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Original Research Article

Comparison of visual and verbal aid to assist patient positioning in performing subarachnoid block: An observational study

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Abstract

Background: Proper patient positioning is crucial for identifying anatomical landmarks during the subarachnoid block (SAB) procedure. Enhancing patient comprehension of the required posture through additional aids may improve procedural efficiency and outcomes.

Aims and Objectives: This study aimed to compare the effectiveness of visual aids combined with verbal instructions (Group B) versus verbal instructions alone (Group A) in assisting patient positioning during SAB. The primary objectives were to evaluate procedural time and the anaesthesiologist's satisfaction with patient positioning. Secondary objectives included the number of attempts required and the first-pass success rate.

Materials and Methods: This observational study included 142 patients aged ≥18 years scheduled for elective or emergency surgery under SAB in the lateral decubitus position. Patients were randomized to receive either verbal instructions (Group A) or visual aids with verbal instructions (Group B) for positioning. The procedural duration, anaesthesiologist satisfaction scores, number of attempts, and first-pass success rates were recorded. Statistical analysis was performed using Chi-square tests, Student's t-test, and Mann–Whitney U tests.

Results: The mean procedural time was significantly shorter in Group B (320 seconds) compared to Group A (401 seconds) ($p = 0.001$). The proportion of patients requiring ≥3 attempts was lower in Group B (4.2%) than in Group A (22.5%) ($p = 0.028$). Anaesthesiologist satisfaction scores regarding patient positioning were significantly higher in Group B compared to Group A ($p = 0.045$).

Conclusion: Incorporating simple visual aids alongside verbal instructions enhances patient positioning, leading to reduced procedural time, fewer attempts, and higher satisfaction among anaesthesiologists during SAB procedures.

Keywords: Patient positioning, Visual aid, Subarachnoid block, Spinal anaesthesia, Anaesthesiologist satisfaction.

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1. Introduction

Subarachnoid block (SAB), also known as spinal anaesthesia, is a type of regional anaesthesia involving the administration of a local anaesthetic into cerebrospinal fluid (CSF).[1] This targets the nerve roots within the subarachnoid space to induce a profound sensory and motor blockade. Proper patient positioning is very crucial for the successful placement of SAB.[2,3] Position of the patient during SAB procedure is a necessity for the correct delivery of anaesthetic solution to the target neural structures.[4] Understanding the anatomy is very essential to avoid complications due to incorrect needle placement. Incorrect identification of spinal vertebral level can lead to direct trauma to spinal cord resulting in a long-term disability.[5]

The optimal position for administration of SAB requires the patient's contribution to some extent. It may also require an assistant to help the patient in maintaining the required position and to facilitate their safety and comfort. Patient's comprehension about the position and the instructions provided must be coherent enough for them to achieve the optimal position in order to aid the procedure. An extensive explanation of the procedure to the patient before administering anaesthesia contributes to better patient compliance.[6,7] Generally, patients are instructed verbally to assume and adapt the position. Demonstration of visual

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images in patient positioning can result in better patient positioning and less time consumption for completion of the procedure.[8] Visual aids are known to enhance understanding, making information more accessible and helping patients process instructions more effectively. While numerous studies have explored predictors of difficult neuraxial blockade, few have focused on techniques to mitigate these challenges. Moreover, the limited research on visual aids for patient positioning has primarily targeted the sitting position and obstetric populations.

This study addresses the gap by investigating the impact of visual aids on patient positioning for the lateral decubitus posture during subarachnoid block (SAB) in Indian general surgical patients. We hypothesized that visual aids would be more effective than verbal instructions alone in achieving optimal patient positioning for SAB.

The study was designed to compare the efficacy of verbal instructions versus a combination of visual aids and verbal instructions in facilitating patient positioning for SAB. Our primary objectives were to compare procedural time—measured from the start of positioning instructions to the visualization of cerebrospinal fluid (CSF) flow—and to evaluate the satisfaction of the performing anaesthesiologist with the patient's positioning. Secondary objectives included assessing the number of attempts required for successful needle placement and the first-pass success rate in each group.

2. Materials and Methods

This Prospective comparative observational study was carried out at a tertiary health care centre from April 2021 - March 2022. Institutional ethical clearance was obtained and study was registered with Clinical Trials Registry CTRI/2021/08/035934. One hundred-forty two adult patients aged ≥18 years, undergoing elective and emergency surgery under SAB were included in the study. The exclusion criteria included patient refusal, those with inability to comprehend the instructions, with anticipated positioning difficulties and audio-visual challenged patients.

After obtaining written informed consent, participants were randomly assigned to one of two groups using a computer-generated random number table. Group allocation was concealed in sealed envelopes until the start of the procedure to maintain allocation concealment. Due to the nature of the intervention, blinding was not feasible.

Participants were assisted in positioning themselves for subarachnoid block (SAB) in the lateral decubitus (LD) position based on their assigned group. Participants in Group A received verbal instructions, while those in Group B were provided with visual aids (images of the LD position) in addition to verbal commands. To ensure consistency and minimize variability, the verbal instructions in Group A were standardized using commonly understood phrases in a language the participants were proficient in. This uniformity reduced bias, enhanced the reliability of the results, and ensured that all participants had a consistent understanding of the procedure. For Group B, the visual aids conveyed the same information as the verbal instructions, reinforcing the communication and assisting participants in comprehending the required positioning effectively (**Figure 1**).

After application of standard monitors and securing intravenous lines, the patients were requested to position themselves on the OT table according to the aid they were provided by an anaesthesia technician. No further assistance in positioning or any verbal prompting was provided by the anaesthesia technician. Patient was allowed to request for intervention in positioning if required. Anaesthesiologists chose the level and approach of the block, as well as the needle and local anaesthetic used. The anaesthesiologist prepared the spinal tray and drugs under aseptic conditions. A second person started the timer and gave the verbal instructions or showed the visual images to the patient, according to the allocated group of the patient. The patient then adopted the required position, and the anaesthesiologist immediately commenced the procedure. A trained independent observer recorded the relevant data.

The primary outcome measured was the length of time taken until successful needle placement in the subarachnoid space. This was defined as the time in seconds from the start of giving instructions until the free flow of CSF. Time duration for the patient to position themselves was also measured (from the start of instructions until the insertion of the spinal needle). Other objectives such as no. of attempts, which is defined as no. of skin punctures attempted was recorded along with no. of needle redirections, which means altering the angle of the needle while maintaining its position within the anatomical landmarks was also recorded. First pass success i.e., successful placement of the block in first prick was noted. Satisfaction of anaesthesiologist with procedure and position of the patient was documented using a verbal rating scale of 0-10 with 0 representing very unsatisfied and 10 being very satisfied, based on their experience with the respective assistance aid the patient received.

The sample size was calculated based on a study conducted by Usha et al.[8] The study reported a mean procedural time of 227.33 seconds with a standard deviation of 55 in Group A (verbal aid) and 221.33 seconds with a standard deviation of 90 in Group B (visual aid), resulting in an effect size of 0.48. Using a mean difference of 35 seconds, a significance level of 5%, and a power of 80%, the required sample size was determined to be 71 participants per group. The calculation was performed using *nMaster Software* version 2.0.

Data collection and computation were performed using Microsoft Excel 2007 (Microsoft Corporation, Redmond, Washington, U.S.). Descriptive statistics were used to summarize the data. For inferential analysis, an unpaired *t*-test or Pearson's Chi-square test was applied as appropriate.

A *p*-value of less than 0.05 was considered statistically significant.

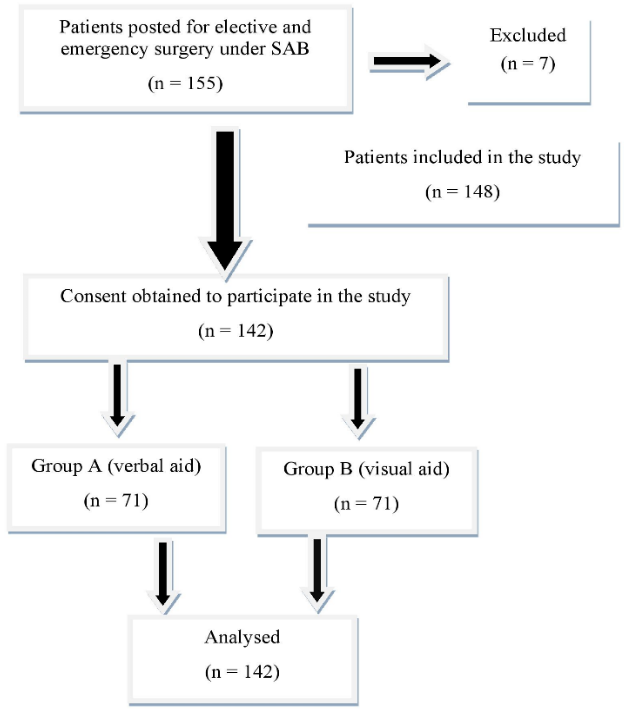

Figure 1: CONSORT flow diagram showing enrolment, allocation and analysis of the participants

3. Results

Seventy-one patients completed the study in each group and were found to have similar demographic and surgical characteristics. (p>0.05).(**Table 1**)

Table 1: Patient demographics and surgical characteristics

	Group A (n=71)	Group B (n=71)
Gender (male/female)	29/42	36/35
Age (mean)years	46	44
Type of surgery (Elective/ Emergency)	65/6	63/8

Data expressed as frequency or mean (Standard Deviation)

The total procedural time was significantly longer in Group A (401.44 seconds; 95% CI: 370.16–432.71) compared to Group B (320.49 seconds; 95% CI: 300.47–346.51), with a *p*-value of <0.001 (**Table 2**).

In terms of the number of attempts required, 16 participants (22.5%) in Group A needed ≥3 attempts, compared to only 3 participants (4.2%) in Group B. The chi-square test statistic was 12.505, with a *p*-value of 0.028, indicating a statistically significant difference between the two groups. First-attempt success was achieved in 40 participants in Group A and 44 participants in Group B. However, the chi-square test statistic was 0.466, with a *p*-value of 0.495, indicating no statistically significant difference in first-attempt success rates between the two groups. (**Table 3**)

The independent *t*-test comparison of satisfaction scores showed that Group B had significantly higher satisfaction scores compared to Group A (*p* = 0.007). Satisfaction scores of ≥8 were reported for 74.6% of participants in Group A and 91.5% in Group B, with a chi-square test statistic of 9.73 (*p* = 0.045), confirming statistical significance. (**Table 4**)

Table 2: Total time taken for procedure in both the groups

			Group		Total
			Group A	Group B	
Total Time (s)	<180	Count	0	3	3
		% within Group	0.0%	4.2%	2.1%
	180-240	Count	9	10	19
		% within Group	12.7%	14.1%	13.4%
	240-300	Count	9	20	29
		% within Group	12.7%	28.2%	20.4%
	300-360	Count	10	19	29
		% within Group	14.1%	26.8%	20.4%
	360-420	Count	18	10	28
		% within Group	25.4%	14.1%	19.7%
	420-480	Count	7	6	13
		% within Group	9.9%	8.5%	9.2%
	480-540	Count	3	2	5
		% within Group	4.2%	2.8%	3.5%
	540-600	Count	4	1	5
		% within Group	5.6%	1.4%	3.5%
	>600	Count	11	0	11
		% within Group	15.5%	0.0%	7.7%
Total		Count	71	71	142
		% within Group	100.0%	100.0%	100.0%

Table 3: Distribution of outcomes

Outcomes	Group A	Group B	p value
Total time for successful needle Placement (s)	401.44	320.49	<0.001
Time taken to position (s)	72.92	56.32	0.002
Number of attempts			0.028
1	40	44	
2	15	24	
>3	16	3	
Number of redirections			0.009
0	13	24	
1	17	18	
>2	41	29	
Success at first attempt			0.495
Yes	40	44	
No	31	27	

Data expressed as mean or frequency

Table 4: Comparison of satisfaction score between the groups

Statistic	Group A (Satisfaction Score)	Group B (Satisfaction Score)	p-value
Mean	8.00	9.00	0.007
S.D.	1.16	0.96	
Percentiles			
25th	7	8	
50th	8	9	
75th	9	10	
Satisfaction ≥8	74.6%	91.5%	0.045

4. Discussion

Visual images have the capability to improve comprehension when they show relationships among ideas and thus, they can influence the adherence to instructions provided with particular intention. Our study demonstrated significant improvement in positioning of patients undergoing SAB with the use of visual aid. Improved positioning of the patients was measured by less time taken for the procedure as well as for the positioning, improved ease of spinal needle placement with less no. of attempts and redirections. Visual aids significantly enhanced the first-pass success rate, as participants were better able to understand the positioning required for successful spinal needle placement with the assistance of visual aid along with verbal commands.

Over the years, numerous studies have highlighted the risks associated with incorrectly placing a needle during central neuraxial blockade. These complications range from minor issues such as post-dural puncture headache to more severe outcomes like permanent neurological damage.[9] Poor positioning during the procedure not only increases the likelihood of complications but also raises the number of attempts needed for successful needle placement, contributing to patient dissatisfaction. Therefore, our study emphasizes the importance of proper positioning during spinal anaesthesia. We investigated whether using both visual aid and verbal aid for positioning improves procedural outcomes compared to using verbal instruction alone

A requirement of >1 attempt and ≥3 redirections is found to be associated with difficult spine anatomy.[10] The requirement of needle redirections decreases with a flexed back increasing the chances of reduced complications and discomfort.[11,12] Previous studies have demonstrated that when three or more attempts were made during spinal anaesthesia, patients often experienced considerable dissatisfaction.[3] This dissatisfaction could potentially lead patients to decline future neuraxial blocks. A successful blockade in a shorter time might enhance both patient and anaesthesiologist satisfaction.[13] In our study, we observed higher levels of anaesthesiologist satisfaction in group B. Our study results are in agreement with those from a comparable study done in an Australian population by Usha Gurunathan et al. in 2018.[8] They found that use of visual image along with verbal instructions resulted in reduction in time taken for the procedure (301s vs 183s) and reduced number of needle punctures. P R Nair et al. found visual aid to be effective for anaesthetists in delivering patient care and improving patient satisfaction in obstetric population in United Kingdom.[14]

The LD position with flexed back often promotes first puncture success rate with reduced requirement of needle redirections in comparison to a straight back.[12] Adequate patient positioning with a flexed back enhances palpability of the spine, which in turn, provides proficient knowledge about the anatomical landmarks to the anaesthesiologist.[15] This helps in identifying the puncture site opportunely. The significant difference in the results can be explained as cognitive preference for picture-based information by humans, rather than text-based information which accounts for improvement in comprehension, adherence and recall.[16]

The experience of the anaesthesiologist emerges as a crucial factor influencing the successful placement of neuraxial blocks, particularly in locating the subarachnoid space.[6,11] Research indicates that greater anaesthesiologist experience correlates with higher procedural success rates.[11] However, findings from Tomislav Ružman et al. suggest a different perspective, demonstrating a higher success rate among younger residents in their study.[6] On the other hand, some studies have found no significant difference in success rates based on anaesthesiologist experience but emphasize that greater experience contributes to a smoother and quicker procedure completion.[17] Our study included anaesthesiologists with more than 2 years of training, though we did not find clear evidence linking experience or seniority to the ability to identify and execute a subarachnoid block. Nonetheless, we speculate that if we had specifically considered experience levels, any time differences between groups might have been more pronounced.

Our study had several limitations. First, we did not assess whether the years of experience of the anaesthesiologists influenced first-pass success rates in either group. While anaesthesiologist satisfaction was evaluated, patient satisfaction regarding the use of visual aids was not considered. Additionally, we did not account for patients' BMI, nor did we investigate whether visual aids contributed to achieving first-pass success more quickly in patients with higher BMI. Future studies could explore the impact of visual aids in patients with higher BMI and incorporate patient satisfaction scores. Moreover, with more comprehensive data, future studies may aim to extend the use of visual aids to spinal trolleys in operating theatres.

While neuraxial ultrasound is increasingly favoured for addressing challenges in achieving successful spinal anaesthesia, its utility in patients with readily identifiable landmarks remains uncertain. The routine use of ultrasound for spinal anaesthesia is still debated. Therefore, there is a need for a practical, easy-to-implement approach that enhances first-pass success rates using the conventional landmark technique in everyday practice.

5. Conclusion

The use of visual aids, combined with verbal instructions, significantly reduces the time required for needle placement during the subarachnoid block (SAB) procedure. It also enhances anaesthesiologist satisfaction and improves the first-pass success rate. This simple visual aid enhances patient comprehension, which plays a key role in achieving optimal positioning for SAB. Given these advantages, visual aids may be considered for routine use in clinical practice to improve both procedural efficiency and patient outcomes.

6. Source of Funding

Nil.

7. Conflict of Interest

The authors declare no conflict of interest.

8. Authorship

The study has been carried out under the guidance of Dr. Gandeeva Ramesh Mudigere. He provided concept and design and supervised the study and revised the article. Miss Rashmitha Balloor drafted the article, acquired data for the study and provided care for the participants. Dr. Priya Mitali Provided writing assistance and approved final version for submission. All authors approved of the manuscript.

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