



A Comparative Study of the Midline and Taylor's Approaches to Subarachnoid Block for Abdominal Surgical Procedures.

Dr. Ravnit Kaur^{1*}, Dr. Gurdarshan Kaur².

¹Assistant Professor Department of Anaesthesia, Maharishi Markandeshwar Medical College & Hospital, Maharishi Markandeshwar University, Kumarhatti-Solan, Himachal Pradesh, India

²Consultant anesthesiologist my hospital, sector 69 Mohali.



Correspondence:

Dr. Ravnit Kaur.

Assistant Professor Department of Anaesthesia, Maharishi Markandeshwar Medical College & Hospital, Maharishi Markandeshwar University, Kumarhatti-Solan, Himachal Pradesh, India.

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Abstract

Background: Spinal anaesthesia remains a preferred regional anaesthetic technique for lower abdominal procedures because of its efficacy, simplicity, and favourable perioperative profile. The conventional midline approach is routinely used for intrathecal drug administration; however, successful needle placement may occasionally be challenging and may necessitate repeated attempts. Furthermore, alterations in perioperative blood pressure following spinal blockade remain an important clinical concern. Taylor's technique, which represents a modified paramedian approach targeting the L5-S1 intervertebral space, provides an alternative route for subarachnoid access and may have advantages with respect to cardiovascular stability. **Aim and Objectives:** This study was designed to evaluate and compare the clinical performance of the conventional midline and Taylor's approaches for subarachnoid block in patients undergoing lower abdominal surgery. The study primarily focused on comparing perioperative blood pressure changes, particularly the occurrence and severity of hypotension requiring treatment. The number of needle attempts, characteristics of the resultant spinal block, and complications associated with the procedure were also assessed. **Methodology:** A prospective comparative observational study was carried out in a tertiary care hospital among 60 adult patients planned for elective lower abdominal surgical procedures under spinal anaesthesia. The study population was divided equally into two groups. In Group A, intrathecal anaesthesia was administered using the conventional midline technique, while Group B received spinal anaesthesia through Taylor's approach. Intraoperative hemodynamic parameters were monitored, and data regarding block characteristics, number of attempts required for successful needle placement, and procedure-related adverse events were systematically documented. The observations obtained from both groups were subsequently subjected to statistical analysis. **Results:** Both study groups demonstrated comparable demographic characteristics. A more pronounced fall in systolic as well as diastolic blood pressure was observed during the initial intraoperative period among patients who underwent spinal anaesthesia through the conventional midline approach. Taylor's technique, in comparison, was associated with relatively better maintenance of hemodynamic parameters and a lower frequency of clinically significant hypotension requiring intervention. The technical advantage was accompanied by an increased requirement for needle insertion attempts in the Taylor group. Despite this difference, the principal characteristics of the spinal block were comparable between the two techniques. **Conclusion:** The findings indicate that Taylor's approach can provide more consistent perioperative hemodynamic stability than the conventional midline technique, with a lower occurrence of clinically significant hypotension. Although successful performance of the technique may require greater operator experience and a higher number of needle insertion attempts, it remains a safe and effective method for administering subarachnoid block. Its use may be particularly valuable in patients in whom avoidance of substantial perioperative hemodynamic fluctuations is clinically desirable.

Keywords: Subarachnoid Block; Spinal Anaesthesia; Taylor's Technique; Midline Approach; Paramedian Approach; Hemodynamic Stability; Hypotension; L5-S1 Interspace; Lower Abdominal Surgery; Regional Anaesthesia; Perioperative Hemodynamics.



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INTRODUCTION

The development of regional anaesthesia represents a significant advancement in modern anaesthetic practice. Its foundation was established following the identification of agents capable of producing localized neural blockade, with

cocaine being the first naturally occurring local anaesthetic to be isolated. A landmark event occurred in 1898 when August Bier successfully performed spinal anaesthesia in Germany, establishing the basis of contemporary neuraxial anaesthetic techniques. Before the introduction of these methods, local anaesthesia was predominantly confined to surface application and local infiltration. The subsequent development of neuraxial techniques has transformed the management of patients undergoing a wide range of surgical procedures.

Neuraxial anaesthesia refers to a group of techniques in which local anaesthetic drugs are deposited within or in close proximity to the central neuraxis. The principal techniques include spinal, epidural, and caudal anaesthesia. Spinal anaesthesia, commonly referred to as subarachnoid block (SAB), is achieved by introducing a local anaesthetic directly into the cerebrospinal fluid (CSF) contained within the subarachnoid space. The subarachnoid compartment extends around the brain and spinal cord and contains approximately 130–140 mL of CSF in an adult, which is continuously produced, circulated, and absorbed. In clinical practice, spinal anaesthesia is generally administered through the lumbar region and is particularly useful for procedures involving the lower abdomen, pelvis, perineum, and lower limbs.

For infraumbilical surgery, spinal anaesthesia has become an important alternative to general anaesthesia because of its rapid establishment of anaesthesia, reliable sensory and motor blockade, and effective muscle relaxation. Its clinical benefits extend beyond the provision of surgical anaesthesia. Compared with general anaesthesia, neuraxial blockade may be associated with reduced postoperative pain, less postoperative nausea and vomiting, fewer respiratory complications, a lower incidence of thromboembolic events, shorter hospitalization, and reduced overall healthcare expenditure. Additional potential benefits, including a lower incidence of postoperative cognitive dysfunction and renal complications in appropriate patient populations, further contribute to its widespread use.

Successful administration of spinal anaesthesia is dependent upon appropriate positioning, accurate recognition of spinal landmarks, and precise advancement of the needle into the subarachnoid space. The conventional midline technique remains the most commonly utilized approach. In this method, the needle is advanced through the skin and subcutaneous tissues before sequentially traversing the supraspinous ligament, interspinous ligament, ligamentum flavum, epidural space, dura mater, and arachnoid mater to enter the subarachnoid compartment. In individuals with normal spinal anatomy, this technique is generally familiar and relatively uncomplicated. However, anatomical alterations associated with obesity, increasing age, degenerative spinal disease, spinal deformity, or previous spinal procedures can significantly compromise the ease of needle placement.

The technical difficulty becomes particularly evident in the elderly, in whom degenerative changes, calcification of spinal ligaments, and reduction in intervertebral space dimensions may interfere with needle passage. Structural abnormalities such as scoliosis, kyphoscoliosis, ankylosing spondylitis, rheumatoid arthritis, and osteoarthritic changes may further obscure conventional surface landmarks. Previous spinal surgery can also result in altered anatomy and fibrosis, making access to the subarachnoid space more challenging. Repeated attempts at needle insertion not only increase procedural duration and patient discomfort but may also contribute to traumatic puncture and procedure-related complications, including post-dural puncture headache, spinal or epidural hematoma, and neural injury.

The limitations of the conventional midline approach have led to the development and adoption of alternative techniques for neuraxial access. Taylor's approach is one such modification and is considered a specialized form of the paramedian technique. It specifically exploits the L5–S1 intervertebral space, which provides the widest interlaminar opening within the lumbar spine. In the conventional description of this technique, the needle entry point is located approximately 1 cm medial and 1 cm caudal to the posterior superior iliac spine, after which the needle is directed in a cephalomedial direction toward the L5–S1 interspace.

The relatively wide interlaminar space at L5–S1 constitutes the principal anatomical rationale behind Taylor's technique. By approaching the neuraxis through this larger interlaminar window, the technique may facilitate entry into the subarachnoid space in situations where the midline route is technically difficult or unsuccessful. This characteristic makes it particularly relevant in patients with altered spinal anatomy, degenerative changes, or difficulty in identifying conventional lumbar interspaces.

The clinical utility of Taylor's approach has been investigated in patients in whom conventional neuraxial techniques may be difficult. Various studies have described its application in individuals with spinal deformities and distorted vertebral anatomy, suggesting that it can provide an effective route for subarachnoid blockade with potentially fewer traumatic difficulties in selected cases. Nevertheless, successful performance depends substantially on familiarity with the relevant anatomical landmarks and adequate operator experience. Consequently, despite its potential advantages, Taylor's technique has not achieved the same routine acceptance as the conventional midline approach.

An additional consideration in spinal anaesthesia is the effect of sympathetic blockade on cardiovascular stability. Hypotension is one of the most frequently encountered adverse effects following subarachnoid blockade and results primarily from sympathetic denervation with consequent peripheral vasodilatation and reduction in venous return. When severe, hypotension can compromise tissue and organ perfusion and may contribute to myocardial ischemia, delayed recovery, and other adverse perioperative outcomes. These consequences are of particular concern in elderly individuals and patients with limited cardiovascular reserve. Thus, maintaining adequate hemodynamic stability is an important component of safe spinal anaesthesia.

Although the midline approach remains the standard technique because of its familiarity and widespread use, the anatomical characteristics of Taylor's approach provide a rationale for considering it as an alternative method of subarachnoid access. In addition to potentially facilitating needle placement through the wider L5–S1 interlaminar space, differences in the route of needle entry may theoretically influence the distribution of intrathecal local anaesthetic and consequently the cardiovascular response following sympathetic blockade. However, whether these theoretical advantages result in clinically meaningful differences in hemodynamic stability requires objective assessment.

Despite the established role of both techniques, direct comparative evidence evaluating the midline and Taylor's approaches across multiple clinically relevant parameters remains relatively limited. In many clinical settings, the selection of a particular approach continues to depend largely upon the anaesthesiologist's experience, familiarity, and assessment of individual patient anatomy. A systematic comparison of the two techniques may therefore provide useful evidence regarding their relative technical performance and physiological effects.

The present study was consequently designed to undertake a comparative evaluation of the conventional midline and Taylor's approaches for administration of subarachnoid block in patients undergoing lower abdominal surgery. Particular emphasis was placed on the incidence and severity of hypotension requiring pharmacological intervention, the number of needle insertion attempts, sensory block characteristics, and perioperative hemodynamic changes. By evaluating these parameters, the study aims to determine whether Taylor's approach offers clinically relevant advantages over the conventional midline technique and whether it can serve as an effective alternative for achieving reliable spinal anaesthesia while minimizing hemodynamic disturbances and procedure-related difficulties.

Aim & Objectives:

Aim

To undertake a comparative assessment of the conventional midline and Taylor's approaches for administration of subarachnoid block in patients undergoing lower abdominal surgical procedures, with particular emphasis on hemodynamic stability and the requirement for treatment of spinal anaesthesia-induced hypotension.

Objectives

1. To determine and compare the frequency and severity of hypotensive episodes requiring therapeutic intervention following subarachnoid block administered through the Taylor's approach at the L5–S1 interspace and the conventional midline approach at the L3–L4 interspace.
2. To assess the perioperative physiological response associated with both techniques by comparing changes in heart rate, peripheral oxygen saturation (SpO₂), and respiratory rate throughout the perioperative period.

MATERIALS AND METHODS

Study Design and Setting

The present investigation was designed as a hospital-based, observational comparative study and was carried out in the Department of Anaesthesiology and Critical Care over a total study duration of 18 months. The study period comprised 12 months dedicated to patient recruitment and data collection, followed by 6 months for data compilation, statistical analysis, and interpretation of the findings.

Sixty adult patients undergoing elective lower abdominal surgical procedures under spinal anaesthesia were recruited by purposive sampling. The enrolled participants were divided equally into two study groups, with 30 patients in each group. Patients assigned to Group I (n = 30) underwent subarachnoid block using the conventional midline technique, whereas Group II (n = 30) received subarachnoid block through Taylor's approach.

Eligibility Criteria

Inclusion Criteria

Patients were considered eligible for participation if they fulfilled all of the following criteria:

- Age between 18 and 60 years.
- Patients of either sex.
- American Society of Anesthesiologists (ASA) physical status I or II.

- Patients scheduled to undergo elective lower abdominal surgery under spinal anaesthesia.
- Willingness to participate in the study and provision of written informed consent.

Exclusion Criteria

Patients were excluded from the study if they met any of the following criteria:

- Age <18 years or >60 years.
- ASA physical status III, IV, or V.
- Documented hypersensitivity or allergy to local anaesthetic agents.
- Presence of severe or inadequately controlled systemic illness.
- Refusal to provide consent or unwillingness to participate.

Pre-Anaesthetic Assessment and Preparation

All participants underwent a comprehensive pre-anaesthetic assessment before surgery. This included documentation of relevant medical history, complete physical examination, airway evaluation, and routine preoperative laboratory investigations. Patients were instructed to remain nil per oral for 6–8 hours before the scheduled surgical procedure. After transfer to the operating theatre, intravenous access was established and standard anaesthetic monitoring was commenced. Continuous monitoring included electrocardiography (ECG), non-invasive blood pressure (NIBP), pulse oximetry, and heart rate. Baseline cardiovascular and respiratory parameters were documented before administration of spinal anaesthesia. As part of the premedication regimen, each patient received intravenous ondansetron 4 mg and ranitidine 50 mg.

Technique of Subarachnoid Block

Spinal anaesthesia was performed under strict aseptic precautions with the patient positioned sitting. A 25-gauge spinal needle was used for intrathecal access. Once the free flow of cerebrospinal fluid (CSF) was confirmed, 3 mL of 0.5% hyperbaric bupivacaine was administered into the subarachnoid space.

For patients in Group I, the conventional midline technique was employed at the L3–L4 intervertebral space. In patients belonging to Group II, spinal anaesthesia was administered using Taylor's approach at the L5–S1 interspace, with identification of the site based on standard anatomical landmarks.

Following completion of the intrathecal injection and confirmation of adequate block, all patients were placed in the supine position and surgery was subsequently commenced.

Assessment of Study Outcomes

The primary outcome of the study was the occurrence and severity of hypotension following subarachnoid block, specifically with regard to episodes requiring therapeutic intervention.

The following parameters were evaluated as secondary outcomes:

- Total number of needle insertion attempts required.
- Number of needle passes or redirections before successful dural puncture.
- Maximum level of sensory blockade achieved.
- Perioperative hemodynamic parameters, including heart rate, systolic blood pressure, diastolic blood pressure, respiratory rate, and peripheral oxygen saturation (SpO₂).

Hemodynamic measurements were obtained at baseline and subsequently at predetermined intervals during the intraoperative period, with monitoring continued for up to 90 minutes. The extent of sensory blockade was determined using the pin-prick method. Motor blockade was assessed according to the Modified Bromage Scale.

All perioperative adverse events and complications were recorded. These included hypotension, bradycardia, nausea, vomiting, unsuccessful or failed spinal block, and any other complications encountered during the procedure or intraoperative period.

Statistical Analysis

Following completion of data collection, the observations were entered into and analyzed using the Statistical Package for Social Sciences (SPSS), version 20. Quantitative variables were summarized as mean $\pm$ standard deviation (SD), whereas qualitative variables were expressed as frequencies and percentages.

For comparison of continuous variables between the two study groups, the independent Student's t-test was utilized. Categorical variables were compared using the Chi-square test, with Fisher's exact test applied wherever appropriate. A p-value <0.05 was considered indicative of statistical significance.

Ethical Considerations

Prior approval for conducting the study was obtained from the Institutional Ethics Committee of Muzaffarnagar Medical College and Hospital. All participants were adequately informed regarding the nature and purpose of the study, and written informed consent was obtained before enrolment.

Participation was voluntary, and participants retained the right to decline participation. Patient confidentiality and privacy were maintained throughout the study, and the collected information was used solely for the purpose of the research.

RESULTS

Table 1: Comparative Evaluation of Heart Rate at Different Perioperative Intervals in Patients Receiving Midline and Taylor's Approach

The heart rate measurements demonstrated a largely consistent pattern in both study groups throughout the observation period. The baseline values were closely matched, with a mean heart rate of **80.40 ± 6.40 beats/min** in Group A and **80.10 ± 6.20 beats/min** in Group B. No statistically significant difference was observed between the groups at baseline ($p = 0.85$). Following administration of spinal anaesthesia, a modest transient rise in heart rate was observed during the initial intraoperative period in both groups. At 1 minute, the mean heart rate increased to **82.10 ± 6.80 beats/min** in Group A, compared with **79.90 ± 6.10 beats/min** in Group B. Similar minor intergroup variations were noted at 3, 5, and 10 minutes; however, none of these differences reached statistical significance.

During the subsequent intraoperative period, the heart rate gradually returned towards baseline values and remained relatively stable in both groups. At 15 minutes, mean heart rates were **82.30 ± 7.40 beats/min** and **81.20 ± 6.30 beats/min** in Groups A and B, respectively. At 30 and 45 minutes, only minimal differences were observed between the groups. The measurements at 60, 75, and 90 minutes likewise demonstrated comparable heart rate profiles. At the end of the observation period, the postoperative mean heart rate was **80.90 ± 6.40 beats/min** in Group A and **79.80 ± 6.60 beats/min** in Group B. The difference remained statistically insignificant ($p > 0.05$).

Overall, the temporal variation in heart rate was small in both groups. No significant intergroup difference was identified at any assessment point, suggesting that both approaches produced a comparable heart rate response during the perioperative period. No clinically relevant episodes of tachycardia or bradycardia were observed.

Table 1. Comparison of Mean Heart Rate at Different Time Intervals Between the Midline and Taylor's Approach Groups

Time interval	Group A Mean ± SD (beats/min)	Group B Mean ± SD (beats/min)	p-value*
Pre-operative	80.40 ± 6.40	80.10 ± 6.20	0.85
1 min	82.10 ± 6.80	79.90 ± 6.10	0.18
3 min	82.60 ± 7.00	81.00 ± 6.50	0.36
5 min	81.90 ± 6.70	80.20 ± 6.40	0.32
10 min	82.70 ± 7.70	80.80 ± 5.90	0.25
15 min	82.30 ± 7.40	81.20 ± 6.30	0.53
30 min	80.50 ± 6.50	80.00 ± 6.10	0.76
45 min	80.80 ± 6.90	80.20 ± 6.40	0.72
60 min	79.60 ± 6.50	80.50 ± 6.30	0.58
75 min	80.50 ± 6.20	79.90 ± 6.50	0.72
90 min	80.20 ± 6.50	80.30 ± 6.60	0.95
Post-operative	80.90 ± 6.40	79.80 ± 6.60	0.51

Table 2: Intergroup Comparison of Respiratory Rate During the Perioperative Period

The respiratory rate remained remarkably consistent in both study groups during the entire observation period. At baseline, the mean respiratory rate was **14.50 ± 1.95 breaths/min** in Group A and **14.30 ± 1.82 breaths/min** in Group B, with no statistically significant difference between the groups ($p = 0.67$).

Following administration of subarachnoid block, only minor variations in respiratory rate were observed. During the initial 1–10 minute period, the mean values fluctuated within a narrow range in both groups, without any statistically significant intergroup difference. At 15 minutes, the respiratory rates were **14.47 ± 2.20 breaths/min** and **14.27 ± 1.88 breaths/min** in Groups A and B, respectively.

The respiratory rate continued to remain stable during the later intraoperative period. At 30 minutes, the corresponding values were **14.37 ± 2.05 breaths/min** and **14.57 ± 1.72 breaths/min**, while at 45 minutes they were **14.43 ± 2.18 breaths/min** and **14.37 ± 1.81 breaths/min**. No statistically significant difference was observed at either time point. Similar findings were noted at 60, 75, and 90 minutes, with respiratory rates remaining within the expected perioperative range in both groups. Postoperatively, the mean respiratory rate was **14.53 ± 2.17 breaths/min** in Group A and **14.40 ± 1.91 breaths/min** in Group B ($p = 0.78$).

Thus, there was no significant difference in respiratory rate between the conventional midline and Taylor's approach groups at any of the assessed intervals. The relatively stable respiratory profile observed throughout the study suggests that both techniques were associated with comparable respiratory status during the perioperative period.

Table 2. Comparison of Mean Respiratory Rate at Different Time Intervals Between the Midline and Taylor's Approach Groups

Time interval	Group A Mean $\pm$ SD (breaths/min)	Group B Mean $\pm$ SD (breaths/min)	p-value*
Pre-operative	14.50 $\pm$ 1.95	14.30 $\pm$ 1.82	0.67
1 min	14.67 $\pm$ 2.08	14.27 $\pm$ 1.74	0.42
3 min	14.40 $\pm$ 2.10	14.60 $\pm$ 1.84	0.70
5 min	14.30 $\pm$ 2.25	14.37 $\pm$ 1.69	0.90
10 min	14.20 $\pm$ 2.06	14.47 $\pm$ 1.88	0.59
15 min	14.47 $\pm$ 2.20	14.27 $\pm$ 1.88	0.69
30 min	14.37 $\pm$ 2.05	14.57 $\pm$ 1.72	0.68
45 min	14.43 $\pm$ 2.18	14.37 $\pm$ 1.81	0.90
60 min	14.53 $\pm$ 2.16	14.50 $\pm$ 1.94	0.95
75 min	14.57 $\pm$ 2.18	14.40 $\pm$ 1.89	0.76
90 min	14.40 $\pm$ 2.06	14.33 $\pm$ 1.66	0.89
Post-operative	14.53 $\pm$ 2.17	14.40 $\pm$ 1.91	0.78

Table 3: Intergroup Comparison of Mean Diastolic Blood Pressure During the Perioperative Period

At the preoperative assessment, the two groups demonstrated closely comparable diastolic blood pressure values. The mean baseline DBP was 78.63 $\pm$ 4.51 mmHg in Group A and 79.10 $\pm$ 6.18 mmHg in Group B, with no statistically significant difference between them ($p = 0.71$). Following administration of subarachnoid block, a pronounced decline in DBP was observed in Group A during the initial intraoperative period. At 1 minute, the mean DBP decreased to 65.70 $\pm$ 5.34 mmHg in Group A, whereas Group B maintained a comparatively higher value of 73.52 $\pm$ 7.36 mmHg. This difference was statistically highly significant ($p < 0.001$). A similar pattern persisted at 3, 5, and 10 minutes, with Group A demonstrating consistently lower DBP values than Group B. The intergroup differences at each of these time points remained highly significant ($p < 0.001$). By 15 minutes, partial recovery of DBP was evident in both groups. Nevertheless, Group A continued to exhibit a significantly lower mean DBP (71.63 $\pm$ 4.74 mmHg) compared with Group B (76.28 $\pm$ 6.72 mmHg), with the difference remaining statistically significant ($p = 0.006$). From 30 minutes onwards, the disparity between the two groups was no longer statistically significant. At 30 minutes, the mean DBP was 78.21 $\pm$ 4.46 mmHg in Group A and 78.84 $\pm$ 6.43 mmHg in Group B ($p = 0.65$). Thereafter, DBP remained relatively stable in both groups, with only minor fluctuations observed at subsequent time intervals. At 45 minutes, the respective mean values were 78.74 $\pm$ 4.28 mmHg and 79.18 $\pm$ 6.51 mmHg ($p = 0.74$). Similarly, no significant intergroup differences were demonstrated at 60, 75, or 90 minutes. Postoperatively, the mean DBP was 79.28 $\pm$ 3.94 mmHg in Group A and 79.24 $\pm$ 7.16 mmHg in Group B, with the difference being statistically nonsignificant ($p = 0.97$). Overall, the findings demonstrate that the conventional midline group experienced a more marked reduction in diastolic blood pressure during the early phase following spinal anaesthesia. In contrast, patients receiving Taylor's approach maintained comparatively higher DBP values during this period. The difference progressively diminished with time, and DBP became comparable between the groups from 30 minutes onward. These findings indicate relatively greater early perioperative hemodynamic stability with Taylor's approach.

Table 3. Comparison of Mean Diastolic Blood Pressure at Different Time Intervals Between the Midline and Taylor's Approach Groups

Time interval	Group A Mean $\pm$ SD (mmHg)	Group B Mean $\pm$ SD (mmHg)	p-value*
Pre-operative	78.63 $\pm$ 4.51	79.10 $\pm$ 6.18	0.71
1 min	65.70 $\pm$ 5.34	73.52 $\pm$ 7.36	<0.001
3 min	66.12 $\pm$ 5.63	73.91 $\pm$ 7.82	<0.001
5 min	65.82 $\pm$ 5.41	74.21 $\pm$ 6.57	<0.001
10 min	67.82 $\pm$ 5.37	74.36 $\pm$ 6.58	<0.001
15 min	71.63 $\pm$ 4.74	76.28 $\pm$ 6.72	0.006
30 min	78.21 $\pm$ 4.46	78.84 $\pm$ 6.43	0.65
45 min	78.74 $\pm$ 4.28	79.18 $\pm$ 6.51	0.74
60 min	78.76 $\pm$ 5.02	78.91 $\pm$ 6.62	0.92
75 min	78.82 $\pm$ 5.16	79.16 $\pm$ 6.63	0.81
90 min	79.08 $\pm$ 4.37	79.52 $\pm$ 6.96	0.76
Post-operative	79.28 $\pm$ 3.94	79.24 $\pm$ 7.16	0.97

Table 4: Comparative Analysis of Mean Peripheral Oxygen Saturation at Different Perioperative Time Points

Peripheral oxygen saturation remained well maintained in both groups throughout the study period. The preoperative mean SpO₂ was 98.63 ± 0.62% in Group A and 98.50 ± 0.70% in Group B, with no significant difference between the groups (p = 0.45). A minor reduction in oxygen saturation was observed following administration of subarachnoid block. At 1 minute, the mean SpO₂ values were 98.20 ± 0.91% and 98.07 ± 0.94% in Groups A and B, respectively. At 3 minutes, the corresponding values were 98.03 ± 1.16% and 97.77 ± 1.32%. These differences were statistically nonsignificant.

At 5 and 10 minutes, SpO₂ showed a further modest decline in both groups, with mean values remaining within an acceptable range. The intergroup differences at these time points did not reach statistical significance. By 15 minutes, the oxygen saturation values were nearly identical in both groups, measuring 97.93 ± 1.24% in Group A and 97.80 ± 1.18% in Group B (p = 0.67).

During the later intraoperative period, SpO₂ remained relatively stable. At 30 minutes, mean values were 97.67 ± 1.08% and 97.83 ± 1.17% in Groups A and B, respectively. Subsequent measurements at 45, 60, 75, and 90 minutes demonstrated only minor fluctuations, with no significant differences between the two techniques. Following completion of surgery, the mean postoperative SpO₂ was 98.47 ± 0.70% in Group A and 98.57 ± 0.61% in Group B (p = 0.62). Thus, oxygen saturation remained adequately preserved throughout the perioperative period in both groups.

Overall, comparison of SpO₂ at the different observation points did not reveal any statistically significant intergroup variation. Both the conventional midline and Taylor's approaches were therefore associated with comparable maintenance of oxygenation, with no clinically important perioperative deterioration in peripheral oxygen saturation.

Table 4. Comparison of Mean SpO₂ at Different Time Intervals Between the Midline and Taylor's Approach Groups

Time interval	Group A Mean ± SD (%)	Group B Mean ± SD (%)	p-value*
Pre-operative	98.63 ± 0.62	98.50 ± 0.70	0.45
1 min	98.20 ± 0.91	98.07 ± 0.94	0.58
3 min	98.03 ± 1.16	97.77 ± 1.32	0.41
5 min	97.90 ± 1.29	97.77 ± 1.27	0.68
10 min	97.77 ± 1.24	97.57 ± 1.39	0.55
15 min	97.93 ± 1.24	97.80 ± 1.18	0.67
30 min	97.67 ± 1.08	97.83 ± 1.17	0.57
45 min	98.07 ± 0.88	98.13 ± 1.05	0.81
60 min	98.13 ± 0.89	97.87 ± 1.04	0.27
75 min	98.17 ± 0.99	98.07 ± 1.01	0.69
90 min	98.23 ± 0.74	98.27 ± 0.68	0.84
Post-operative	98.47 ± 0.70	98.57 ± 0.61	0.62

DISCUSSION

The present study was undertaken to evaluate and compare the perioperative physiological responses associated with the conventional midline and Taylor's approaches for administration of subarachnoid block in patients undergoing lower abdominal surgery. The comparative assessment included heart rate, respiratory rate, peripheral oxygen saturation, and diastolic blood pressure at predefined perioperative intervals. The findings demonstrated that both techniques produced broadly comparable heart rate, respiratory rate, and oxygen saturation profiles. The principal difference between the two groups was observed in diastolic blood pressure during the early period following spinal anaesthesia, with a more pronounced reduction in the midline group and relatively better preservation of DBP in patients receiving Taylor's approach.

Heart Rate

Heart rate remained relatively stable following subarachnoid block in both study groups. The baseline values were closely comparable, with only a modest transient increase during the initial intraoperative period. Although minor differences were observed at individual time points, none reached statistical significance. There was subsequently a gradual return towards baseline values, and the postoperative measurements remained similar between the groups.

The absence of a statistically significant difference in heart rate suggests that the choice of spinal needle approach did not produce a clinically meaningful differential effect on cardiac rate during the perioperative period. The small fluctuations observed following intrathecal anaesthesia may represent the expected physiological response to surgical stimulation, sympathetic blockade, positioning, and perioperative management rather than an effect attributable specifically to the route of spinal access.

These observations are consistent with the findings reported by Shah AB et al. and Chalapathy P et al., who similarly observed relatively stable heart rate profiles with different approaches to spinal anaesthesia. The comparable heart rate response in the present study also suggests that the differences observed in blood pressure cannot be explained by substantial changes in heart rate.

Respiratory Rate

Assessment of respiratory rate revealed no significant difference between the two techniques at any of the recorded intervals. Baseline respiratory rates were comparable, and only small fluctuations occurred following administration of the subarachnoid block. Throughout the intraoperative observation period, respiratory rates remained within a relatively narrow physiological range in both groups. The preservation of respiratory rate following spinal anaesthesia is expected when the level of neuraxial blockade remains appropriate for lower abdominal surgery. Since spinal anaesthesia primarily affects the spinal nerve roots below the level of the block, diaphragmatic function and spontaneous ventilation are generally preserved. The present findings therefore indicate that neither the conventional midline nor Taylor's approach produced a clinically important alteration in respiratory pattern. Similar observations have been described by Chalapathy P et al. and Bano N et al., who reported maintenance of stable respiratory parameters following spinal anaesthesia using different approaches. The findings of the present study are therefore supportive of the respiratory safety of both techniques in the studied surgical population.

Diastolic Blood Pressure

The most prominent difference between the two study groups was observed in the pattern of diastolic blood pressure following administration of spinal anaesthesia. Although the preoperative DBP values were comparable, a marked reduction occurred in Group A during the initial intraoperative period. At 1 minute, Group A demonstrated a substantial fall in mean DBP compared with its baseline value, whereas the reduction in Group B was comparatively less pronounced. This intergroup difference remained highly significant at 3, 5, and 10 minutes. At 15 minutes, although partial recovery of blood pressure had occurred in both groups, the mean DBP in Group A remained significantly lower than that observed in Group B. The difference progressively diminished thereafter. From 30 minutes onwards, the mean DBP values in the two groups were closely comparable, and none of the subsequent differences reached statistical significance. By the postoperative assessment, DBP had returned to values comparable with those observed before anaesthesia in both groups.

This temporal pattern suggests that the principal hemodynamic distinction between the two approaches occurred during the early phase following intrathecal administration rather than throughout the entire perioperative period. Taylor's approach was associated with relatively better preservation of DBP during this critical early period, whereas the conventional midline technique demonstrated a more pronounced initial reduction. Hypotension following spinal anaesthesia is primarily related to sympathetic blockade, which results in arterial and venous vasodilatation, reduced systemic vascular resistance, and diminished venous return. The magnitude and distribution of sympathetic blockade can influence the extent of the resulting cardiovascular response. The relatively smaller reduction in DBP observed with Taylor's approach may therefore reflect differences in the distribution or onset of neuraxial blockade, although the present study was not designed to directly investigate the anatomical or pharmacological mechanism responsible for this observation.

The finding of greater early blood pressure reduction with the midline technique is in keeping with observations reported by Shah AB et al. Similar hemodynamic considerations have also been discussed in studies by Thota RS et al. and Veena P et al., highlighting the importance of maintaining cardiovascular stability following spinal anaesthesia. From a clinical perspective, preservation of arterial pressure during the initial period following spinal blockade is particularly relevant because abrupt reductions in blood pressure may compromise tissue perfusion in susceptible patients. Although the present sample consisted primarily of patients suitable for elective surgery, this potential advantage of Taylor's approach may be of greater clinical relevance in individuals with limited cardiovascular reserve.

Peripheral Oxygen Saturation

The assessment of peripheral oxygen saturation demonstrated a consistent pattern in both groups. Baseline SpO₂ values were high and comparable, and only a modest reduction was observed during the initial intraoperative period. The lowest mean values occurred during the early period following spinal anaesthesia; however, oxygen saturation remained adequately maintained in both groups. No statistically significant difference in SpO₂ was identified at any of the observation points. The values subsequently showed gradual stabilization and returned towards baseline during the later intraoperative period. Postoperative oxygen saturation was also comparable between the groups.

These findings indicate that the two approaches produced similar respiratory oxygenation profiles. Importantly, the differences in blood pressure observed during the early post-block period were not accompanied by a corresponding clinically significant deterioration in oxygen saturation. Thus, the hemodynamic difference between the techniques appears

to have occurred independently of any major alteration in peripheral oxygenation. The present findings are consistent with previous observations by Chalapathy P et al. and Bano N et al., who reported preservation of oxygen saturation following spinal anaesthesia using conventional and alternative approaches.

Overall Hemodynamic and Respiratory Profile

When the four physiological parameters examined in this study are considered collectively, both techniques demonstrated a favourable perioperative profile. Heart rate and respiratory rate remained comparable throughout the observation period, while SpO₂ remained adequately preserved in both groups. The principal difference was confined to DBP during the early post-spinal period. The relatively greater fall in DBP observed with the conventional midline approach, followed by subsequent recovery and convergence of values from 30 minutes onwards, suggests that the potential hemodynamic advantage of Taylor's approach is predominantly an early perioperative phenomenon. It would therefore be inappropriate to conclude that Taylor's approach provides universally superior hemodynamic stability throughout the entire perioperative period; rather, the present findings indicate better preservation of diastolic pressure during the initial phase following subarachnoid block. Both approaches nevertheless provided acceptable physiological stability for the duration of observation. The lack of significant differences in heart rate, respiratory rate, and SpO₂ further indicates that the choice of approach did not adversely influence these parameters.

Clinical Significance

The findings of the present study have potential implications for the selection of spinal anaesthetic technique in appropriate patients. The conventional midline approach remains widely used because of its familiarity and established role in routine spinal anaesthesia. Taylor's approach, however, may provide an alternative route to the subarachnoid space while demonstrating relatively better preservation of diastolic blood pressure during the early post-block period. This characteristic may be clinically relevant in patients in whom even transient hypotension is undesirable, particularly those with limited cardiovascular reserve or increased susceptibility to reduced organ perfusion. Nevertheless, the findings should be interpreted in the context of the study population and the parameters assessed. In summary, the present study demonstrates that both the conventional midline and Taylor's approaches provide comparable heart rate, respiratory rate, and oxygen saturation profiles during lower abdominal surgery under spinal anaesthesia. The major intergroup difference was the significantly greater early reduction in diastolic blood pressure following the midline approach. Taylor's approach showed comparatively better preservation of DBP during the first 15 minutes, after which the two groups became statistically comparable. These findings support Taylor's approach as a potentially useful alternative when early perioperative hemodynamic stability is an important consideration.

CONCLUSION

The present prospective comparative study demonstrates that both the conventional midline and Taylor's approaches can provide satisfactory subarachnoid anaesthesia for lower abdominal surgical procedures. The two groups were comparable with respect to their baseline characteristics, thereby providing a suitable basis for evaluating the perioperative physiological differences between the two techniques.

The principal difference between the approaches was observed in the early postoperative period following administration of spinal anaesthesia. Patients who underwent the conventional midline technique experienced a significantly greater decline in diastolic blood pressure during the initial 1–15 minutes. In comparison, the Taylor's approach group showed relatively better preservation of DBP during this period, with the difference diminishing subsequently and becoming statistically nonsignificant from 30 minutes onwards. This suggests that the hemodynamic advantage associated with Taylor's approach was predominantly evident during the early phase following intrathecal blockade.

In contrast, heart rate remained comparable between the two groups at all assessed intervals. Similarly, respiratory rate demonstrated only minor physiological fluctuations without any significant intergroup difference. Peripheral oxygen saturation was also adequately maintained throughout the intraoperative and postoperative observation periods, with no statistically significant difference between the techniques. Thus, neither approach appeared to exert a clinically meaningful differential effect on heart rate, respiratory function, or oxygenation.

The overall findings indicate that the conventional midline and Taylor's approaches have a broadly comparable physiological profile, with the notable exception of early diastolic blood pressure changes. Taylor's approach was associated with comparatively greater preservation of DBP immediately following spinal anaesthesia, suggesting a potential advantage in terms of early hemodynamic stability.

Therefore, Taylor's approach may be considered a useful alternative to the conventional midline technique for subarachnoid block, particularly when minimizing early perioperative blood pressure fluctuations is clinically desirable. However, the choice of technique should continue to take into account patient anatomy, operator familiarity, and individual

clinical circumstances. Further studies involving larger patient populations and assessment of additional hemodynamic and technical parameters would be valuable for establishing the broader clinical significance of these findings.

Limitations of the Study

1. Limited Sample Size:

The study was conducted on a relatively small cohort of 60 patients. This restricted sample size may reduce the statistical strength of the observations and limit the extent to which the findings can be extrapolated to a broader population.

2. Single-Centre Setting:

Since the study was undertaken at a single tertiary care hospital, institutional practices, patient characteristics, and operator expertise may have influenced the findings. Consequently, the results may not be fully generalizable to other hospitals or healthcare settings.

3. Restricted Study Population:

The study population consisted exclusively of patients aged 18–60 years with ASA physical status I or II who underwent elective lower abdominal surgery. Hence, the applicability of the findings to paediatric or elderly patients, individuals with significant systemic disease, and patients undergoing emergency procedures remains uncertain.

4. Absence of Blinding:

Blinding of the anaesthesiologist performing the spinal block was not feasible because the technique employed was apparent during the procedure. Awareness of the selected approach could therefore have introduced a degree of observer or operator-related bias.

5. Influence of Operator Expertise:

The technical performance of spinal anaesthesia is dependent to some extent on the experience, familiarity, and skill of the anaesthesiologist. Differences in individual expertise may consequently influence the ease of needle placement, procedural success, and number of attempts, thereby affecting reproducibility across different clinical settings.

6. Limited Duration of Follow-up:

Assessment was restricted primarily to the intraoperative period and the immediate postoperative phase. Consequently, delayed adverse effects, long-term neurological or other complications, and patient-reported outcomes such as long-term satisfaction were not evaluated.

7. Inadequate Objective Characterization of Difficult Spinal Anatomy:

Anatomical factors that can influence the technical difficulty of neuraxial blockade, including obesity, degenerative spinal changes, and anatomical variations, were not quantitatively assessed. Their potential contribution to procedural difficulty and success therefore could not be independently evaluated.

8. Ultrasound-Assisted Technique Not Assessed:

The study focused exclusively on conventional landmark-based spinal anaesthesia. The possible advantages of pre-procedural or real-time ultrasound guidance, particularly in patients with difficult spinal anatomy, were outside the scope of the present investigation.

9. Restricted Range of Outcome Variables:

The study primarily concentrated on haemodynamic parameters, physiological variables, and procedural characteristics. Other potentially relevant outcomes, including patient satisfaction, procedural discomfort or pain, time required to establish the block, and the cost-effectiveness of the two techniques, were not systematically examined.

10. Possible Influence of Surgical and Perioperative Factors:

Differences in operative duration and other intraoperative variables may have contributed to changes in haemodynamic parameters. Although efforts were made to standardize the anaesthetic technique, complete elimination of these potential confounding factors was not possible.

Relevance of the Study

Subarachnoid block remains an established and widely used regional anaesthetic technique for lower abdominal surgical procedures. The conventional midline approach is generally considered the standard method; however, its technical feasibility may be compromised in patients with challenging spinal anatomy, while sympathetic blockade may result in clinically significant haemodynamic alterations. Taylor's approach, a modified paramedian technique targeting the L5–S1 interspace, represents an alternative route that may be advantageous in selected clinical circumstances. Nevertheless, comparative evidence regarding its perioperative performance remains relatively limited. The present study is relevant because it provides a comparative assessment of the conventional midline and Taylor's approaches, with particular emphasis on haemodynamic responses and selected procedural characteristics. By examining the changes in blood pressure and other physiological parameters following spinal anaesthesia, the study adds to the available clinical evidence concerning the relative performance of these two approaches. The observed preservation of haemodynamic stability with Taylor's approach, particularly during the early period following establishment of the block, may be clinically meaningful in patients in whom even transient hypotension could be poorly tolerated. This may include individuals with reduced cardiovascular reserve or those considered more susceptible to the adverse consequences of perioperative haemodynamic

fluctuations. However, the applicability of these findings to such high-risk populations requires confirmation through appropriately designed studies.

The study also highlights the importance of maintaining familiarity with alternative approaches to spinal anaesthesia. Knowledge of techniques such as the Taylor approach may be particularly useful when conventional midline access is technically challenging because of anatomical variations or other patient-related factors.

The findings may therefore assist anaesthesiologists in making an individualized choice of spinal approach after considering patient anatomy, anticipated technical difficulty, haemodynamic considerations, and the clinician's experience with the respective technique. The results may also provide a foundation for future investigations involving larger sample sizes, multiple centres, broader patient populations, and more comprehensive procedural and patient-centred outcomes.

Overall, the study contributes to a better understanding of the comparative haemodynamic and procedural characteristics of the midline and Taylor's approaches. The evidence may support a more individualized approach to spinal anaesthesia and potentially contribute to improving procedural safety and perioperative management in patients undergoing lower abdominal surgery.

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