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Comparison of Local Infiltration Versus Superficial Cervical Plexus Block for Central Venous Catheter Insertion in Awake Adult Patients

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ABSTRACT

Objective: To measure the frequency of pain and satisfaction (Linkert score) with two local anesthesia techniques for central venous line insertion in awake patients.

Study Design: Quasi-Experimental Study.

Place and Duration of Study: Pak Emirates Military Hospital, Rawalpindi, Pakistan from Jul to Dec 2023.

Methodology: After seeking approval from the Ethical Committee, a sample of 170 patients was randomized into two Groups. One Group was given subcutaneous local infiltration, and the other was given a superficial cervical plexus block before central venous catheter insertion.

Results: There were 40(47.1%) patients in Group LWI who felt mild pain, 42(49.4%) patients who felt moderate pain, and 3(3.5%) patients who felt severe pain. 41(48.2%) patients were satisfied in Group LWI and 44(51.8%) patients were not satisfied with the intervention. In Group, CPB, 71(83.5%) patients experienced mild pain, and 13(15.3%) patients experienced moderate pain. None of the patients felt severe pain, with a value of less than 0.001. Seventy-two (84.7%) patients in Group CPB were satisfied, while only 13(15.3%) conveyed dissatisfaction on the basis of linkert score.

Conclusion: We concluded that the superficial cervical plexus block provided superior analgesia for central venous catheter placement in awake patients with better patient satisfaction.

Keywords: Central Venous Catheter, Lignocaine, Linkert score, Superficial Cervical Plexus Block, Pain, and Satisfaction.

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INTRODUCTION

The placement of a central venous catheter (CVC) is a commonly performed invasive intervention in anesthesia and critical care settings. The conscious patient may experience significant discomfort due to the requirement of maintaining the Trendelenburg position, with the head extended and the neck fully rotated to the other side while remaining completely still. Securing the catheter to the skin using sutures or tunneling of the catheter might cause discomfort and anxiety.[1] Infiltration of the field with local anesthetics may itself be accompanied by considerable pain,[2] and the use of short-acting opioids, a combination of Propofol or Midazolam, may be effective in providing relief and comfort. However, they can lead to a notable occurrence of negative effects, primarily respiratory depression.[3]

The superficial cervical plexus targets superficial branches of the cervical plexus.[4] It is used for carotid endartectomies, head and neck interventions, and post-operative pain relief for thyroid surgeries.[5] The cervical plexus (C2-C4) provides sensory and motor innervation to the SCM.[6] The USG-guided CPB performed improves accuracy and provides adequate anesthesia and analgesia for neck surgeries involving SCM muscle manipulation or resection.[7]

Local Wound Infiltration is mainly employed to anesthetize skin before the insertion of a central venous catheter. Despite the injection of this local anesthetic, a fraction of patients report moderate to severe discomfort.[8] Therefore, there is a need for a method that ensures that the quality of analgesia is also maintained. Alleviation of pain is an important step to earning patients' cooperation and trust during awake procedures. According to a case series, imaging-guided superficial cervical plexus block provided superior analgesia for large bore cannula placement, but the time was twice as local infiltration Group. However, local infiltration was patchy, while the block was not patchy.[9]

Imaging-guided central catheter placement is relatively new in Pakistan. The landmark technique is still used in most resource-limited setups. Therefore, the rationale of our study is to measure the comfort and safety of central venous catheter placement in

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patients who are given ultrasound-guided superficial cervical plexus block and ultrasound-guided local infiltration. The method with greater comfort in terms of lower pain scores and fewer complications will be adopted and recommended.

METHODOLOGY

After getting permission from the Hospital Ethical Committee with IERB# A/28/ERC/595/2023, this Quasi-experimental study was carried out at the Anesthesia Department of Combined Military Hospital (CMH), Rawalpindi from July to December 2023. The sample was calculated with the help of a WHO sample size calculator, keeping the anticipated mean Visual analog score (P1) with local infiltration was 410 Type equation here., and the anticipated mean Visual analog score (P2) with superficial cervical plexus block to be 210.[10] We collected a sample of 170 patients through non-probability consecutive sampling and divided them into two Groups named Group LWI and Group CPB through randomization by sealed envelope.

Inclusion Criteria: Adult patients (18-70 years) who came for central venous catheter insertion in the jugular vein under local anesthesia were incuded.

Exclusion Criteria: Pregnant patients, patients with altered sensorium (GCS<14), patients with a platelet count less than $50^{x}109$ per liter, psychiatric patients, and patients who were given sedation were excluded.

Before the procedure, all patients were given information about the postoperative pain scale, which was assessed using the Visual Analogue Score (VAS). The Visual Analogue Scale (VAS) was described as a numerical scale that measured pain intensity in a range from zero to 10.[11] A score of zero showed the complete absence of pain, while a score of 10 represented the highest level of suffering possible, as shown in Table-I. In Group LWI, the patients were placed in the Trendlenberg position with their heads tilted to the opposite side. The patient was scrubbed and draped, and a generous infiltration of 10ml of 1% Lignocaine between the layers of subcutaneous tissue was done under ultrasound guidance with a 22 gauge needle. After five minutes of local infiltration, an 18 gauge needle was used to access the vein under imaging. Once the vein was punctured, the guide wire was passed, and the central venous catheter was placed using the Seldinger technique. During the entire procedure, if the patient complained of pain, 5 ml of additional local anesthetic was injected under ultrasound guidance.

In Group CPB patients, patients were again placed in the Trendlenberg position with their heads rotated to the opposite sites. The footprint of the ultrasonic transducer was placed across the side of the neck, more precisely near the middle of the clavicular head of the sternocleidomastoid (SCM) muscle's posterior side. The hyperechoice 22 gauge needle was navigated to the space between the SCM muscle and prevertebral fascia, which is close to the dorsal edge of the SCM, starting from the dorsal aspect and puncturing skin and fascia covering the platysma injection a total volume of 10ml of local anesthetic Ligonocaine (1%). After execution of the block, an 18 gauge needle was used to access the vein under imaging after 5 minutes. Once vein was punctured, guide wire was passed and central venous catheter was placed by seldinger technique. During the entire procedure, if the patient complained of pain, 5 ml of additional local anesthetic was injected under ultrasound guidance. The patients were asked about the presence of pain after the procedure. VAS >4 was considered as pain, and VAS<4 was defined as "no pain." A six-point Linkert scale was used to quantify the frequency of satisfaction; a score of more than four indicated that the patient was satisfied, and a score of less than four indicated that the patient was not.[12] The presence or absence of pain, along with satisfaction, were primary outcomes. The secondary outcomes included time taken for techniques (local infiltration versus cervical block), side effects, and additional local anesthetic required information on local infiltration. Demographic variables included Age, weight, and gender.

The data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 26. We calculated means along with standard deviation for quantitative variables and the frequencies with percentages for qualitative parameters. Chi-square analysis and Independent sample t-test were used to find the significance indicated by a p-value ≤0.05.

RESULTS

The sample size was one-seventy and was randomized into two equal Groups, with 85 patients in Group LWI and 85 patients in Group CPB. The primary outcome was the frequency of pain measured by VAS and satisfaction measured by the Linkert scale. The average age of patients in Group LWI was 47.16±11.94 years, and 48.64±12.16 years in Group CPB. The average weight of Group LWI patients was 68.96±5.36 kilograms, and 70.87±5.56 kilograms in

Group CPB patients. There were 42(49.4%) males in Group LWI and 43(50.6%) females. There were 41(48.2%) males in Group LWI and 44(51.8%) females in Group CPB. The demographics were similar in both Groups. The mean time taken for intervention in Group LWI was 21.52±.97 minutes in Group LWI and 23.18 minutes in Group CPB with a p-value of 0.031, which shows that there was no significant difference. The demographic details are presented in Table-I.

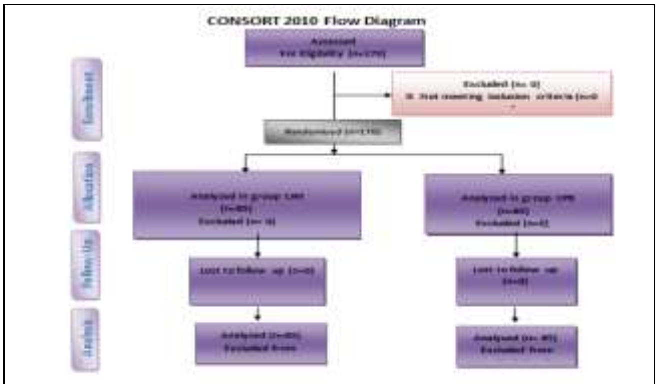

Figure: Patient Flow Diagram

Table-I: The Demographic Characteristics of the STUDY GROUPS (n=170)

Parameters		Group-LWI (n=85) Mean±SD	Group=CPB (n=85) Mean±SD	*p*-value
Age (years)		47.16±11.94	48.64±12.16	0.322
Weight (kilograms)		68.96±5.36	70.875.56	0.705
Time Required For Intervention (minutes)		21.52±2.97	23.18±3.49	0.031
		Frequency (%)	Frequency (%)	0.500
Gender	Male	42(49.4)	41(48.2)	
	Female	43(50.6)	44(51.8)	

There were 40(47.1%) patients in Group LWI who felt mild pain, 42(49.4%) patients who felt moderate pain, and 3(3.5%) patients who felt severe pain. 41(48.2%) patients were satisfied in Group LWI and 44(51.8%) patients were not satisfied with the intervention. In Group, CPB, 71(83.5%) patients experienced mild pain, and 13(15.3%) patients experienced moderate pain. severe pain was felt by none of the patients, with a value of less than 0.001. seventy-two (84.7%) patients in Group CPB were satisfied, while only 13(15.3%) conveyed dissatisfaction. Twenty-five (29.4%) patients required an additional dose of local anesthetic in Group LWI, and only 7(8.2%) patients in Group CPB required an additional dose of local anesthetic with a *p*-value of <0.001, as displayed in Table-II.

Table-II: Comparison of Visual Analogue Score (VAS) and Satisfaction Between Study Groups (n=170)

Parameters		Group-LWI (n=85) n(%)	Group-CPB (n=85) n(%)	*p*-value
Visual analogue score (VAS)	Mild	40(47.1)	71(83.5)	<0.001
	Moderate	42(49.4)	14(16.5)	
	Severe	3(3.5)	0(0)	
Satisfaction	Yes	41(48.2)	72(84.7)	<0.001
	No	44(51.8)	13(15.3)	
Additional dose of local anesthetic	Yes	25(29.4)	60(70.6)	<0.001
	No	7(8.2)	78(91.8)	

DISCUSSION

The primary aim of our study was to assess the comfort of superficial cervical plexus block with local infiltration of anesthetic so as to find a better and time-efficient alternative in awake patients who are anxious and have higher analgesic requirements. The results of the study showed that SCPB application under ultrasound guidance with a single injection would be preferable to local infiltration anesthesia delivery from several locations during central venous catheter insertion. It produced a more satisfactory VAS score while requiring fewer additional doses of local anesthetic while increasing patient comfort and satisfaction. The earlier studies implied that CPB was a time-consuming procedure and required extra time compared to local infiltration. However, we demonstrated that the cumulative duration of intervention was the same in both Groups, and there was no additional time delay due to CPB.

The majority of patients who need central venous catheters are critical and have multiple peripheral cancellations prior to central venous cannulation. They have horrible recollections, and they fear excruciating discomfort. Some patients have a fear of needles, and they exhibit more significant anxiety. Almost twenty to thirty percent of the adult population has a fear of needles.[13] The local administration requires multiple insertions and re-direction of the syringes in subcutaneous tissue, which has the greatest number of nerve terminals. That is why it causes intense burning pain in the start before making the area numb.[14] There are studies to support the fact that nerve blocks cause less discomfort compared to local infiltration; therefore, if nerve blocks are available, they should be preferred.[14] In our study, the cervical plexus block provided depth of analgesia, and it was not patchy. Local anesthetic did not cover all areas and caused discomfort in most patients with the same volume and concentration of the drug. In many patients, the CVP insertion was interrupted, and additional local infiltration was done.

According to Cislaghi et al. SCPB block provided adequate anesthesia for carotid endarterectomy. They advocated that SCPB reduced post-operative analgesic requirements and associated it with fast learning. The local anesthetic infiltration seems to be a simple intervention that does not require much of the operator's dexterity, but the SCPB also showed a fast learning curve.[15] The simplicity and effectiveness make SCPB a reasonably good alternative. If it can be sufficient for carotid endarterectomy, it can be helpful for central venous catheter insertion, which is a less invasive intervention.

The superficial cervical plexus block with a moderate-acting local anesthetic like bupivacaine can provide twenty-four hours of analgesia in patients with thyroidectomy, which is associated with considerably high pain scores.[16] Its use for less invasive intervention holds good. Conventionally, a central venous catheter is placed with local infiltration, but somehow, the other patient's comfort is ignored. We aim to provide a painless experience to patients who are already in distress. Most of them have a history of multiple cannulations, and their fear sensitizes them to pain. In our study, SCPB proved reliable, and very few patients required additional local anesthetic.

According to a case presentation, a patient with a clavicular fracture was given a superficial cervical plexus block to alleviate acute pain. The ultrasound machine was brought to the patient's bedside, and a point-of-care block was given.[17] Thus, SCPB is a novel technique for pain management. Not only can it be used for acute pain management in emergency medicine settings, but also it can be utilized safely and reliably for central venous catheter placement.[18]

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LIMITATIONS OF STUDY

The pain was measured subjectively, which is prone to individual bias.

CONCLUSION

We concluded that the superficial cervical plexus block provided superior analgesia for central venous catheter placement in awake patients with better patient satisfaction.

Conflict of Interest: None.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

ZK & AK: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

FN & SI: Conception, data analysis, drafting the manuscript, approval of the final version to be published.

DRD & AAQ: Data acquisition, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Donati A, Damiani E, Adrario E, Romano R, Pelaia P. Pain and discomfort management during central venous catheter insertion. Indian J Crit Care Med 2014; 18(7): 417-418. https://doi.org/10.4103/0972-5229.136066
2. Massand S, Carr L, Schneider E, Johnson TS. Management of intravenous infiltration injuriesAnn. Plast. Surg 2019; 83(6): e55-58. https://doi.org/10.1097/SAP.0000000000001984
3. Samantaray A, Rao MH. Effects of fentanyl on procedural pain and discomfort associated with central venous catheter insertion: A prospective, randomized, double-blind, placebo controlled trial. Indian J Crit Care Med 2014; 18(7): 421. https://doi.org/10.1016/j.bjae.2022.11.008
4. Jarvis MS, Sundara Rajan R, Roberts AM. The cervical plexus. BJA Educ 2023; 23(2): 46-51. https://doi.org/10.1016/j.bjae.2022.11.008
5. Aweke Z, Sahile WA, Abiy S, Ayalew N, Kassa AA. Effectiveness of Bilateral Superficial Cervical Plexus Block as Part of Postoperative Analgesia for Patients Undergoing Thyroidectomy in Empress Zewditu Memorial Hospital, Addis Ababa, Ethiopia. Anesthesiol Res Pract 2018; 2018: 6107674. https://doi.org/10.1155/2018/6107674
6. Yao Y, Lin C, He Q, Gao H, Jin L, Zheng X. Ultrasound-guided bilateral superficial cervical plexus blocks enhance the quality of recovery in patients undergoing thyroid cancer surgery: A randomized controlled trial. J Clin Anesth 2020; 61: 109651. https://doi.org/10.1016/j.jclinane.2019.109651
7. Tran DQ, Dugani S, Finlayson RJ. A randomized comparison between ultrasound-guided and landmark-based superficial cervical plexus block. Reg Anesth Pain Med 2010; 35(6): 539-543. https://doi.org/10.1097/AAP.0b013e3181faa11c
8. Braga LM, Parreira PM, Oliveira AD, Mónico LD, Arreguy-Sena C, Henriques MA. Phlebitis and infiltration: vascular trauma associated with the peripheral venous catheter. Revista Latino-Americana de Enfermagem 2018; 26: e3002. https://doi.org/10.1590/1518-8345.2377.3002

9. Sheikh M, Carvalho B, Boublik J, Ansari J. Superficial Cervical Plexus Block for Awake Large-Bore Central Line Placement in Parturients: A Case Series. A A Pract 2021; 15(3): e01429. https://doi.org/10.1213/XAA.0000000000001429
10. Akelma H, Salık F, Bıçak M, Erbatur ME. Local anesthesia for port catheter placement in oncology patients: an alternative to landmark technique using ultrasound-guided superficial cervical plexus block—a prospective randomized study. J Oncol 2019; 2019: 2585748. https://doi.org/10.1155/2019/2585748
11. Shafshak TS, Elnemr R. The Visual Analogue Scale Versus Numerical Rating Scale in Measuring Pain Severity and Predicting Disability in Low Back Pain. J Clin Rheumatol 2021; 27(7): 282-285. https://doi.org/10.1097/RHU.0000000000001320
12. McLenon J, Rogers MA. The fear of needles: A systematic review and meta-analysisIS J Adv Nurs 2019; 75(1): 30-42. https://doi.org/10.1111/jan.13818
13. Junger H, Sorkin LS. Nociceptive and inflammatory effects of subcutaneous TNFα. Pain 2000; 85(1-2): 145-151. https://doi.org/10.1016/S0304-3959(99)00262-6
14. Watson R, Leslie K. Nerve blocks versus subcutaneous infiltration for stereotactic frame placement. Aneth Analg 2001; 92(2): 424-427. https://doi.org/10.1213/00000539-200102000-00028
15. Cislaghi F, Munari M, Savi C, Delle Fave A, Ferrari C, Condemi AM, et al. Regional anaesthesia in carotid endarterectomy: comparison between superficial and deep cervical plexus block in patients with coronary artery disease: O-54. Eur J Anaesthesiol 2006; 23: 18-19.
16. Mayhew D, Sahgal N, Khirwadkar R, Hunter JM, Banerjee A. Analgesic efficacy of bilateral superficial cervical plexus block for thyroid surgery: meta-analysis and systematic review. Br J Anaesth 2018; 120(2): 241-251. https://doi.org/10.1016/j.bja.2017.11.083
17. Graglia S, Kornblith A. Point-of-care ultrasound-guided regional anaesthesia: the superficial cervical plexus block for a patient with a clavicle fracture. Emerg Med 2023; 40(10): 694-697. https://doi.org/10.1136/emermed-2023-213071
18. Ho B, De Paoli M. Use of ultrasound-guided superficial cervical plexus block for pain management in the emergency department. Emerg Med 2018; 55(1): 87-95. https://doi.org/10.1016/j.jemermed.2018.04.030

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