International Journal of Research in Medical Sciences
Kulkarni V et al. Int J Res Med Sci. 2025 Apr;13(4):1514-1518
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20250974

Original Research Article

Evaluation of efficacy and safety of Taylor's approach for neuraxial blockade in infraumbilical surgeries with difficult lumbar access: a retrospective, single-centre study

Vivek Kulkarni*, Kshama Shah, Shilpa Tiwaskar, Jyotsna Karande, Rahul Ranade, Priyanka Reddy, Dipti Madan, Vidhi Narechania, Shweta Vaze, Vijakumar Gawali

Department of Anesthesia, Bhaktivedanta Hospital and Research Institute, Thane, Maharashtra, India

Received: 03 February 2025
Accepted: 07 March 2025

***Correspondence:**
Dr. Vivek Kulkarni,
E-mail: drvivek.k@bhaktivedantahospital.com

ABSTRACT

Background: Spinal block, commonly known as subarachnoid anesthesia, is the most popular method for performing lower extremity procedures. In patients with difficult spinal anatomy, the Taylor modified paramedian technique has proven to be beneficial. This study aim is to assess the efficacy and safety of Taylor's technique in a heterogeneous group.
Methods: This retrospective observational study was conducted from March 2018 to August 2024, involving 68 patients aged between 18 and 80 years, classified as ASA I–III. The study focused on patients with degenerative diseases or spinal anomalies that complicated lumbar puncture procedures. For regional anaesthesia, lumbar subarachnoid blocks (LSAB) were administered using Taylor's method. Data on drug dosages, complications, outcomes and procedure parameters were collected and analysed.
Results: The mean time to onset of sensory and motor block was 8.26 minutes, while the mean regression time was 197.98 minutes. The procedure was successful in 97.06% of cases and a large study population needed 2–3 needle redirection attempts. Mean depth of lumbar puncture measured with Stocker's formula was 63.81 mm, which matched nearly with that of the calculated depth. Trendelenburg position was preserved for 10 minutes facilitating anaesthetic flow. The most frequent reasons for disability in the implementation of LSAB were lumbar spinal disorders 48.11% , obesity 35.85% and 16.04% had difficulty in sitting due to pain.
Conclusions: The modified paramedian approach from Taylor's for LSAB is effective, rapid, and reliable technique.

Keywords: Infraumbilical, Stocker’s formula, Subarachnoid, Taylor’s approach

INTRODUCTION

Subarachnoid anesthesia, also known as a spinal block, is a type of central neuraxial anesthesia (CNA) that involves injecting an anaesthesia into the subarachnoid space of the spinal cord.[1] Subarachnoid anaesthesia procedures have demonstrated exceptional safety, utilizing minimal medication to achieve profound and consistent sensory analgesia and motor block with negligible systemic effects as opposed to epidural anaesthesia.[2] Neuraxial anaesthesia is preferred to general anaesthesia for lower extremity surgery. This type of anaesthesia is equally effective when compared to general anaesthesia and offers favourable outcomes by decreasing respiratory complications and surgical stress response, reducing exposure to blood product transfusion, improving functional recovery and shortening the length of hospital stay.[3-8]

The midline route of neuraxial anaesthesia is the most often used technique nevertheless, it has limitations in

individuals who cannot comply due to pain and arthritic issues. Patients with deformed spines caused by scoliosis, kyphos-scoliosis or arthritis (osteo arthritis, rheumatoid arthritis and ankylosing spondylitis) pose a challenge for anaesthesiologists due to the technical difficulty of establishing a successful subarachnoid block due to spine rotation, limited articular mobility, obliteration of the interspinous spaces and inability of patient to position adequately.[9]

In 1940, Taylor devised a modified paramedian method which is also known as, Taylor or lumbosacral approach via the L5-S1 region that is reliable, less traumatic in problematic spines and generates less hemodynamic side effects.[10]

Previous case reports have demonstrated the benefits of Taylor's approach in patients with ankylosing spondylitis.[11] Similarly, other studies have emphasized the importance of utilizing Taylor's technique.[12] However, their findings are limited by small sample sizes, selection bias and population constraints. This study aims to explore the effects and advantages of Taylor's approach in a larger and more diverse population, encompassing a broader range of spinal deformities and associated conditions.

METHODS

Study place

This retrospective observational study was carried out in the Anesthesia Department of a tertiary care centre in the Mumbai Suburban Region.

In this study data of 68 patients were analysed between the time period of March 2018 to August 2024.

The study included patients aged 18 to 80 years, classified as ASA I, II and III of either sex, who were scheduled for below-umbilical surgeries under spinal anesthesia. These patients had difficulty undergoing lumbar punctures at the L2-3, L3-4 and L4-5 intervertebral spaces using the midline and paramedian approaches due to spinal abnormalities or degenerative diseases, resulting in failure of the standard technique due to challenging spinal anatomy.

Patients on anticoagulant medications, those with a history of local infections or those who refused neuraxial blockade were excluded from the study. The study received approval from the institutional ethical committee and since it was retrospective in nature, a waiver of consent was obtained.

Before the procedure, each patient underwent a clinical evaluation and standard preoperative investigations. Upon entering the operating room, standard monitoring was initiated, including heart rate, continuous electrocardiogram, pulse oximetry and non-invasive blood pressure measurements. The lumbar puncture was performed by administering a precalculated drug dose depending on the type of surgery. The number of lumbar puncture attempts, depth of needle insertion, and the time to achieve a successful subarachnoid block were recorded. This retrospective observational study was carried out in the anesthesia department of a Bhaktivedanta Hospital and Research Institute in the Mumbai suburban region. Needle redirection without skin puncture was not considered an additional effort.

All blocks were performed by a single experienced anaesthesiologist skilled in Taylor's technique. The block was considered successful when CSF flowed freely, confirming correct identification of the subarachnoid space and the procedure was completed without the need for additional analgesics. Patients were monitored for complications for 7 days after discharge from hospital and were instructed to report any concerns either by phone or in person.

This technique was primarily used in surgeries within General Surgery, Obstetrics and Gynaecology, Orthopaedic Surgery and Urology. Key data parameters recorded during the study included the cause of difficulty in performing lumbar subarachnoid blockade, the number of needle redirection attempts (cephalocaudal), time to regression of sensory and motor block, time to onset of sensory and motor block, duration of Trendelenburg's position post-SA, depth of lumbar puncture and correlation to Stocker's formula (in mm). The pre-calculated depth of needle insertion, based on Stocker's formula (0.5×weight + 18), was also recorded.

The data was analyzed using basic statistical methods such as distribution and mean. Clinical details, preoperative diagnostics and procedural characteristics were summarized using descriptive statistics.

RESULTS

The study included a total of 68 patients. The gender distribution showed a slightly higher proportion of females (52.94%) compared to males (47.06%). The majority of patients (44.12%) were between the ages of 61 to 80 years. Patients aged 41 to 60 years comprised 26.47% of the cohort, followed by 25.00% in the 20 to 40 years age group. Only 4.41% of the patients were aged above 81 years.

The analysis of comorbidities revealed that a significant majority of patients (48.42%) had metabolic syndrome. Cardiac disease was the second most prevalent comorbidity, affecting 31.58% of the patients.

Lumbar spinal deformity was noted in 10.53% of patients, while respiratory disorders and renal disorders were present in 6.32% and 3.16% of the patients, respectively. In terms of ASA (American Society of Anesthesiologists) grade, over half of the patients (51.47%) were classified as ASA II. ASA III patients made up 30.88% of the cohort,

while ASA I patients constituted 17.65% (Table 1). This study evaluated the distribution of surgeries based on the amount of drug administered (2.6 ml versus 3.4 ml) across different types of surgical procedures. A summary of the findings is presented in Table 2.

A higher proportion of general surgeries (38.46%) were conducted with 2.6 ml of the drug, compared to only 10.34% with 3.4 ml. This indicates that the lower dose was more commonly administered in this category. Similarly, obstetrics and gynecology procedures predominantly utilized 2.6 ml of the drug (25.64%), while only 3.45% of these surgeries employed the higher dose of 3.4 ml.

In contrast to the previous categories, orthopaedic surgeries showed a reversed trend. A significantly higher proportion of procedures (58.62%) were performed with 3.4 ml of the drug, compared to just 10.26% with 2.6 ml. Urology procedures demonstrated a relatively balanced distribution between the two dosages. While 25.64% of surgeries used 2.6 ml, 27.59% involved the administration of 3.4 ml.

The findings suggest variability in the dosage preferences based on the type of surgery. While general surgery and obstetrics/Gynecology favoured the lower dose (2.6 ml), orthopaedic surgeries predominantly required the higher dose (3.4 ml). Urology procedures showed no strong preference, with both dosages being utilized in relatively comparable proportions.

The most common cause of difficulty in performing LSAB was lumbar spinal disorders, with 51 out of 68 (48.11%) individuals reporting this as the cause.

Obesity was the second most common factor, with 38 out of 68 (35.85%) of the cases experiencing difficulty. Pain while sitting was reported by 17 out of 68 individuals (16.14%) as a contributing factor to the difficulty.

Only 15 out of 68 individuals (22.06%) required just one attempt for needle redirection, suggesting that for a minority of cases, the procedure was straightforward. The majority, 25 out of 68 individuals (36.76%), required two attempts. A significant portion of cases, 28 out of 68 individuals (41.18%), required three attempts.

The mean time for regression of sensory-motor block was 197.976 minutes while the mean time to onset of the sensory-motor block was 8.2647 minutes, reflecting the rapid onset of drug action. The Trendelenburg position was maintained for a mean duration of 10 minutes after the procedure.

The measured depth of lumbar puncture was 63.8088 mm calculated using Stocker's formula while the precalculated depth of needle insertion, as per Stocker's formula was 64.8235 mm, showing a near-perfect match with the measured depth.

Table 1: Demographic and clinical characteristics of the patients.

Categories	Sub categories	N (%)
Gender	Females	36 (52.94)
	Males	32 (47.06)
Age (in years)	20 to 40	17 (25.00)
	41 to 60	18 (26.47)
	61 to 80	30 (44.12)
	Above 81	3 (4.41)
Comorbid Conditions	Metabolic syndrome	46 (48.42)
	Respiratory disorder	6 (6.32)
	Cardiac disease	30 (31.58)
	Renal disorders	3 (3.16)
	Lumbar spinal deformity	10 (10.53)
ASA Grade	ASA I	12 (17.65)
	ASA II	35 (51.47)
	ASA III	21 (30.88)

Table 2: Distribution of surgeries by amount of drug administered (2.6 ml vs 3.4 ml).

Name of surgery	2.6 ml (Amount of drug given (ml)		3.4 ml (Amount of drug given (ml)	
	N	%	N	%
General surgery	15	38.46	3	10.34
Obstetrics and gynaecology	10	25.64	1	3.45
Orthopaedic surgeries	4	10.26	17	58.62
Urology procedures	10	25.64	8	27.59

Table 3: Challenges and procedural factors in Taylor's Approach.

Categories	Sub categories	N	%
Cause of difficulty in lumbar subarachnoid blockade (LSAB)	Lumber spinal disorders	51	48.11
	Obesity	38	35.85
	Pain in sitting	17	16.04
No of attempts for needle redirection (Cephalo cranial)	1	15	22.06
	2	25	36.76
	3	28	41.18

Table 4: Procedural parameters and needle insertion characteristics.

Parameters	Mean
Time to regression of sensory motor block (min)	197.976
Time to onset of sensory motor block (min)	8.2647
Duration of Trendelenberg's position post SA (min)	10
Depth of lumbar puncture and correlation to Stockers formula (mm)	63.8088
Precalculated depth of needle insertion as per stockers formula (0.5X weight+18) in mm	64.8235

DISCUSSION

In this study the procedural aspects and needle insertion characteristics related to Taylor's technique, focusing on factors such as the depth of the lumbar puncture, needle insertion angle and the time taken for the block to initiate and regress were evaluated. The findings are crucial for enhancing the precision and effectiveness of lumbar subarachnoid block (LSAB) techniques, which are vital for ensuring high-quality anaesthesia during surgical procedures.[1]

In another study involving 66 patients scheduled for lower abdominal surgery, the Trendelenburg position was found to be more effective, five patients in the Trendelenburg position achieved a T4 level block, compared to just one patient in the horizontal position group. The studies revealed that the Trendelenburg position had a higher level of sensory block sooner, with the block height being at a maximum of two spinal segments above the control group of horizontal.[13] Similar to present study the Trendelenburg position was maintained for 10 minutes (Table 4).

In another study, Taylor's approach achieved a significant success rate of 94% in establishing anaesthesia for challenging spinal cases, with most patients aged 51–70 years.[9] Similarly, in the present study, 30% of patients belonged to the geriatric age group (61–80 years) and 4.41% were aged above 81 years, demonstrating a significant success rate with the use of Taylor's approach (Table 1).

Taylor's technique is particularly advantageous for elderly patients with degenerative spinal changes, as it targets the L5-S1 interspace, which is typically the widest and most accessible. The use of preoperative imaging, such as lumbar X-rays, can further enhance the accuracy and success rates of this approach.[14] A case report have also highlighted the effectiveness of Taylor's approach in patients with complex spinal anatomy and various comorbidities.[11] These findings are consistent with the present study, where Taylor's approach proved effective, particularly in patients with metabolic, cardiac and lumbar comorbidities (Table 1).

Spinal anesthesia is generally preferred over general anesthesia as it avoids airway manipulation, requires only a small volume of drug and produces sensory anesthesia without systemic pharmacological effects.[15,16] Drug level of sensory blockade depends on concentration, volume of drug, as well as total dose. There are several patients' factors - CSF Volume decreases with ageing. In morbid obesity, decreased amount of CSF volume, augmented abdominal mass, a collapsed airway and higher instances of difficult intubation risk are present when managing obese patient's airway hence patients are more favoured to undergo spinal anesthesia over the general anesthesia.

Using the L5-S1 interlaminar space of the Taylor's technique has several special advantages. It is the lowest and widest available lumbar space, which has minimal chances of spinal cord trauma. This space is also less influenced by degenerative or arthritic changes; therefore, Taylor's technique becomes a better alternative to the midline approach in difficult spinal cases. It provides the subarachnoid block with adequate sensory and motor blockade that can be applied to surgeries below the umbilicus and lower limbs.[9]

CONCLUSION

Taylor's modified paramedian approach for lumbar subarachnoid block (LSAB) is a reliable and effective technique for delivering anesthesia in surgeries involving the lower abdomen, pelvis and limbs. Its quick onset, precise needle placement and reduced complication rates make it an important tool in anaesthesiology. The correlation with Stocker's formula enhances accuracy and

minimizes risks. Compared to epidural and general anesthesia, LSAB using Taylor's method offers superior speed and precision, though it requires expertise. Future studies should assess its long-term effectiveness and applicability in diverse patient populations.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Cousins MJ. Neural blockade in clinical anaesthesia and pain management. 3rd ed. Philadelphia: Lippincott Williams and Wilkins. 1998.
2. Liu SS, McDonld SB. Current issues in spinal anaesthesia. Anaesthesiol. 2001;94:888–906.
3. Johnson RL, Kopp SL, Burkle CM, Duncan CM, Jacob AK, Erwin PJ, et al. Neuraxial vs general anaesthesia for total hip and total knee arthroplasty: a systematic review of comparative-effectiveness research. BJA: British J Anaesth. 2016;116(2):163-76.
4. Anesthesia technique and mortality after total hip or knee arthroplasty: a retrospective, propensity score-matched cohort study. Perlas A, Chan VWS, Beattie S. Anesthesiology. 2016;125:724–31.
5. General anesthesia vs spinal anesthesia for patients undergoing total-hip arthroplasty: a meta-analysis. Pu X, Sun J-M. Medicine (Baltimore). 2019;98:14925.
6. Chu CC, Weng SF, Chen KT, Chien CC, Shieh JP, Chen JY, et al.Propensity score-matched comparison of postoperative adverse outcomes between geriatric patients given a general or a neuraxial anesthetic for hip surgery: a population-based study. Anesthesiology. 2015;123:136–47.
7. McIsaac DI, Wijeysundera DN, Huang A, Bryson GL, van Walraven C. Association of hospital-level neuraxial anesthesia use for hip fracture surgery with outcomes: a population-based cohort study. Anesthesiology. 2018;128:480–91.
8. Anaesthesia for hip fracture surgery in adults. Guay J, Parker MJ, Gajendragadkar PR, Kopp S. Cochrane Database Syst Rev. 2016;2:521.
9. Dr P. Chalapathy, Dr. E. Jayasundaram. Taylors approach is best apporoach to overcome difficulty in lumbar puncture in difficult spinal cases. IORS-JDMS. 2016;12-5.
10. Litz, R.J, Brandt, M., Wiessner, D., et al. spinal anaesthesia using Taylors lumbosacral approach reducing incidence and severity of hemodynamic side effect in patient undergoing transuretheral surgery. EJA. 2006;23:114.
11. Jindal P, Chopra G, Chaudhary A, Rizvi AA, Sharma JP. Taylor’s approach in an ankylosing spondylitis patient posted for percutaneous nephrolithotomy: A challenge for anesthesiologists. Saudi J Anaesth. 2009;3(2):87-90.
12. Halder B, Narayan A K, Shandilya A S, Taylors approach as a savior in difficult spine anatomy. Indian J Clin Anaesth 2020;7(4):700-2.
13. Banerjee S, Hazra S, Banerjee A. Effect of position Trendelenburg and horizontal on the height of sensory block in patients undergoing lower abdominal surgery. 2023;3:56.
14. Kirby GA, Guo W, Mitchell JD, Ma H. Using Lumbar X-Ray to facilitate modified taylor's approach of spinal anesthesia in an elderly patient with scoliosis. Cureus. 2021;13(1):12556.
15. McLain RF, Kalfas I, Bell GR, Tetzlaff JE, Yoon HJ, Rana M. Comparison of spinal and general anesthesia in lumbar laminectomy surgery: a case-controlled analysis of 400 patients. J of Neurosurg: Spine 2005;2:17–22.
16. Karaman S, Karaman T, Dogru S. Retrospective evaluation of anesthesia approaches for lumbar disc surgery. J of Anesthesia and Clinical Research 2014;5:4.

Cite this article as: Kulkarni V, Shah K, Tiwaskar S, Karande J, Ranade R, Reddy P, et al. Evaluation of efficacy and safety of Taylor's approach for neuraxial blockade in infraumbilical surgeries with difficult lumbar access: a retrospective, single-centre study. Int J Res Med Sci 2025;13:1514-8.