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Original Research Article

A COMPARATIVE OBSERVATIONAL STUDY OF COMBINED LUMBAR PLEXUS AND SCIATIC NERVE BLOCK VERSUS SPINAL ANAESTHESIA FOR ELECTIVE FEMUR AND TIBIA ORTHOPAEDIC SURGERIES IN ADULTS

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ABSTRACT

Background: Femur and tibia fractures and their surgical management are frequently associated with significant perioperative pain and physiological stress. Although spinal anaesthesia provides rapid and reliable surgical anaesthesia, its duration of postoperative analgesia may be limited. Combined lumbar plexus and sciatic nerve block may provide prolonged sensory blockade with potentially greater haemodynamic stability. This study compared the efficacy and perioperative outcomes of spinal anaesthesia with combined lumbar plexus and sciatic nerve block in adult patients undergoing elective femur and tibia orthopaedic surgeries.

Materials and Methods: This hospital-based prospective observational comparative study was conducted in a tertiary care teaching hospital over a period of 20 months from January 2020 to August 2021. Eighty adult patients aged 18–60 years with ASA physical status I or II undergoing elective femur or tibia orthopaedic surgery were included. Patients were divided into two groups of 40 each: Group I received spinal anaesthesia and Group II received combined lumbar plexus and sciatic nerve block. The onset and duration of sensory and motor blockade, postoperative pain scores, time to first rescue analgesia, perioperative haemodynamic parameters, and complications were assessed. Sensory block was evaluated using cold sensation and motor block using the modified Bromage scale. Patients were followed for 8 hours postoperatively.

Results: The baseline demographic characteristics were comparable between the groups. Spinal anaesthesia demonstrated a significantly faster onset of sensory and motor blockade compared with combined nerve block. The mean onset of sensory block was 1.00 ± 0.00 minutes in Group I versus 6.53 ± 0.55 minutes in Group II, while motor block occurred at 1.57 ± 0.50 and 12.68 ± 0.62 minutes, respectively ($p < 0.001$). However, the duration of sensory and motor blockade was significantly longer with combined lumbar plexus and sciatic nerve block. Sensory block lasted 290.05 ± 9.77 minutes in Group II compared with 183.67 ± 4.40 minutes in Group I, while motor block lasted 234.42 ± 5.10 versus 135.42 ± 5.36 minutes, respectively ($p < 0.001$). Postoperative VAS scores were comparable at 1 hour but were significantly lower in Group II from 2 to 8 hours postoperatively ($p < 0.001$). The time to first rescue analgesia was significantly longer with combined nerve block than with spinal anaesthesia (6.50 ± 0.89 vs. 5.80 ± 0.41 hours; $p = 0.008$). Haemodynamic trends showed greater fluctuations in heart rate and blood pressure in the spinal anaesthesia group, whereas the combined block group demonstrated comparatively stable parameters. Complications were infrequent in both groups.

Conclusion: Spinal anaesthesia provides a more rapid onset of sensory and motor blockade, whereas combined lumbar plexus and sciatic nerve block provides significantly prolonged blockade and superior early postoperative analgesia. The combined block was also associated with comparatively stable perioperative haemodynamic parameters and a longer duration before rescue analgesia. Thus, combined lumbar plexus and sciatic nerve block may be considered an effective alternative to spinal anaesthesia for selected adult patients undergoing elective femur and tibia orthopaedic surgery.
Keywords: Lumbar plexus block; sciatic nerve block; spinal anaesthesia; femur surgery; tibia surgery; regional anaesthesia; postoperative analgesia; haemodynamic stability.

INTRODUCTION

Fractures of the femur and tibia are major orthopaedic injuries associated with considerable morbidity, functional limitation, and healthcare burden. Approximately one million femur and tibia fractures occur worldwide each year.[1] In addition to the consequences of the injury itself, these patients are at increased risk of respiratory, cardiovascular, and thromboembolic complications. Reported postoperative mortality ranges from 7–11% at one month, 16–28% at six months, and 22–37% at one year.[2-4] Appropriate surgical management, comprehensive perioperative care, and early postoperative mobilization play an important role in reducing complications, shortening hospital stay, and improving survival.[5]

Pain is a major concern in patients undergoing surgery for lower-limb fractures. Approximately one-third of patients with femoral fractures experience severe pain, while another 30% experience moderate pain.[6] Inadequate perioperative pain control can interfere with mobilization and rehabilitation and may contribute to postoperative morbidity. Effective analgesia, in contrast, has been associated with earlier mobilization, reduced hospital stay, and lower rates of delirium and respiratory and cardiovascular complications.[6] Therefore, selection of an appropriate anaesthetic and analgesic technique is an important component of perioperative management in these patients.

A variety of techniques are available for anaesthesia and analgesia during lower-limb orthopaedic surgery, including systemic analgesia, neuraxial techniques, and peripheral nerve blocks. General and spinal anaesthesia are commonly employed for intraoperative management, while peripheral nerve blocks may be used as the primary anaesthetic technique in selected patients or as an adjunct to systemic analgesia. Systemic analgesia may be limited by patient-related contraindications and adverse effects. Non-steroidal anti-inflammatory drugs may be unsuitable in patients with renal dysfunction, whereas opioid analgesics may cause sedation, respiratory depression, nausea, and vomiting. These limitations have increased interest in regional anaesthetic techniques that can provide effective surgical anaesthesia while reducing systemic drug exposure.

Spinal anaesthesia is widely used for lower-limb orthopaedic procedures because it provides reliable and dense surgical anaesthesia. However, sympathetic blockade following spinal anaesthesia may result in hypotension and bradycardia. Such haemodynamic changes can be clinically significant, particularly in patients with limited cardiovascular reserve, and may contribute to reduced organ perfusion. In addition, neuraxial anaesthesia may be contraindicated or require careful consideration in patients receiving anticoagulant or antiplatelet therapy, depending on the individual clinical circumstances and coagulation status.

Peripheral nerve blocks provide an alternative regional approach and may offer effective anaesthesia with less sympathetic blockade. The lumbar plexus gives rise to important nerves supplying the lower limb, including the femoral and lateral femoral cutaneous nerves. However, the sciatic nerve originates from the sacral plexus and therefore is not adequately covered by a lumbar plexus block alone. Combining a lumbar plexus block with a sciatic nerve block can provide more extensive anaesthesia of the operative lower limb and may be suitable for selected femur and tibia orthopaedic procedures.

The combined lumbar plexus and sciatic nerve block technique may provide effective intraoperative anaesthesia while maintaining greater haemodynamic stability compared with neuraxial techniques.[7,8] It may also provide prolonged postoperative analgesia and reduce the need for systemic rescue analgesics. However, its clinical effectiveness depends on the adequacy and onset of sensory and motor blockade, duration of the block, haemodynamic stability, and the incidence of procedure-related complications.

Although spinal anaesthesia remains an established technique for lower-limb orthopaedic surgery, there is increasing interest in regional techniques that may provide satisfactory surgical anaesthesia with fewer haemodynamic disturbances and reduced systemic adverse effects. Comparative evaluation of combined lumbar plexus and sciatic nerve block against spinal anaesthesia may therefore provide clinically relevant information regarding the onset and duration of sensory and motor blockade, haemodynamic responses, postoperative analgesic requirements, and complications.

Therefore, the present observational study was undertaken to compare the efficacy of combined lumbar plexus and sciatic nerve block with spinal anaesthesia for intraoperative anaesthesia in adult patients undergoing elective femur and tibia orthopaedic surgeries at a tertiary care centre. The primary objective was to compare the duration of sensory and motor blockade between the two techniques. Secondary objectives were to compare the onset of sensory and motor blockade, haemodynamic parameters including blood pressure, heart rate, SpO_2 and ECG changes, duration of analgesia or time to requirement of rescue analgesia, and the incidence of complications between the two groups.

MATERIALS AND METHODS

This was a hospital-based, prospective, observational comparative study conducted in the Department of Anaesthesiology at a tertiary care teaching hospital. The study was carried out over a period of 20 months, from 1 January 2020 to 30 August 2021. Patients were observed during the intraoperative period and for 8 hours postoperatively. Prior to commencement of the study, approval was obtained from the Institutional Ethics Committee.Ppatients were informed regarding the purpose and procedures of the study, and written informed consent was obtained.

The study included adult patients scheduled to undergo elective orthopaedic surgeries involving the femur or tibia. Patients were recruited using consecutive sampling. A total of 80 patients fulfilling the predefined eligibility criteria were included. Patients were classified into two groups. Group I consisted of patients who received spinal anaesthesia, whereas Group II consisted of patients who received combined lumbar plexus and sciatic nerve block. As this was an observational study, patients were not randomly assigned to either group.

Patients aged 18–60 years, belonging to either sex, with an American Society of Anesthesiologists (ASA) physical status of I or II, and scheduled for elective femur or tibia orthopaedic surgery were eligible for inclusion. Patients were excluded if they had infection at the proposed puncture or block site, coagulopathy, known allergy to local anaesthetic drugs, pregnancy, severe pulmonary pathology, mental incapacity or a significant language barrier that could interfere with assessment, or if they declined to provide consent.

All patients underwent a detailed preoperative assessment, including medical history, physical examination, airway assessment, and evaluation of the cardiovascular and respiratory systems. Relevant laboratory investigations were reviewed before surgery. Baseline heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, peripheral oxygen saturation, and electrocardiographic findings were recorded.

Patients in Group I received spinal anaesthesia according to the institutional anaesthetic protocol. Under appropriate aseptic precautions, the patient was positioned appropriately and the lumbar region was prepared with antiseptic solution. After identification of the appropriate intervertebral space, spinal anaesthesia was administered using a suitable spinal needle. Following confirmation of free flow of cerebrospinal fluid, the predetermined dose of intrathecal local anaesthetic was administered according to the patient's clinical requirements. The patient was subsequently positioned for surgery, and the adequacy and onset of sensory and motor blockade were assessed before commencement of the surgical procedure.

Patients in Group II received combined lumbar plexus and sciatic nerve block. The blocks were performed under standard aseptic precautions using the regional anaesthesia technique followed at the institution. The lumbar plexus block was performed to provide blockade of the major nerves arising from the lumbar plexus, particularly the femoral and lateral femoral cutaneous nerves, while a separate sciatic nerve block was performed to provide anaesthesia in the distribution of the sciatic nerve. The two blocks were combined to provide extensive anaesthesia of the operative lower limb. Following administration of the local anaesthetic, the onset and adequacy of sensory and motor blockade were assessed, and surgery was commenced after satisfactory surgical anaesthesia had been achieved.

Sensory blockade was assessed by applying a cold gel bag to the corresponding dermatomal areas lower limb. Assessment was performed at 10-minute intervals for the first 30 minutes following administration of the anaesthetic technique. The time to complete loss of sensation over the lower limb was recorded. Thereafter, sensory function was assessed at hourly intervals until complete resolution of the sensory block or the requirement for rescue analgesia. The duration of sensory block was defined as the time interval between successful establishment of the block and complete resolution of sensory anaesthesia in all nerve-innervated areas of the operated lower limb. The findings were recorded for each patient.

The intensity of sensory blockade was graded using a three-point scale. Grade 0 indicated normal sensation, with the patient able to perceive a sharp pin stimulus. Grade 1 indicated analgesia, in which the patient perceived a dull sensation to the stimulus. Grade 2 indicated complete anaesthesia, with no sensation perceived.

Motor blockade was assessed using the modified Bromage scale. Motor function was evaluated by assessing the patient's ability to flex and extend the hip, knee, and toes. Grade 0 indicated normal motor function with full flexion and extension of the hip, knee, and toes. Grade 1 indicated decreased motor strength with the ability to move the toes only. Grade 2 indicated complete motor blockade, with inability to move the toes. Motor block was assessed at predefined intervals following administration of the anaesthetic technique and the time of onset and

subsequent resolution of motor blockade were recorded for each patient.
Haemodynamic parameters were monitored throughout the intraoperative and postoperative periods. Heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and peripheral oxygen saturation were recorded at baseline and at predefined intervals. Episodes of hypotension, bradycardia, desaturation, or other haemodynamic disturbances were recorded and managed according to institutional protocols.
Following completion of surgery, all patients were observed for a period of 8 hours. Postoperative analgesia was assessed by recording the time from completion of the anaesthetic procedure until the first requirement for rescue analgesia.
Patients were monitored for any complications related to the anaesthetic technique during the intraoperative period and throughout the postoperative observation period.
The primary outcome of the study was the comparison of the duration of sensory and motor blockade between spinal anaesthesia and combined lumbar plexus and sciatic nerve block. Secondary outcomes included comparison of the onset of sensory and motor blockade, perioperative haemodynamic parameters including heart rate, blood pressure, peripheral oxygen saturation and ECG changes, duration of postoperative analgesia or time to first rescue analgesic requirement, and the incidence of complications between the two groups.
The collected data were entered into a statistical software package and analysed using appropriate statistical methods. Continuous variables were expressed as mean ± standard deviation or median with interquartile range, depending on the distribution of the data, while categorical variables were expressed as frequencies and percentages. Normality of continuous variables was assessed before selection of the appropriate statistical test. Continuous variables between the two groups were compared using an independent-samples t-test for normally distributed data or the Mann–Whitney U test for non-normally distributed data. Categorical variables were compared using the Chi-square test or Fisher's exact test, as appropriate. A two-tailed p-value <0.05 was considered statistically significant.

RESULTS

A total of 80 patients were included in the study, with 40 patients in each group. Group I consisted of patients who received spinal anaesthesia, while Group II consisted of patients who received combined lumbar plexus and sciatic nerve block.
The two groups were comparable with respect to age, weight, height, ASA physical status, and sex, with no statistically significant differences in baseline characteristics ($p > 0.05$ for all comparisons). [Table 1]

Table 1: Comparison of Demographic and Clinical Characteristics Between the Two Groups (n = 80)

Parameter	Group I (Spinal Anaesthesia) n = 40	Group II (Combined Lumbar Plexus + Sciatic Nerve Block) n = 40	P value
Age in years mean ± SD	39.90 ± 7.99	36.45± 10.084	0.094
Weight in kg mean ± SD	67.58± 7.04	64.58± 7.61	0.071
Height in cms mean ± SD	159.65 ±10.44	160.98± 8.19	0.064
ASAI:ASAII	20(50.0%):20(50.0%)	24(60.0%):16(40.0%)	0.36
Male: Female	24(60.0%):16(40.0%)	25(62.5%): 15(37.5%)	0.47

Data are presented as mean ± standard deviation (SD) or frequency (percentage), as appropriate. Group I = spinal anaesthesia; Group II = combined lumbar plexus and sciatic nerve block; ASA = American Society of Anesthesiologists. A p-value <0.05 was considered statistically significant.
The onset of both sensory and motor blockade was significantly faster in the spinal anaesthesia group compared with the combined lumbar plexus and sciatic nerve block group ($p < 0.001$). However, the combined nerve block provided significantly prolonged sensory and motor blockade compared with spinal anaesthesia ($p < 0.001$), indicating a slower onset but longer duration of block.(Table 2)

Table 2: Comparison of Onset and Duration of Sensory and Motor Block Between the Study Groups

Parameters	Group I (Spinal Anaesthesia) n = 40	Group II (Combined Lumbar Plexus + Sciatic Nerve Block) n = 40	P value
Onset of sensory block in minutes mean ± SD	1.00± 0.00	6.53± 0.55	
Onset of motor block in minutes mean ± SD	1.57± 0.50	12.68± 0.62	<0.001
Duration of sensory block in minutes mean ± SD	183.67± 4.40	290.05± 9.77	<0.001
Duration of motor block in minutes mean ± SD	135.42± 5.36	234.42± 5.10	<0.001

Postoperative pain scores were comparable between the groups at 1 hour ($p = 0.463$). From the second hour onward, patients receiving combined lumbar plexus and sciatic nerve block had significantly lower VAS scores than those receiving spinal anaesthesia ($p < 0.001$ at all time points). The difference was most pronounced between the 4th and 7th postoperative hours, indicating superior and more sustained postoperative analgesia with the combined nerve block technique. [Table 3]

Table 3: Comparison of Postoperative Pain Scores (Visual Analogue Scale) Between the Study Groups

Time interval	Group I (Spinal Anaesthesia) n = 40	Group II (Combined Lumbar Plexus + Sciatic Nerve Block) n = 40	P value
1 hour	0.12 ± 0.33	0.07 ± 0.26	0.463
2 hours	0.85 ± 0.53	0.17 ± 0.38	<0.001*
3 hours	2.10 ± 0.84	0.55 ± 0.95	<0.001*
4 hours	3.22 ± 0.89	0.82 ± 1.44	<0.001*
5 hours	4.72 ± 1.08	1.25 ± 1.91	<0.001*
6 hours	5.55 ± 0.81	1.60 ± 2.41	<0.001*
7 hours	4.32 ± 0.52	1.77 ± 1.83	<0.001*
8 hours	3.02 ± 0.94	1.85 ± 1.33	<0.001*

*Data are presented as mean ± standard deviation. VAS = Visual Analogue Scale. Group I = spinal anaesthesia; Group II = combined lumbar plexus and sciatic nerve block. $p < 0.05$ was considered statistically significant.

The mean time to first rescue analgesia was significantly longer in Group II than in Group I (6.50 ± 0.89 vs. 5.80 ± 0.41 hours; $p = 0.008$), indicating that the combined lumbar plexus and sciatic nerve block provided more prolonged postoperative analgesia. [Table 4]

Table 4: Comparison of Time to First Rescue Analgesia Between the Study Groups

Variable	Group I (Spinal Anaesthesia) n = 40	Group II (Combined Lumbar Plexus + Sciatic Nerve Block) n = 40	P-value
First rescue analgesia (hours)	5.80 ± 0.41	6.50 ± 0.89	0.008*

Data are presented as mean ± standard deviation (SD). Group I = spinal anaesthesia; Group II = combined lumbar plexus and sciatic nerve block. $p < 0.05$ was considered statistically significant.

Hypotension was observed in both groups with an equal frequency (3 patients each). Hematoma occurred only in Group I (4 patients), whereas nausea and its associated manifestations were reported only in Group II. Overall, complications were limited and comprised predominantly minor perioperative events. [Table 5]

Table 5: Distribution of Perioperative Complications in the Study Groups

Complication	Group I (Spinal Anaesthesia) n = 40	Group II (Combined Lumbar Plexus + Sciatic Nerve Block) n = 40	Total (n)
Hematoma	4	0	4
Hypotension	3	3	6
Nausea	0	3	3
Nausea with hypotension	0	2	2
Nausea with vomiting	0	2	2

Data are presented as number of patients. Group I = spinal anaesthesia; Group II = combined lumbar plexus and sciatic nerve block.

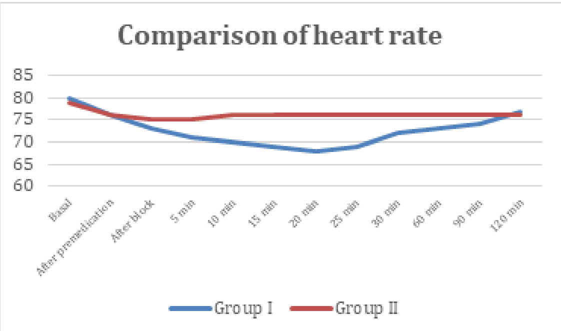

Figure 1: Comparison of heart rate at Different Time Intervals Between the Study Groups

Baseline heart rate was comparable between the two groups. Following anaesthesia, Group I showed a progressive decline in heart rate, reaching its lowest value around 20 minutes, followed by a gradual recovery toward baseline by 120 minutes. In contrast, Group II demonstrated relatively stable heart rate throughout the observation period, with only minor fluctuations. Overall, the graph suggests greater intraoperative variation in heart rate following spinal anaesthesia, whereas haemodynamic changes were comparatively limited in the combined lumbar plexus and sciatic nerve block group. [Figure 1]

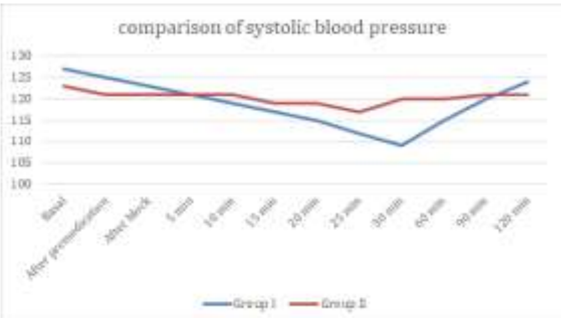

Figure 2: Comparison of systolic Blood Pressure at Different Perioperative Time Intervals Between the Study Groups

Baseline systolic blood pressure was slightly higher in Group I than in Group II. Following administration of anaesthesia, Group I demonstrated a progressive decline in systolic blood pressure, with the lowest value observed at approximately 30 minutes, followed by gradual recovery toward baseline by 120 minutes. Group II showed comparatively stable systolic blood pressure throughout the observation period, with only minor fluctuations. Overall, the graph suggests greater haemodynamic variation in systolic blood pressure following spinal anaesthesia, whereas the combined lumbar plexus and sciatic nerve block was associated with relatively stable systolic pressure. [Figure 2]

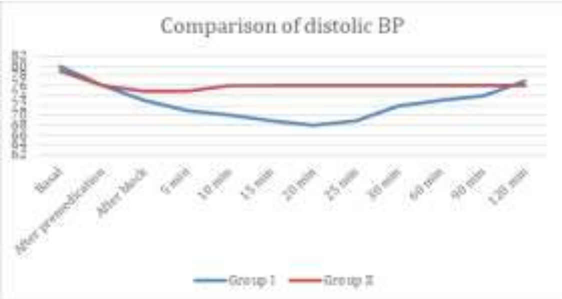

Figure 3: Comparison of Diastolic Blood Pressure at Different Perioperative Time Intervals Between the Study Groups

Diastolic blood pressure showed a greater decline in Group I, reaching its lowest level around 30 minutes, followed by gradual recovery. Group II maintained relatively stable values with only minor fluctuations throughout the observation period. [Figure 3]

DISCUSSION

The present prospective observational study compared spinal anaesthesia with combined lumbar plexus and sciatic nerve block for intraoperative anaesthesia in adults undergoing elective femur and tibia orthopaedic surgery. The two groups were comparable with respect to demographic parameters. A major finding of the present study was the difference in the onset and duration of neural blockade. Spinal anaesthesia produced a significantly faster onset of sensory and motor block than the combined lumbar plexus and sciatic nerve block. The mean onset of sensory block was 1.00 ± 0.00 minutes in the spinal group compared with 6.53 ± 0.55 minutes in the combined block group, while motor block developed at 1.57 ± 0.50 and 12.68 ± 0.62 minutes, respectively ($p < 0.001$ for both). This more rapid onset is expected with intrathecal administration because the local anaesthetic is deposited directly in the cerebrospinal fluid and rapidly reaches the relevant spinal nerve roots. In contrast, peripheral nerve blockade requires diffusion of local anaesthetic around the target nerves and therefore generally takes longer to achieve complete surgical anaesthesia.

Although the combined block had a slower onset, it provided a significantly longer duration of both sensory and motor blockade. Sensory block lasted 290.05 ± 9.77 minutes in Group II compared with 183.67 ± 4.40 minutes in Group I, while motor block lasted 234.42 ± 5.10 minutes compared with 135.42 ± 5.36 minutes, respectively ($p < 0.001$). Thus, the present findings demonstrate a clinically important distinction between the two techniques: spinal anaesthesia provides a rapid onset, whereas combined lumbar plexus and sciatic nerve blockade provides more prolonged postoperative neural blockade.

These findings are consistent with those of Adali et al,[9] nbwho compared spinal anaesthesia with combined sciatic/lumbar plexus block in patients undergoing lower-extremity orthopaedic surgery. They reported that the duration of regional anaesthesia was significantly longer with the combined sciatic/lumbar plexus block, although the time required to prepare patients for surgery was significantly shorter with spinal anaesthesia. Both techniques were considered effective, with comparable patient and surgeon satisfaction.[9]

The postoperative pain findings further support the prolonged analgesic effect of the combined nerve block. At 1 hour, pain scores were comparable between the groups ($p = 0.463$). However, from the second postoperative hour onwards, patients receiving combined lumbar plexus and sciatic nerve block had significantly lower VAS scores than those receiving spinal anaesthesia, with the difference remaining statistically significant through 8 hours ($p < 0.001$). The maximum difference was observed during the intermediate postoperative period, when the effect of spinal anaesthesia had progressively regressed while the peripheral nerve block continued to provide analgesia.

The time to first rescue analgesia also supports this finding. Patients receiving combined lumbar plexus and sciatic nerve block required their first rescue analgesic significantly later than those receiving spinal anaesthesia (6.50 ± 0.89 vs. 5.80 ± 0.41 hours, $p = 0.008$). The difference, although modest in absolute duration, indicates a sustained postoperative analgesic benefit with the combined block. Similarly, Canakci et al,[10] reported, that the psoas compartment block (PCB) provides longer time to first analgesia, comparing with the spinal anesthesia (SA). Although PCB group had significantly lower opioid consumption –300 mg tramadol versus 1500 mg in SA group. The longer duration of analgesia may be particularly advantageous after lower-limb orthopaedic procedures, where postoperative pain can interfere with mobilisation and rehabilitation.

The findings of the present study are in agreement with those reported by Bielka et al.[11] The authors found substantially lower postoperative opioid requirements, fewer patients with severe pain, fewer demands for rescue analgesia, better sleep quality, and earlier postoperative mobilisation in the peripheral block group. Although their study population, surgical setting, and protocol differed from the present study, the direction of the findings is similar: a lumbar plexus-based peripheral technique combined with sciatic blockade can provide prolonged and effective postoperative analgesia compared with spinal anaesthesia.

The difference between the studies should nevertheless be acknowledged. Bielka et al,[11] used a continuous psoas compartment block with postoperative infusion, in addition to the intraoperative block, whereas the present study evaluated the duration of a combined lumbar plexus and sciatic nerve block without such a prolonged catheter-based regimen. Therefore, the longer analgesic duration and reduced opioid requirement reported by Bielka et al. cannot be directly equated with the findings of the present study. Nevertheless, both studies support the underlying advantage of peripheral regional anaesthesia in extending postoperative analgesia.

Meta-analysis published in 2017,[12] showed that peripheral nerve blocks reduced pain on movement within 30 min of block placement, in this study we also showed the efficacy of lumbar plexus block for pain management after lower limb surgery – the number of patients with severe pain was significantly lower in block group.

Haemodynamic findings in the present study also suggest a difference between the two techniques. The graphical assessment demonstrated greater variation in heart rate and blood pressure in the spinal anaesthesia group, particularly during the early intraoperative period. Systolic and diastolic blood pressures showed a more pronounced decline in Group I, with subsequent recovery toward baseline. In contrast, the combined lumbar plexus and sciatic nerve block group demonstrated relatively stable blood pressure values throughout the observation period. These findings are physiologically plausible because spinal anaesthesia produces sympathetic blockade, which can result in vasodilatation and reductions in venous return and systemic vascular resistance. Peripheral nerve blocks generally have less extensive sympathetic involvement and therefore preserves cardiovascular stability.

The present haemodynamic observations are supported by Bielka et al,[11] who reported that hypotension was significantly more frequent in their spinal anaesthesia group than in the psoas compartment block group (OR 9, 95% CI 1.9–47; $p = 0.004$). Their findings provide additional evidence that peripheral regional techniques may have an advantage over spinal anaesthesia in maintaining haemodynamic stability, particularly in patients at increased cardiovascular risk.

The complication profile in the present study showed that hypotension occurred in three patients in each group. Haematoma was reported in four patients in the spinal anaesthesia group and none in the combined block group, whereas nausea occurred in three patients in Group II and was not observed as an isolated complication in Group I. Nausea with hypotension and nausea with vomiting were also recorded only in Group II. Because the numbers were small and the study was not powered specifically to detect differences in complications, these findings should be interpreted cautiously.

The occurrence of hypotension in both groups contrasts somewhat with the findings of Bielka et al,[11] where hypotension was significantly more common following spinal anaesthesia. The difference may be related to differences in patient age, fracture status, surgical procedures, anaesthetic doses, perioperative fluid management, and study design. The present study involved relatively younger adults undergoing elective femur and tibia surgery, whereas Bielka et al,[11] studied elderly patients with proximal femur fractures, a population with substantially different physiological and cardiovascular characteristics. Therefore, the haemodynamic advantage of peripheral blockade observed in the present study should be considered supportive rather than definitive.

The results are also broadly consistent with the findings of Adali et al,[9] who demonstrated that both spinal anaesthesia and combined sciatic/lumbar plexus blockade were effective techniques for lower-extremity orthopaedic surgery. Their study showed that combined blockade required a longer preparation time but produced a significantly longer duration of regional anaesthesia. The present study similarly demonstrates a trade-off between speed of onset and duration of anaesthesia: spinal anaesthesia offers rapid establishment of surgical anaesthesia, whereas combined peripheral blockade provides a slower onset but substantially prolonged sensory and motor effects.

From a clinical perspective, these findings suggest that the choice between spinal anaesthesia and combined lumbar plexus and sciatic nerve block should be individualized. Spinal anaesthesia remains advantageous when rapid onset and efficient preparation for surgery are priorities. In contrast, combined peripheral nerve blockade may be particularly useful when prolonged postoperative analgesia, reduced requirement for rescue analgesics, and greater haemodynamic stability are desirable. This may be especially relevant in patients in whom sympathetic blockade associated with neuraxial anaesthesia is undesirable or in those at increased risk of haemodynamic instability.

The study by Bielka et al,[11] further emphasizes the potential benefits of peripheral regional techniques beyond immediate pain control. Their patients receiving perioperative psoas compartment block had lower severe pain rates, reduced opioid consumption, fewer rescue analgesic requirements, improved sleep quality, and earlier mobilisation compared with patients receiving spinal or general anaesthesia. Although the present study did not evaluate opioid consumption, sleep quality, or time to mobilisation, the significantly lower VAS scores and delayed requirement for rescue analgesia in the combined block group suggest a similar analgesic advantage.

The present study has several limitations. It was conducted in a single tertiary care centre with a relatively small sample of 80 patients, which limits the generalizability of the findings. Furthermore, because the study was observational rather than randomized, selection bias and differences in clinical decision-making between groups cannot be completely excluded. The follow-up period was limited to 8 hours, preventing assessment of longer-term analgesic outcomes, functional recovery, and delayed complications. In addition, the study did not assess patient or surgeon satisfaction, postoperative opioid consumption, time to mobilisation, or length of hospital stay, which were important outcomes in previous studies such as those by Adali et al. and Bielka et al.[9,11]

Overall, the present study demonstrates that spinal anaesthesia provides a significantly faster onset of sensory and motor blockade, whereas combined lumbar plexus and sciatic nerve block provides significantly longer sensory and motor blockade, lower postoperative pain scores from the second postoperative hour onward, and a longer duration before the first rescue analgesic requirement. The haemodynamic trends also suggest comparatively greater stability with the combined peripheral block. These findings, together with the observations of Adali et al. and Bielka et al,[9,11] support combined lumbar plexus and sciatic nerve blockade as an effective alternative to spinal anaesthesia for selected patients undergoing elective femur and tibia orthopaedic surgery.

CONCLUSION

Spinal anaesthesia provides a more rapid onset of sensory and motor blockade, whereas combined lumbar plexus and sciatic nerve block provides significantly prolonged blockade and superior early postoperative analgesia. The combined block was also associated with comparatively stable perioperative haemodynamic parameters and a longer duration before rescue analgesia. Thus, combined lumbar plexus and sciatic nerve block may be considered an effective alternative to spinal anaesthesia for selected adult patients undergoing elective femur and tibia orthopaedic surgery.

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