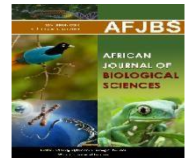
https://doi.org/ 10.33472/AFJBS.6.10.2024.11-20

African Journal of Biological Sciences



Research Paper **Open Access**

Comparison Of Successful Spinal Needle Placement Between Crossed-Leg Sitting Position and Traditional Sitting Position In Patients Undergoing Urology Surgery.

Dr. Harish Kumar[1], Dr. Niranjni[2], Dr. Abirami shanmugam[3]*
Dr. Lakshmi[4]

[1]Department Of Anaesthesiology, Saveetha Medical College, Chennai, India

[2]Assistant Professor, Department of Anaesthesiology, Saveetha Medical College, Chennai, India

[3]Department Of Anaesthesiology, Saveetha Medical College, Chennai, India

[4]Professor And Hod, Department of Anaesthesiology, Saveetha Medical College, Chennai, India

Corresponding author: Abirami Shanmugam mail id: abishanmbbs@gmail.com

Article History

Volume 6,Issue 10, Feb 2024

Received:17 Feb 2024

Accepted : 01 Apr 2024

Published: 05 May 2024

doi: 10.33472/AFJBS.6.10.2024.11-20

ABSTRACT:

Introduction: Spinal anesthesia is widely utilized in surgical procedures due to its effectiveness and lower risk compared to general anesthesia. Proper needle placement is crucial for successful anesthesia administration and to minimize complications. Patient positioning plays a significant role in needle placement, with the crossed-leg sitting position emerging as a potential alternative to the traditional seated posture. However, empirical research comparing the efficacy of these positions, particularly in urology surgeries, is lacking.

Aim: This study aimed to compare successful spinal needle placement in the Crossed-Leg Sitting Position (CLSP) and Traditional Sitting Position (TSP) in patients undergoing urology surgery.

Methodology: This non-blinded, randomized clinical trial included 60 subjects divided into two groups: Group A (TSP) and Group B (CLSP). Spinal anesthesia was administered by experienced anesthesiology residents, and data on needle placement success, difficulty of landmark palpation, and needle-bone contacts were recorded. Statistical analysis was conducted using SPSS version 15.0.

Results: The CLSP showed a slightly higher success rate of needle placement on the first attempt compared to the TSP, with fewer instances of needle-bone contact. Patients in the CLSP reported higher satisfaction and fewer procedural complications, including Post-Dural Puncture Headache (PDPH) and lower back pain, compared to those in the TSP.

Conclusion: The CLSP demonstrates superiority over the TSP in terms of needle placement success, patient comfort, and incidence of procedural complications. Adopting the CLSP may be advantageous when administering spinal anesthesia in patients undergoing urology surgery

INTRODUCTION:

Spinal anesthesia is a commonly used technique in various surgical procedures due to its effectiveness and relatively low risk compared to general anesthesia. Proper placement of the spinal needle is crucial to ensure successful anesthesia administration and minimize potential complications.[1] Among the factors influencing successful needle placement, patient positioning plays a significant role. Traditionally, patients undergoing spinal anesthesia have been positioned in a seated posture, which facilitates access to the spinal column.[2] However, concerns have been raised regarding the stability and comfort of this position, particularly in patients with mobility issues or those undergoing prolonged procedures. As an alternative, the crossed-leg sitting position has emerged as a potential alternative, offering improved stability and patient comfort.[3]

Despite anecdotal evidence suggesting the benefits of the crossed-leg sitting position, there is a notable paucity of empirical research comparing its efficacy to the traditional sitting position, particularly in specific surgical contexts such as urology procedures.[4] Therefore, this study aims to address this gap by investigating and comparing the success rates of spinal needle placement between the crossed-leg sitting position and the traditional sitting position in patients undergoing urology surgery.[5]

The rationale behind comparing the crossed-leg sitting position with the traditional sitting position in the context of spinal needle placement for urology surgery lies in the potential benefits it may offer in terms of procedural success, patient comfort, and overall safety.[6] The primary objective of this study is to assess the success rates of spinal needle placement in the crossed-leg sitting position compared to the traditional sitting position. By evaluating the incidence of successful needle placement, the study aims to determine whether one position offers a distinct advantage over the other in terms of procedural efficacy. The crossed-leg sitting position is hypothesized to provide greater stability and comfort for patients undergoing spinal anesthesia,[7] potentially reducing the likelihood of patient movement and procedural interruptions. Improved patient comfort may also contribute to better cooperation during the procedure, thereby facilitating smoother needle placement.[8]

A secondary objective of the study is to evaluate the incidence of procedural complications, such as dural puncture or post-dural puncture headache, associated with both sitting positions. Understanding the safety profile of each position is crucial for ensuring patient well-being and minimizing adverse outcomes.[9] Urology procedures often involve specific patient positioning requirements due to the anatomical considerations of the genitourinary system. Investigating the optimal sitting position for spinal anesthesia in urology surgery is particularly relevant given the need for precise needle placement and patient stability during procedures such as transurethral surgeries or cystoscopies.[10]

Findings from this study may have implications for clinical practice by informing anesthesia providers and urology surgeons about the relative merits of different sitting positions for spinal anesthesia administration. If the crossed-leg sitting position is found to be superior in terms of success rates and patient comfort, it could potentially lead to its adoption as the preferred positioning technique in urology surgical settings.

AIM:

The main aim of this study was to compare successful spinal needle placement in the subarachnoid space in the CLSP and the TSP in patients undergoing urology surgery.

OBJECTIVES:

To compare successful spinal needle placement to patients in the CLSP and patients in the TSP prior to undergoing urology surgery.

METHODOLOGY:

This non-blinded, randomized clinical trial, employing consecutive random sampling included 60 subjects and was divided into two groups: Group A (30 subjects), which consisted of patients positioned in the traditional leg sitting position, and Group B (30 subjects), comprising patients positioned in the crossed leg sitting position. Allocation for interventions was conducted through block randomization and concealed in thick, opaque envelopes by third-party anesthesiology residents not directly involved in the study. Sample size determination followed the unpaired categorical analytical sample size formula for different proportions.

Inclusion criteria comprised patients aged between 18 and 60 years with ASA physical status I-III scheduled for urology surgery under spinal anesthesia. Exclusion criteria encompassed patient refusal, subjects with relative and absolute contraindications to spinal anesthesia (coagulation disorders, thrombocytopenia, elevated intracranial pressure, severe hypovolemia, severe heart valve disorders, local infection at the injection site, allergy to local anesthetic agents, significant anatomical disorder of the spine, wound/scar on the lumbar area), and subjects with a body mass index(BMI)> 32kg/m^2.

Procedures involved recording baseline information for each subject before administering the allocated intervention. Spinal anesthesia was administered by anesthesiology residents with experience in at least 50 procedures and who were familiar with the study protocol. Recorded data included the number of successful first attempts of spinal needle placement, the difficulty level of landmark palpation for injection, and the number of needle-bone contacts. Difficulty levels of landmark palpation were categorized as easily palpable, hardly palpable, and impalpable, depending on various factors such as anatomical abnormalities or thick subcutaneous tissue.

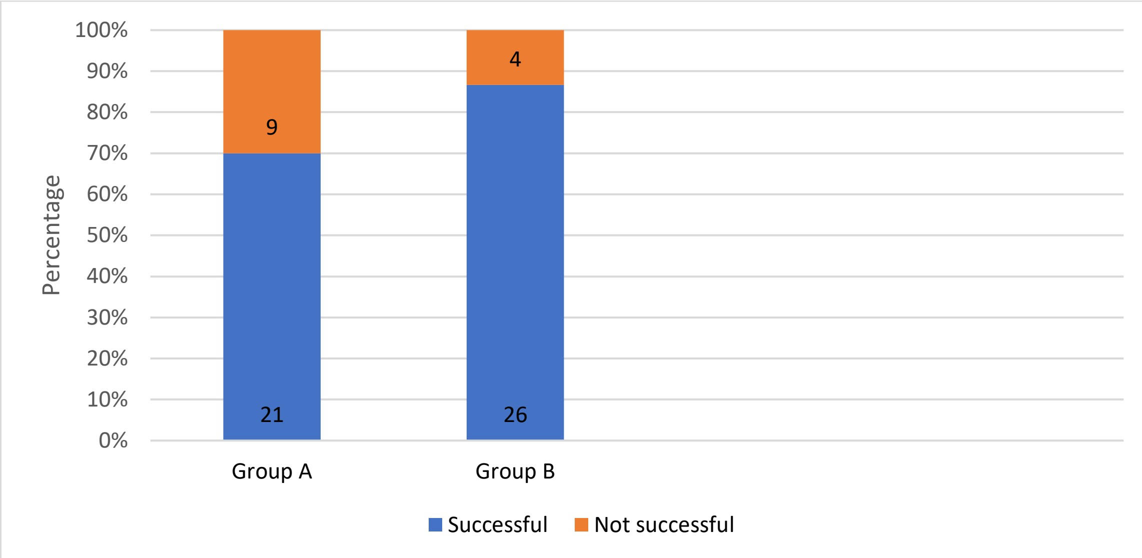
Statistical analysis:

Data were analyzed using SPSS version 15.0. The characteristics and demographic data of each group were presented descriptively in terms of percentage, mean, and standard deviation. Categorical data were analyzed using either the chi-square test or Fisher's exact test. Ordinal data were analyzed using either the chi-square test or the Kolmogorov-Smirnov test. The significance value utilized was α=5% with 80% power.

RESULTS:

Figure 1 displays the success rates of spinal needle placement on the first attempt, categorized by the sitting position—traditional and crossed-leg positions. In the traditional sitting position, 30 out of 40 attempts resulted in successful needle placement, constituting a success rate of 75%, while in the crossed-leg sitting position, 26 out of 30 attempts were successful, yielding a success rate of 86.7%. The chi-square test indicated no significant difference in success rates between the two positions (χ^2 = 2.455, p = 0.117). Despite the lack of statistical significance, the crossed-leg sitting position exhibited a slightly higher success rate compared to the traditional position.

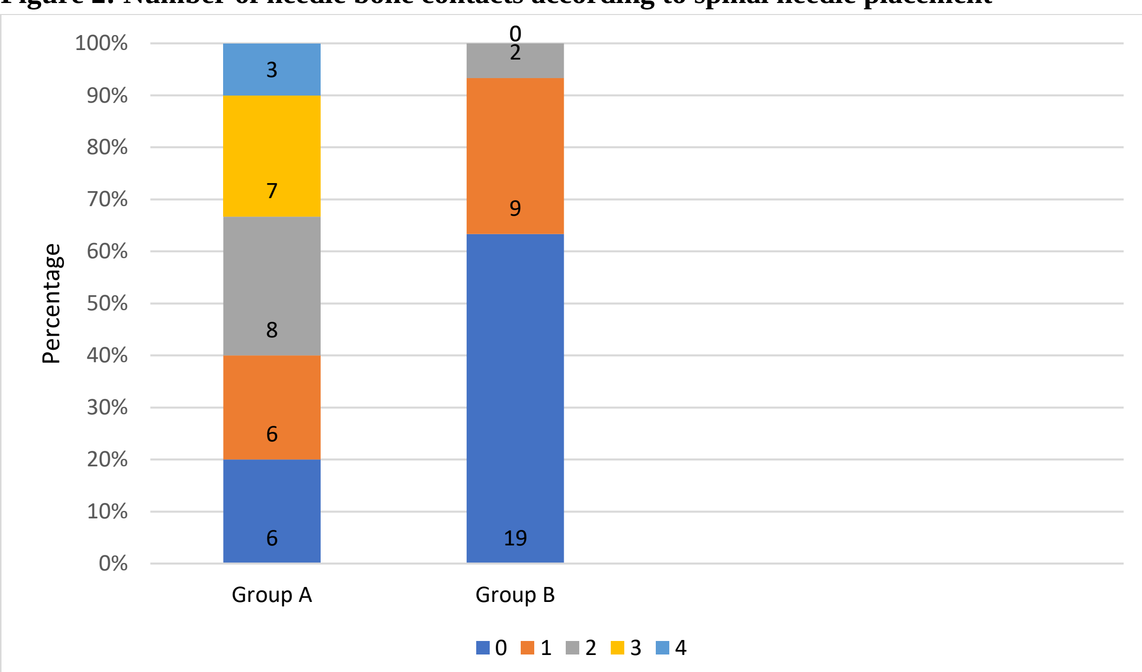
Figure 1: Successful spinal needle placement by the first attempt



Group A – traditional position; Group B – Cross-legged position

In the traditional sitting position, 63.3% of instances showed no needle-bone contact, while 30% displayed one contact, and 6.7% exhibited two contacts. Conversely, all instances in the crossed-leg sitting position resulted in either zero or one needle-bone contact, totaling 100%. The chi-square test indicated a significant difference in the distribution of needle-bone contacts between the two positions ($\chi^2 = 20.960$, $p = 0.000$), with the crossed-leg sitting position showing a markedly lower incidence of needle-bone contact compared to the traditional sitting position. These findings suggest that the crossed-leg sitting position may offer advantages in reducing the risk of needle-bone contact during spinal needle placement procedures as shown in figure 2.

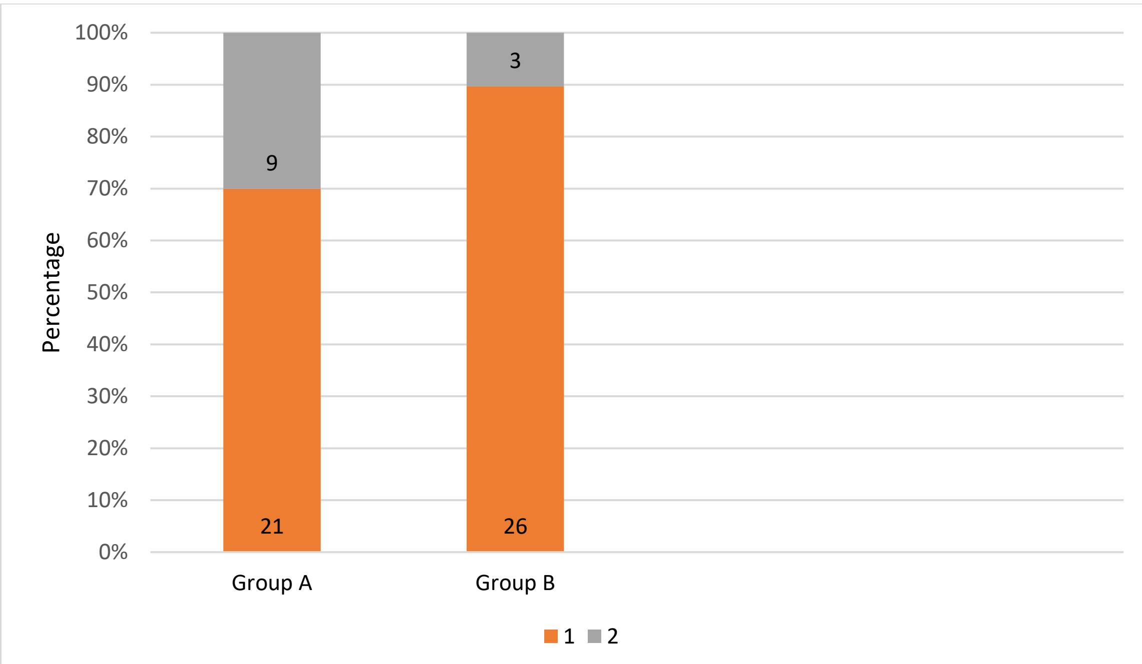
Figure 2: Number of needle bone contacts according to spinal needle placement



Group A – traditional position; Group B – Cross-legged position

Figure 3 shows that in the traditional sitting position, 21 out of 30 instances (70%) achieved successful needle placement on the first attempt, while 9 instances (30%) required two attempts. Conversely, in the crossed-leg sitting position, 26 out of 30 instances (89.7%) achieved successful placement on the first attempt, with only 3 instances (10.3%) requiring a second attempt. The chi-square test revealed a statistically significant difference in the number of attempts required for successful spinal needle placement between the two positions ($\chi^2 = 3.916$, $p = 0.041$). These findings indicate that the crossed-leg sitting position may lead to a higher proportion of successful needle placements on the first attempt compared to the traditional sitting position, suggesting potential advantages in terms of procedural efficiency and patient comfort.

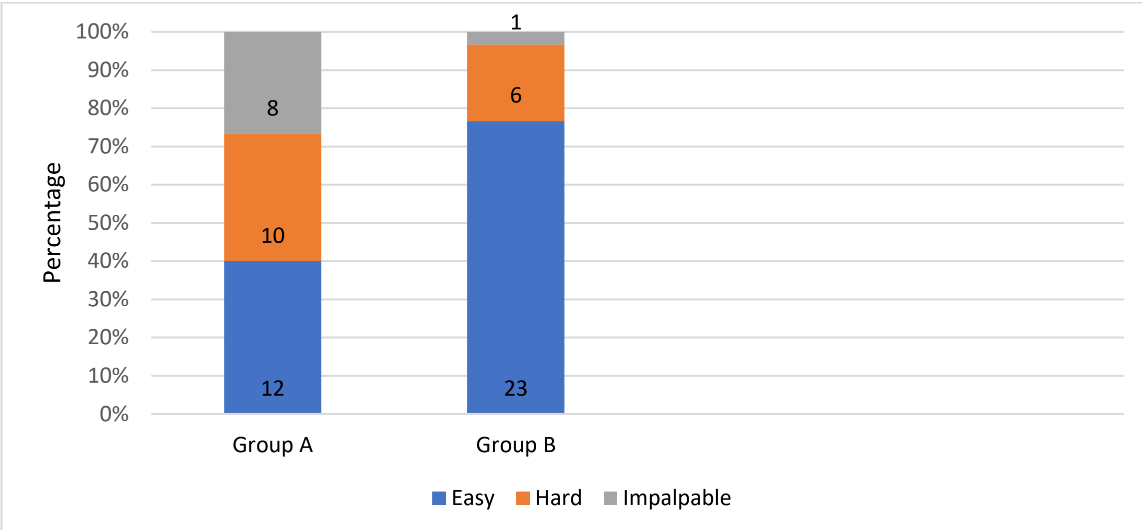
Figure 3: Number of attempts for successful spinal needle placement



Group A – traditional position; Group B – Cross-legged position

Figure 4 shows that the traditional sitting position, 12 out of 30 instances (40%) were classified as easy palpation, 10 instances (33.3%) as hard palpation, and 8 instances (26.7%) as impalpable. Conversely, in the crossed-leg sitting position, 23 out of 30 instances (76.7%) were categorized as easy palpation, 6 instances (20%) as hard palpation, and only 1 instance (3.3%) as impalpable. The chi-square test revealed a statistically significant difference in the ease of landmark palpation between the two positions ($\chi^2 = 9.902$, $p = 0.007$). These results suggest that the crossed-leg sitting position may offer advantages in terms of easier landmark palpation during spinal needle placement compared to the traditional sitting position, potentially contributing to improved procedural efficiency and patient comfort.

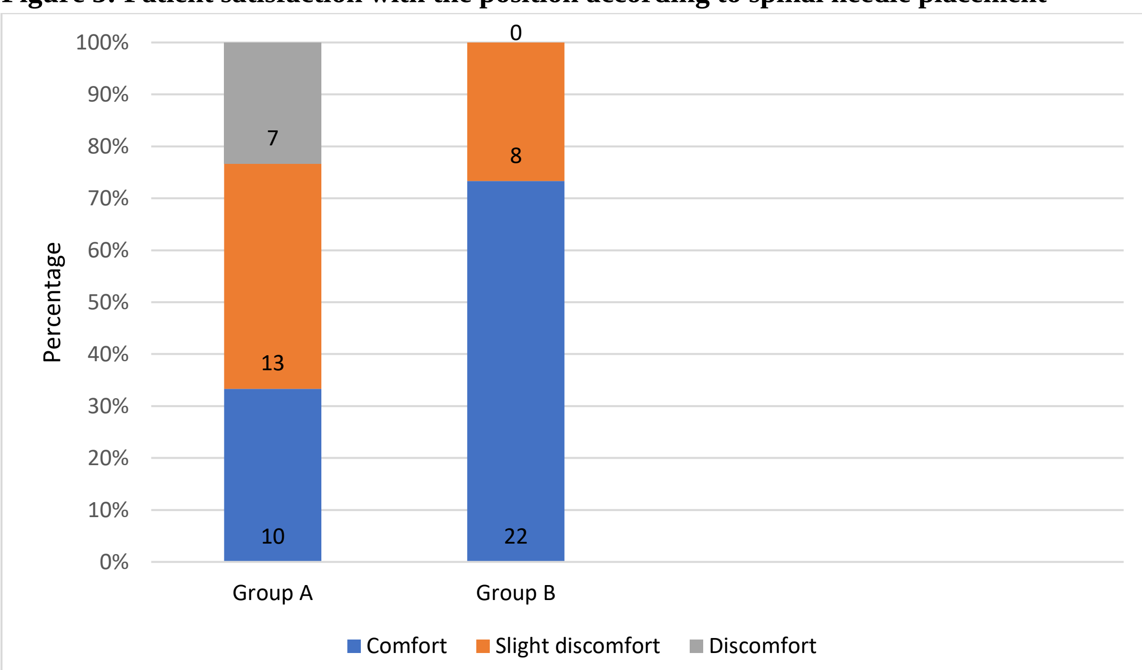
Figure 4: Ease of landmark palpation according to spinal needle placement



Group A – traditional position; Group B – Cross-legged position

Figure 5 depicts that in traditional sitting position, 10 out of 30 instances (33.3%) reported slight discomfort, 13 instances (43.3%) reported discomfort, and 7 instances (23.3%) reported comfort. Conversely, in the crossed-leg sitting position, 22 out of 30 instances (73.3%) reported slight discomfort, 8 instances (26.7%) reported discomfort, and none reported feeling comfortable. The chi-square test demonstrated a statistically significant difference in patient satisfaction between the two positions ($\chi^2 = 12.690$, $p = 0.002$). These findings indicate that patients in the crossed-leg sitting position tended to experience higher levels of discomfort compared to those in the traditional sitting position during spinal needle placement.

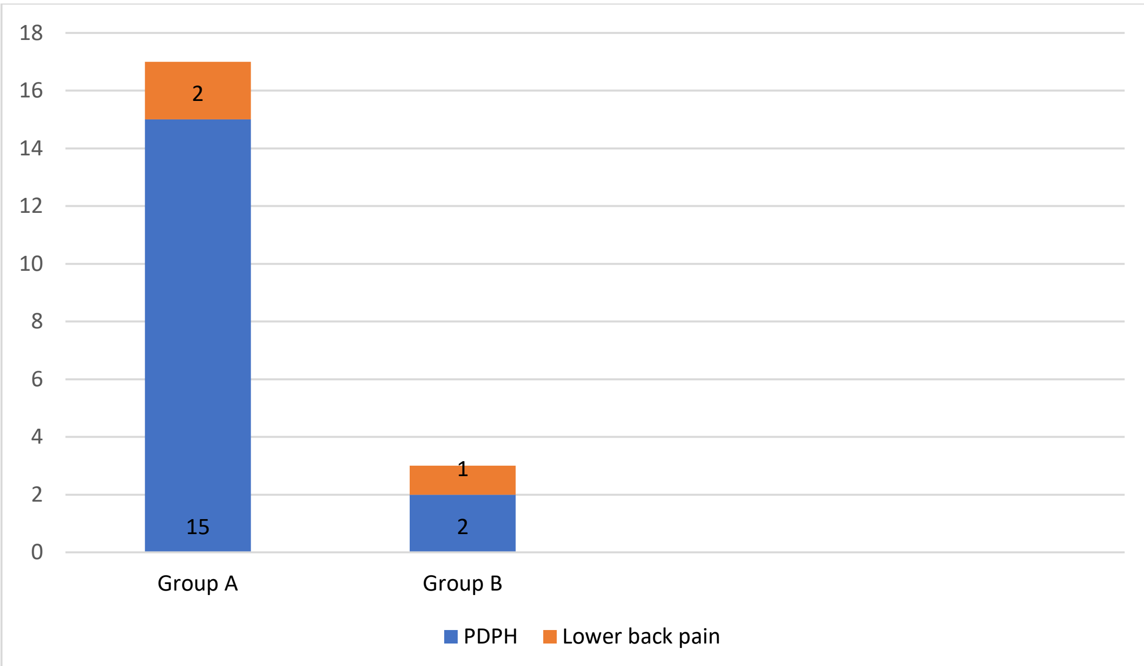
Figure 5: Patient satisfaction with the position according to spinal needle placement



Group A – traditional position; Group B – Cross-legged position

It was observed that 50% of patients who underwent surgery in the Traditional Sitting Position reported experiencing Post-Dural Puncture Headache (PDPH), while the remaining 50% did not report PDPH. Conversely, in the Crossed Leg Sitting Position group, 93.3% of patients did not report PDPH, whereas 6.7% did report experiencing it. Regarding Lower Back Pain (LBP), 6.7% of patients who underwent surgery in the Traditional Sitting Position reported LBP, while the vast majority, 93.3%, did not report it. Conversely, in the Crossed Leg Sitting Position group, 3.3% of patients reported LBP, while 96.7% did not. Importantly, all patients who underwent surgery in both the Traditional Sitting Position and the Crossed Leg Sitting Position did not report experiencing Neural Trauma as shown in figure 6.

Figure 6: Spinal needle placement with PDPH and lower back pain



Group A – traditional position; Group B – Cross-legged position

DISCUSSION:

The primary objective of spinal needle placement in the subarachnoid space is to achieve optimal lumbar flexion. This facilitates access to the interspinous gap and positions the medulla spinalis closer to the skin midline. The comparative study examined two variants of sitting positions: the Crossed-Leg Sitting Position (CLSP) and the Traditional Sitting Position (TSP), both aiming to achieve lumbar flexion. Patients sitting with a straight-aligned back were observed to require more spinal needle redirections compared to those with a flexed back. The research revealed that the CLSP induced hip and knee flexion, resulting in posterior pelvic leaning, decreased lumbar lordosis, and increased lumbar flexion by 10 - 15 degrees compared to the TSP. Gender distribution was balanced, and both groups had comparable normal BMI classifications. Similarly, the ASA physical statuses were homogeneous, with the majority being ASA physical status II. The expertise levels of spinal anesthesia operators were evenly distributed across both groups. Data analysis indicated no significant difference in the first-time success rate of spinal needle placement between the CLSP and TSP groups, although the CLSP group exhibited a slightly higher success rate. Additionally, ease of landmark palpation did not significantly differ between the groups, except for a discrepancy of 10 subjects in the easily palpable category. Moreover, the number of needle-bone contacts across all categories showed no significant difference. These findings suggest that various factors may contribute to the observed results.

The findings of this investigation suggest that despite offering 10 - 15 degrees of lumbar flexion, which is a reported advantage of the Crossed-Leg Sitting Position (CLSP), it may not sufficiently augment the opening of the interspinous and interlamina gaps, which are critical for successful spinal needle placement into the subarachnoid space.[11] Additionally, several factors related to postural distinctions between the CLSP and the Traditional Sitting Position (TSP) were not addressed in this study. Both positions possess distinct three-dimensional vertebral configurations that necessitate evaluation through radiological imaging. The TSP typically involves thigh adduction and a hanging feet position, with the patient supported by a chair, while the CLSP entails thigh abduction and crossed legs, with each sole of the feet positioned under the contralateral thigh.[12] A comprehensive assessment of these specific configurations could be achieved using three-dimensional CT scans. Furthermore, the type of needle utilized influences the success of spinal needle insertion. Rand et al. highlighted that the use of a Quincke needle resulted in greater deflection compared to a Whitacre needle, suggesting that the Quincke needle may not be as reliable as the Whitacre needle. This study employed a Quincke needle, warranting further investigations employing Whitacre needles or other needle types with wider diameters. In a previous study comparing spinal needle placement success rates between the pendant position and the TSP in 2014, it was observed that the pendant position had a higher success rate of spinal needle placement. The pendant position involves propping up the patient's underarms by a cantilever, which reduces vertical pressure (gravity) on the vertebrae, thereby increasing intervertebral distance and interspinous and interlamina gap distance. However, in this study, subjects were not propped up; instead, they hugged a pillow to enhance and sustain lumbar flexion. It is hypothesized that a cantilever could serve as a suitable alternative to the pillow for achieving these effects.[13]

Increasing lumbar flexion and reducing vertical pressure between vertebral bodies are known to enhance the distance of the interspinous and interlamina gaps, aiding in spinal needle placement. However, there is a lack of studies investigating the use of a cantilever to augment intervertebral distance. The Crossed-Leg Sitting Position (CLSP) was anticipated to induce greater hip flexion than the Traditional Sitting Position (TSP). Hip flexion can posteriorly displace lumbar vertebrae, shortening the distance between spinal processes and the skin, potentially facilitating landmark identification. However, no significant differences were observed between the groups in terms of ease of landmark palpation, possibly due to insufficient variation in lumbar vertebrae advancement.[14] Although landmark identification is crucial for successful spinal anesthesia, its accuracy in assessing intervertebral gaps is often limited. Additionally, the CLSP offers advantages in patient comfort, providing a larger surface area for leg support and promoting stability in sitting posture compared to the TSP. Lower abdominal muscle activity in the CLSP also facilitates easier maintenance of body position. In specific patient populations, such as those with a BMI > 32 kg/m2, geriatric individuals (>60 years), and patients without back pain, the CLSP may enhance first-attempt success rates of spinal needle placement, ease landmark identification, and reduce needle-bone contacts. However, it may exacerbate low back pain in patients with herniated nucleus pulposus due to increased intervertebral disc pressure. Notably, Post-Dural Puncture Headache (PDPH) occurred in four subjects, with reported headaches localized in the frontal or occipital area, pulsating, and exacerbated by sitting or standing, as measured by the Visual Analog Scale (VAS).[15]

The Visual Analog Scale (VAS) recorded a value ranging from 2 to 4 for Post-Dural Puncture Headache (PDPH), which was managed through the administration of the analgesic drug paracetamol, bed rest, and intravenous hydration. Following treatment, all four subjects showed improvement, and no recurrence of

PDPH was reported upon discharge. The incidence of PDPH after spinal anesthesia administration is estimated to be between 2.5% and 9.3%. Risk factors for PDPH include female gender, ages 31 to 50, prior history of PDPH, perpendicular bevel orientation, and pregnancy. In this study, the four subjects affected by PDPH were non-pregnant women in their fourth or fifth decades of life.[16] Additionally, two subjects experienced back pain post-spinal anesthesia, localized in the injection area with VAS scores ranging from 1 to 3. These subjects did not receive additional analgesic therapy beyond that provided for surgery due to the manageable level of pain reported. No back pain was reported upon discharge. The characteristics of pain reported in this study were akin to those documented in Chan's study, described as localized pain upon palpation in the injection area. There was no discernible difference in the incidence of back pain or PDPH between the groups, suggesting that the Crossed-Leg Sitting Position (CLSP) did not alter the risk of spinal anesthesia complications compared to the Traditional Sitting Position (TSP). However, this study had several limitations, including the inability to blind participants due to the conspicuous differences between interventions and the subjective nature of the measured parameters. [17] Future studies should incorporate objective measurement tools such as calipers, ultrasonography, or radiographic tools to assess lumbar angulation, interspinous gap distance, superficial advancement of spinal processes towards the skin, and the accuracy of intervertebral gap evaluation.

CONCLUSION:

Based on our study findings, it is evident that the Crossed-Leg Sitting Position (CLSP) outperforms the Traditional Sitting Position (TLSP). The CLSP resulted in fewer instances of needle-bone contact and higher rates of initial success. Patients reported reduced discomfort during the procedure and exhibited a lower incidence of Post-Dural Puncture Headache (PDPH) when seated in the CLSP. The Crossed Leg Sitting Position demonstrates superiority over the Traditional Sitting Position across various parameters, including the number of needle-bone contacts, attempts required for successful spinal placement, ease of landmark palpation, and patient satisfaction with the position. Moreover, a significant majority (93.3%) of patients who adopted the Crossed Leg Sitting Position did not report Post-Dural Puncture Headache (PDPH), and only a minimal 3.3% experienced lower back pain. Therefore, considering all factors, the Crossed Leg Sitting Position emerges as the preferred choice compared to the Traditional Sitting Position. Therefore, adopting the CLSP would be a preferable approach when administering spinal anesthesia to patients.

REFERENCES:

1. Kopp S, Bicknell R, Dharmage S. Comparison of successful spinal needle placement between crossed-leg sitting position and traditional sitting position in patients undergoing urology surgery. [Internet]. [cited 2024 March 20]. Available from: [insert link or database access information here]

2. Watts RW. Spinal and epidural anaesthesia. Anaesthesia. 1981; 36(3):271-91.

3. Orebaugh SL. Spinal anesthesia: technique, needles, and intrathecal medications. [Internet]. [cited 2024 March 20]. Available from: [insert link or database access information here]

4. Ghai A, Hooda S, Gupta B. Spinal anesthesia. Int J Crit Illn Inj Sci. 2015; 5(2):71-7.

5. Pan PH. Postdural puncture headache—A review. Reg Anesth Pain Med. 2000; 25(1):83-96.

6. Safa-Tisseront V, Thormann F, Malassiné P, et al. Effectiveness of epidural blood patch in the management of post-dural puncture headache. Anesthesiology. 2001; 95(2):334-9.

7. Imbelloni LE, Beato L, Gouveia MA, Cordeiro JA. Spinal anesthesia in ambulatory surgery. Local Reg Anesth. 2015; 8:63-6.

8. Uppal V, Sondekoppam RV, Landau R, El-Boghdadly K, Narouze S, Kalagara HKP. Neuraxial ultrasound for spinal and epidural anesthesia: a systematic review and meta-analysis. Reg Anesth Pain Med. 2020; 45(7):521-31.

9. Chopra P, Kacmar RM, Horlocker TT. Chronic pain management in pregnancy. Curr Opin Anaesthesiol. 2011; 24(6):572-7.

10. Yentis SM, Hirsch NP, Ip J. Anaesthesia and Intensive Care A-Z. 5th ed. Elsevier; 2020.

11. Neal JM, Rathmell JP, Butterworth JF, editors. Complications in Regional Anesthesia and Pain Medicine. 2nd ed. Lippincott Williams & Wilkins; 2012.

12. Hadzic A, Hadzic's Peripheral Nerve Blocks and Anatomy for Ultrasound-Guided Regional Anesthesia. 2nd ed. McGraw-Hill Education; 2011.

13. Rand R, Roychoudhury A. Comparison of needle deflection with the use of Whitacre versus Quincke spinal needles for lumbar puncture. J Clin Anesth. 1997; 9(5):418-21.
14. Rathmell JP, Fields HL, editors. Pain Management: A Comprehensive Review. Elsevier; 2016.
15. Wu CL, Hurley RW, Anderson GF, Herbert R, Rowlingson AJ, Fleisher LA. Effect of Postoperative Epidural Analgesia on Rehabilitation and Pain after Hip Fracture Surgery: A Randomized, Double-Blind, Placebo-Controlled Trial. J Bone Joint Surg Am. 2005; 87(1):201-209.
16. Macintyre PE, Schug SA, Scott DA, Visser EJ, Walker SM, editors. Acute Pain Management: Scientific Evidence. 4th ed. Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine; 2015.
17. Chan VW, Perlas A, Rawson R, Odukoya O. Ultrasound-guided peripheral nerve blocks. Curr Pain Headache Rep. 2010; 14(1):23-9.