from the needle. The guide wire was then advanced through the needle into the vessel and the catheter was placed using the Seldinger technique and secured in place using sutures.

In Ultrasonography-guided (UG) technique, the patient was placed in the Trendelenburg position, with the head slightly rotated to the contralateral side. Using USG, the anatomical location and patency of the IJV was assessed and guided by real-time USG imaging, the introducer needle was mounted on a syringe is inserted into the IJV. Once blood was freely aspirated, the USG probe was set aside and the syringe will be removed from the needle. The procedure was further completed as mentioned in the AL technique.

Standard triple lumen CVC was used for cannulation in all patients. The position of the CVC was confirmed by a chest radiograph at the end of the procedure. The real-time USG-guided technique was performed with a single dedicated USG machine and a 6-13 MHz linear probe for the entire duration of the study. The whole procedure was carried out according to the standard ED protocol.

At the end of each procedure, the operator recorded the data which included patient demographics, access time and number of attempts).

The primary outcome measure was the successful cannulation of IN. The secondary outcome measured were included the flash time, the cannulation time, the number of cannulation attempts, and acute complications.

Numerical variables i.e., Age, BMI, access time and the average number of attempts were shown as mean ± SD. Categorical variable i.e., gender and side of catheterization were shown as both the absolute number of the patients and their percentage in their group and was expressed as frequency and percentages. Data was stratified for age, gender and side of catheterization. Post-stratification t-test test was applied for respective variables taking p value <0.05 as significant.

## RESULTS

Age range in this study was ≥18 years with mean age of 40.86 ± 11.15 years. The mean age of patients in group A was 40.85 ± 10.55 years and in group B was 40.91 ± 11.31 years. Majority of the patients 91 (70.0%) were between 18 to 45 years of age as shown in Table I.

Out of these 130 patients, 77 (59.23%) were male and 53 (40.77%) were females with male to female ratio of ratio of 1.4:1 (Table II). Distribution of patients according to side is shown in Table III. Mean BMI was 25.18 ± 3.10 $kg/m^2$ (Table IV).

In my study, average number of attempts 1.79 ± 0.71 in land mark group (LM) and average number of attempts 1.32 ± 0.47 in Ultrasound guided group (UG). Access time was 164.51 ± 9.14 seconds in LM group and 87.32 ± 8.54 seconds in US group (Table V).

Stratification of number of attempts with respect to age, gender and side is shown in Table VI, VII & VIII respectively. Stratification of access time with respect to age, gender and side is shown in Table IX, X & XI respectively.

**Table I:** Age distribution for both groups (n=130).

| | Group A (n=65) | | Group B (n=65) | | Total (n=130) | |
|---|---|---|---|---|---|---|
| **Age (years)** | No. of patients | %age | No. of patients | %age | No. of patients | %age |
| **18-45** | 45 | 69.2 | 46 | 70.8 | 91 | 70 |
| **36-70** | 20 | 30.8 | 19 | 29.2 | 39 | 30 |
| **Mean ± SD** | **40.85 ± 10.55** | | **40.91 ± 11.31** | | **40.86 ± 11.15** | |

**Table II:** Gender distribution for both groups (n=130).

| | Group A (n=65) | | Group B (n=65) | | Total (n=130) | |
|---|---|---|---|---|---|---|
| **Gender** | No. of patients | %age | No. of patients | %age | No. of patients | %age |
| **Male** | 37 | 56.92 | 40 | 61.5 | 77 | 59.23 |
| **Female** | 28 | 43.08 | 25 | 38.5 | 53 | 40.77 |

**Table III:** Distribution of patients according to side.

| **Side** | Group A (n=65) | | Group B (n=65) | | Total (n=130) | |
|---|---|---|---|---|---|---|
| | No. of patients | %age | No. of patients | %age | No. of patients | %age |
| **Right** | 50 | 76.92 | 52 | 80 | 102 | 78.46 |
| **Left** | 15 | 23.08 | 13 | 20 | 28 | 21.54 |

**Table IV:** Distribution of patients according to BMI (n=130).

| | Group A (n=65) | | Group B (n=65) | | Total (n=130) | |
|---|---|---|---|---|---|---|
| **BMI ($kg/m^2$)** | No. of patients | %age | No. of patients | %age | No. of patients | %age |
| **≤25** | 39 | 60 | 39 | 60 | 78 | 60 |
| **>25** | 26 | 40 | 26 | 40 | 52 | 40 |
| **Mean ± SD** | **25.29 ± 3.12** | | **25.08 ± 3.10** | | **25.18 ± 3.10** | |

**Table V:** Comparison of the technique for internal jugular vein cannulation by landmark (LM) and ultrasound guided (UG) in Emergency department patients (n=130).

| | Group A (n=65) | Group B (n=65) | P-value |
|---|---|---|---|
| **Number of attempts** | 1.32 ± 0.47 | 1.79 ± 0.71 | **0.0001** |
| **Access time (seconds)** | 87.32 ± 8.54 | 164.51 ± 9.14 | **0.0001** |

**Table VI:** Stratification of number of attempts with respect to age.

| **Age of patients (years)** | Group A (n=65) | | Group B (n=65) | | P-value |
|---|---|---|---|---|---|
| | Number of attempts | | Number of attempts | | |
| | Mean | SD | Mean | SD | |
| **18-45** | 1.29 | 0.46 | 1.85 | 0.73 | **0.0001** |
| **46-70** | 1.4 | 0.5 | 2 | 0.67 | **0.0001** |

**Table VII:** Stratification of number of attempts with respect to gender.

| **Gender** | Group A (n=65) | | Group B (n=65) | | P-value |
|---|---|---|---|---|---|
| | Number of attempts | | Number of attempts | | |
| | Mean | SD | Mean | SD | |
| **Male** | 1.38 | 0.49 | 1.88 | 0.72 | **0.0001** |
| **Female** | 1.25 | 0.44 | 1.92 | 0.7 | **0.0001** |

**Table VIII:** Stratification of number of attempts with respect to side

| **Side** | Group A (n=65) | | Group B (n=65) | | P-value |
|---|---|---|---|---|---|
| | Number of attempts | | Number of attempts | | |
| | Mean | SD | Mean | SD | |
| **Right** | 1.2 | 0.4 | 1.94 | 0.7 | **0.0001** |
| **Left** | 1.73 | 0.46 | 1.69 | 0.75 | **0.0001** |

**Table IX:** Stratification of access time with respect to age.

| **Age of patients (years)** | Group A (n=65) | | Group B (n=65) | | P-value |
|---|---|---|---|---|---|
| | access time (sec) | | access time (sec) | | |
| | Mean | SD | Mean | SD | |
| **18-45** | 84.24 | 7.82 | 164.98 | 9.25 | **0.0001** |
| **46-70** | 94.25 | 5.57 | 163.37 | 9.03 | **0.0001** |

**Table X:** Stratification of access time with respect to gender.

| **Gender** | Group A (n=65) | | Group B (n=65) | | P-value |
|---|---|---|---|---|---|
| | access time (sec) | | access time (sec) | | |
| | Mean | SD | Mean | SD | |
| **Male** | 88.32 | 9.36 | 161.33 | 9.03 | **0.0001** |
| **Female** | 86.6 | 7.26 | 169.6 | 6.81 | **0.0001** |

**Table XI:** Stratification of access time with respect to side.

| **Side** | Group A (n=65) | | Group B (n=65) | | P-value |
|---|---|---|---|---|---|
| | access time (sec) | | access time (sec) | | |
| | Mean | SD | Mean | SD | |
| **Right** | 86.04 | 7.93 | 164.56 | 9.82 | **0.0001** |
| **Left** | 91.6 | 9.36 | 164.31 | 5.99 | **0.0001** |

## DISCUSSION

Central venous catheterization (CVC) is an invasive procedure that must be performed during cardiovascular surgery (CVS). Among the indications are hemodynamic monitoring, central venous pressure monitoring, blood transfusion and fluid replacement, a variety of drug infusions, hemodialysis, and hyperalimentation. There may be differences between operators and centers in the routes chosen for CVC. The most commonly chosen intervention route in CVS operations is the internal jugular vein (IJV). The subclavian vein and femoral vein are other anatomic regions where CVC can be performed.[15] Complications that may be observed during CVC procedures range from simple local hematomas to complications with mortal progression, including chylothorax, pneumothorax, hemothorax, or mediastinitis.

Until recently, CVC was performed using anatomical indicators (the landmark technique). Although the landmark technique is very standardized, even in the best hands, it has complication rates that cannot be reduced.[16] Currently, this technique is being replaced by methods using imaging modalities as an aid. CVC guided by ultrasonography (USG) was first described by Legler.[17] This method ensures the visualization of anatomic variations before interventions, independent of location and continuous observation of the needle during cannulation. Thus, there are fewer needle passes, shorter catheterization times, and fewer complications. Venous interventions completed with USG are reported to have low complication rates.[18]

This study was conducted to compare the technique for internal jugular vein cannulation by landmark (LM) and ultrasound guided (UG) in Emergency department patients. In my study, average number of attempts 1.79 ± 0.71 in land mark group (LM) and average number of attempts 1.32 ± 0.47 in Ultrasound guided group (UG). Access time was 164.51 ± 9.14 seconds in LM group and 87.32 ± 8.54 seconds in US group. In a study, Average number of attempts 1.42 ± 0.92 in land mark group (LM) and average number of attempts 1.08 ± 0.33 in Ultrasound guided group (UG). Access time was 185 (97.36%) in LM group and 95 ± 136 in US group.[19]

In another study, seventy patients were enrolled, of which 35 patients underwent IJV cannulation by USG-guided technique (USG group) and 35 patients by the AL technique (AL group). There were a 100% success rate (35/35) for cannulation in the USG group and a 91.4% success rate (32/35) in the AL group. The catheter was placed on the first attempt in 17 (48.6%) patients in the AL group and 32 (91.4%) patients in the USG group. In the AL group, there were three failed cannulation attempts in comparison to the USG group. The mean start to flash time for the AL technique was 16.59 s (±10.67) and 4.86 s (±2.18) in the USG group. The mean cannulation time was 305.88 s (±66.84) in the AL group and 293.03 s (±71.15) in the USG group. A total of seven acute complications were noted, of which 2 (5.7%) in the USG group and 5 (14.3%) in the AL group.[20]

In a study, IJV cannulation with USG guidance was successful at the first attempt in 77.8% of patients in critical care setting (Troianos et al., 1991). Several previous studies suggest that there is higher incidence of mechanical complications when the number of attempts for successful CVC increases. The incidence of complications after three or more insertion attempts was significantly increased according to the McGee and Gould review of CVC complications. Therefore, the number of attempts to successful venipuncture and catheter placement is important.[21]

A similar study observed in their meta-analysis that real time USG guidance significantly reduced the risk of cannulation failure (RR = 0.18, P < 0.001) and reduce the occurrence of clinical adverse events, including the risk of arterial puncture (RR = 0.25, P < 0.001), hematoma (RR = 0.30, P < 0.001), pneumothorax (RR = 0.21, P = 0.014), and hemothorax (RR = 0.10, P = 0.007).[22] It was observed the mean time to successful aspiration of venous blood was lesser in group undergoing USG guided IJV catheterization as compared to the landmark approach group (145 secs vs. 176.43 secs.) in I.C.U. patients. The mean number of attempts required in the first group was much less than the second group (1.20 vs. 1.53). Also the landmark group encountered arterial puncture (10%) and pneumothorax (2.5%) whereas no such complications were observed in USG group.[23]

A study assessed the impact of simulation training on CVC insertion success rate and observed that USG guidance, both dynamic as well as static, for CVC insertion were associated with improved in-hospital first cannulation rates and overall success rates of insertions by junior residents. Ultrasound use during central vein catheterization provides advanced degree benefits to the clinician performing the procedure for the identification and assessment of the target vein in addition to an observation of the anatomic structures around the vein. This method was shown to increase the procedure's success in intensive care patients and severely reduce the procedure's complications in a variety of publications in the literature.[24]

## CONCLUSION

This study concluded that ultrasound guided (UG) technique for internal jugular vein cannulation is better (less number of attempts and access time) than landmark (LM) technique in Emergency department patients. So, we recommend that ultrasound guided (UG) technique should be used routinely for internal jugular vein cannulation in order to prevent complications.

**Ethical approval:**

Ethical approval was taken from institutional review board of Sahiwal Medical College, Sahiwal with the IRB number 67--/IRB/SLMC/SWL, Dated 04-08-2022.

**Conflict of Interest:**

Authors declare no conflict of interest.

**Financial Disclosure:**

None

## REFERENCES


1. Takeshita J, Tachibana K, Nakajima Y, Shime N. Incidence of catheter-related bloodstream infections following ultrasound-guided central venous catheterization: a systematic review and meta-analysis. BMC Infect Dis. 2022;22:772. doi:10.1186/s12879-022-07760-1.
2. Subramony R, Spann R, Ross J, Shah K. Ultrasound-guided versus landmark method for subclavian vein catheterization in an academic emergency department. J Emerg Med. 2022;62(6):760-768. doi:10.1016/j.jemermed.2021.11.002.
3. Fournil C, Boulet N, Bastide S, Louart B, Ambert A, Boutin C, et al. High success rates of ultrasound-guided distal internal jugular vein and axillary vein approaches for central venous catheterization: a randomized controlled open-label pilot trial. J Clin Ultrasound. 2023;51(1):158-166. doi:10.1002/-jcu.23383.
4. Boulet N, Muller L, Rickard CM, Lefrant JY, Roger C. How to improve the efficiency and safety of real-time ultrasound-guided central venous catheterization in 2023: a narrative review. Ann Intensive Care. 2023;13(1):46. doi:10.1186/-s13613-023-01141-w.
5. Zawadka M, La Via L, Wong A, Olusanya O, Muscarà L, Di Stefano C. Real-time ultrasound guidance compared with landmark technique for subclavian central venous cannulation: a systematic review and meta-analysis with trial sequential analysis. Crit Care Med. 2023;51(5):642-652. doi:10.1097/CCM.0000000000005819.
6. Naddi L, Borgquist O, Adrian M, Bark BP, Kander T. Ultrasound-guided subclavian vein catheterisation with a needle guide (ELUSIVE): protocol for a randomised controlled study. BMJ Open. 2023;13(12):e080515. doi:10.1136/bmjopen-2023-080515.
7. Brusciano V, Lecce M. Advantages of the use of ultrasound in newborn vascular access: a systematic review. J Ultrasound. 2024;27(2):203-207. doi:10.1007/s40477-023-00832-1.
8. Spagnuolo F. Global use of ultrasound in newborn vascular access: RA.CE.VA.—implantation and management of complications. J Ultrasound. 2024;27(2):397-406. doi:10.1007/s40477-023-00813-4.
9. Pacheco M, Forero C, Guayacán L, Díaz J, Mejía D, Salazar A. Efficacy and safety of supraclavicular versus infraclavicular approach for subclavian vein catheterisation: an updated systematic review and meta-analysis of randomised controlled trials. Indian J Anaesth. 2023;67(6):486-496. doi:10.4103/ija.ija_837_22.
10. Pittiruti M, Annetta MG, D'Andrea V. Point-of-care ultrasound for vascular access in neonates and children. Eur J Pediatr. 2024;183(3):1073-1078. doi:10.1007/s00431-023-05378-2.
11. Teja B, Bosch NA, Diep C, Pereira TV, Mauricio P, Sklar MC. Complication rates of central venous catheters: a systematic review and meta-analysis. JAMA Intern Med. 2024;184(5):474-482. doi:10.1001/jamainternmed.2023.8232.
12. Imai E, Kataoka Y, Watanabe J, Okano H, Namekawa M, Owada G. Ultrasound-guided central venous catheterization around the neck: systematic review and network meta-analysis. Am J Emerg Med. 2024;78:206-214. doi:10.1016/j.ajem.2024.01.043.
13. AlGhamdi F, AlJoaib N, Aldawood A, AlGhamdi M, AlMulhim A. Comparing short-axis versus long-axis ultrasound-guided techniques for internal jugular vein cannulation: a meta-analysis of clinical outcomes and safety. Australas J Ultrasound Med. 2024;27(3):149-158. doi:10.1002/ajum.12385.
14. Cui Y, Zhang X, Li Q. Systematic review of ultrasound-guided central venous catheter placement-related complications in neonates and infants aged under 12 months. J Int Med Res. 2024;52(10):3000605241287168. doi:10.1177/03000605241287168.
15. Boulet N, Muller L, Rickard CM, Lefrant JY, Roger C. Central venous catheter-related infections: a systematic review, meta-analysis, trial sequential analysis and meta-regression comparing ultrasound guidance and landmark technique for insertion. Crit Care. 2024;28(1):378. doi:10.1186/s13054-024-05162-0.
16. Shin KW, Park S, Jo WY, Choi S, Kim YJ, Park HP, Oh H. Comparison of catheter malposition between left and right ultrasound-guided infraclavicular subclavian venous catheterizations: a randomized controlled trial. Crit Care Med. 2024;52(10):1557-1566. doi:10.1097/CCM.-0000000000006368.
17. Ängeby K, Borgquist O, Adrian M. Central venous catheter tip misplacement: a multicentre cohort study of 8556 thoracocervical central venous catheterisations. Acta Anaesthesiol Scand. 2024;68(4):520-529. doi:10.1111/-aas.14380.
18. Eo SJ, Kim DH, Kim J. One-hand guidewire introducer kit for ultrasound-guided central venous catheterization: a proof-of-concept study. Sci Rep. 2024;14:28115. doi:10.1038/s41598-024-79784-3.
19. Ravikumar RH, Majage S, Prasanna M, Ray BR. Comparison of ultrasound-guided supraclavicular subclavian vein versus infraclavicular subclavian or axillary vein catheterization: a systematic review and meta-analysis. J Vasc Access. 2025;26(2):633-640. doi:10.1177/11297298241239092.
20. Pinelli F, Pittiruti M, Biffi R, Buononato M, Capozzoli G, Dolcetti L. A GAVeCeLT consensus on the indication, insertion and management of central venous access devices in the critically ill. J Vasc Access. 2025;26(4):965-982. doi:10.1177/11297298241262932.
21. Vegas A, Wells B, Braum P, Denault A, Miller Hance WC, Kaufman C. Guidelines for performing ultrasound-guided vascular cannulation: recommendations of the American Society of Echocardiography. J Am Soc Echocardiogr. 2025;38(2):57-91. doi:10.1016/-j.echo.2024.12.004.
22. Johnston AJ, Bishop L, Bodenham A. Association of Anaesthetists guidelines: safe vascular access 2025. Anaesthesia. 2025;80(12):1381-1396. doi:10.1111/anae.16727.
23. Lee IK, Lee KH, Han HJ, Choi J, Kim NJ, Kim K. Different axis approaches for ultrasound-guided centrally inserted central catheterization in children: a systematic review and meta-analysis of randomized controlled trials. Front Surg. 2025;12:1481975. doi:10.3389/fsurg.2025.1481975.
24. Thomsen KK, Schmitt J, Kousoulas F, Bergholz A, Kottenberg K, Flick M. Wire-in-needle versus conventional syringe-on-needle technique for ultrasound-guided central venous catheter insertion in the internal jugular vein: the WIN randomized trial. J Clin Monit Comput. 2025;39(5):805-811. doi:10.1007/s10877-024-01232-4

*Authors' Contributions:*

**MOA & MAK:** Conceptualization and study design

**AY, ZM& RM:** Data Collection and manuscript drafting.

**AY, RM& HMA:** Data Analysis and critical review.

**MOA, ZM & HMA:** Supervision &Manuscript drafting & proof reading.

All authors have read and approved the final version of the manuscript and are responsible and accountable for the accuracy and integrity of the work.

1. Muhammad Omer Ajmal
Associate Professor Department of Anesthesiology Sahiwal Medical College & Sahiwal Teaching Hospital, Sahiwal.
2. Muhammad Aslam Khan
Assistant Professor Department of Anesthesiology Punjab Institute of Neurosciences, Lahore.
3. Zuraira Mujahid
Associate Professor Department of Anesthesiology Sahiwal Medical College & Sahiwal Teaching Hospital, Sahiwal.
4. Rashid Minhas
Assistant Professor Department of Surgery, Sahiwal Medical College & Sahiwal Teaching Hospital, Sahiwal.
5. Aakif Yousaf
Assistant Professor Surgery. Department of Surgery, Sahiwal Medical College & Sahiwal Teaching Hospital, Sahiwal.
6. Hafiz Muhammad Amjad
Professor of Surgery. Department of Surgery, Sahiwal Medical College & Sahiwal Teaching Hospital, Sahiwal.