Parasacral Ischial Plane Block with Femoral Block in High-Risk Patients of Below Knee Surgery: A Prospective Observational Study

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ABSTRACT:

Background: High-risk patients undergoing below-knee surgeries require anesthetic techniques that ensure hemodynamic stability and effective analgesia.

Objective: To evaluate the block performance characteristics, hemodynamic stability, and analgesic efficacy of ultrasound-guided parasacral ischial plane block combined with femoral nerve block in high-risk patients.

Material and Methods: A prospective observational study was conducted in 70 ASA III and IV patients undergoing below-knee surgeries, assessing hemodynamic parameters, sensory and motor block characteristics, and duration of analgesia.

Results: Hemodynamic parameters remained stable intraoperatively with no significant deviations from baseline. Sensory and motor block onset times were predictable, and prolonged durations of blockade and analgesia were achieved.

Conclusion: Ultrasound-guided parasacral ischial plane block with femoral nerve block is a safe and effective regional anesthesia technique for below-knee surgeries in high-risk patients, providing excellent hemodynamic stability and prolonged postoperative analgesia.

Keywords: Parasacral ischial plane block; Femoral nerve block; High-risk patients; Below-knee surgery

Introduction

Ultrasound-guided regional anesthesia techniques have transformed perioperative pain management by offering targeted nerve blockade with improved safety and efficacy, particularly in high-risk patients for whom general or neuraxial anesthesia may pose significant hemodynamic risks [1]. Below-knee orthopedic surgeries often involve complex sensory and motor innervation from both the lumbar and sacral plexuses, rendering single nerve blocks insufficient for complete anesthesia; hence, combining sacral plexus nerve block (SNB) with femoral nerve block has been increasingly recommended to achieve comprehensive coverage of the operative field [2]. The sacral plexus supplies the posterior

thigh, entire lower limb below the knee (except the medial aspect), and branches critical to lower limb motor and sensory function, which necessitates precise blockade when regional anesthesia is chosen as the primary technique [3]. Traditional approaches for ultrasound-guided sacral plexus blockade, including the "classical" landmark-based or short-axis techniques, often present challenges related to visualization of deep anatomic structures, increased scanning and needling times, and variable block success rates [4]. In response to these limitations, the parasacral parallel shift (PSPS) approach has emerged as a technical refinement that enhances visualization of the sacral plexus beneath the piriformis and between bony landmarks, potentially reducing block performance time and improving block success [1,5]. Preliminary evidence suggests that imaging the iliac bone contour and shifting the transducer inferomedially facilitates clearer identification of sacral plexus structures, contributing to more efficient needle placement and perineural injectate spread under ultrasound guidance [6].

Comparative trials focusing on scintific block performance characteristics have highlighted that the PSPS technique results in shorter scanning and needling times and faster onset of complete sensory and motor block compared to classical approaches, which may be attributable to better alignment of the ultrasound beam with the long axis of the nerve and proximity of injectate to target structures [1]. Furthermore, total block performance time and procedural efficiency are critical in high-risk patients with compromised cardiopulmonary reserve, where prolonged anesthesia setup may increase physiological stress and intraoperative complications [7,8]. The integration of femoral nerve block with SNB is also essential from a clinical perspective, as femoral blockade addresses the anterior and medial lower limb innervation, supplementing the sacral plexus blockade to achieve surgical anesthesia for below-knee procedures [9]. Enhanced procedural efficiency, faster onset, and potentially superior block quality can translate into reduced requirement for supplemental analgesics, minimized intraoperative hemodynamic perturbations, and improved postoperative pain control, particularly in patients with significant comorbidities where multimodal analgesia and minimized systemic opioid use are desirable [10]. Despite these theoretical and preliminary clinical benefits, direct comparisons of the PSPS versus classical approach in terms of block performance characteristics remain under-studied in the context of combined SNB and femoral block for below-knee surgeries in high-risk patients, necessitating controlled observational studies to guide evidence-based practice. This study was therefore designed to rigorously assess and compare the performance characteristics of SNB via the PSPS versus classical approach in conjunction with femoral block to determine the optimal regional anesthesia strategy for this patient population.

Material and Methods

The present prospective observational study entitled "Parasacral Ischial Plane Block with Femoral Block in High-Risk Patients of Below-Knee Surgery" was conducted in the Department of Anaesthesiology at Government Medical College and SSG Hospital, Vadodara, from May 2024 to March 2025, after obtaining approval from the Institutional Ethics Committee for Biomedical and Health Research and registration with the Clinical Trials Registry of India (CTRI/2024/09/073447). Written informed consent was obtained from all participants after explaining the objectives, methodology, benefits, and possible complications of the study in detail. A total of 70 high-risk patients classified as ASA physical status III and IV, aged between 18 and 70 years, of either sex, and scheduled for planned or emergency below-knee surgeries of less than two hours duration under orthopaedic or general surgery were included. Patients were required to be able to understand and use the visual analogue scale for pain assessment. Patients who did not provide consent, had a history of allergy to local anaesthetics, coagulopathy, local infection at the block site, pre-existing neurological deficits, pelvic fractures causing difficulty in positioning, or surgeries anticipated to result in major blood loss exceeding 20% were excluded. Eighty

patients were assessed for eligibility, of whom ten were excluded due to non-fulfilment of inclusion criteria, refusal to participate, or inability to maintain lateral positioning. The remaining 70 patients completed the study with no loss to follow-up. All patients underwent a detailed pre-anaesthetic evaluation including history taking, general and systemic examination. Routine investigations such as haemoglobin, blood urea, serum creatinine, random blood sugar, electrocardiography, chest radiography, bleeding time, and clotting time were performed for all patients, with additional investigations undertaken when clinically indicated. On the day prior to surgery, patients were kept nil per oral for eight hours and were administered oral ranitidine 150 mg. On the day of surgery, baseline vital parameters including pulse rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygen saturation were recorded in the recovery room. In the operating theatre, standard monitoring was applied, and intravenous premedication consisting of ondansetron 4 mg, glycopyrrolate 0.2 mg, midazolam 1 mg, and dexmedetomidine 0.5 µg/kg was administered five minutes prior to block performance. All procedures were carried out under strict aseptic precautions with standard operating theatre preparation, including availability of resuscitation equipment, anaesthesia workstation, ultrasound machine, peripheral nerve stimulator, and multiparameter monitors. The local anaesthetic solution used comprised lignocaine 2% with adrenaline (1:200,000) 15 mL, bupivacaine 0.5% 15 mL, and dexamethasone 8 mg. For the parasacral ischial plane block, patients were positioned in Sim's position with the limb to be blocked placed in the non-dependent position. (Figure 1) A low-frequency curvilinear ultrasound probe (2–5 MHz) was placed along the line joining the greater trochanter and posterior superior iliac spine, with the medial edge of the probe positioned over the posterior superior iliac spine. The probe was then moved inferomedially to identify the posteromedial border of the ischium with the overlying piriformis muscle at the level of the greater sciatic foramen. A 22-gauge, 100–150 mm insulated needle was inserted using an in-plane lateral-to-medial approach under combined ultrasound and nerve stimulator guidance. Initial nerve stimulation was set at 1.5 mA and gradually reduced to 0.3–0.5 mA to obtain acceptable motor responses such as hamstring, calf, foot, or toe movements. Following confirmation of needle tip placement and negative aspiration, 20 mL of the local anaesthetic solution was injected, and its spread beneath the piriformis muscle toward the sacral plexus was visualized under ultrasound.

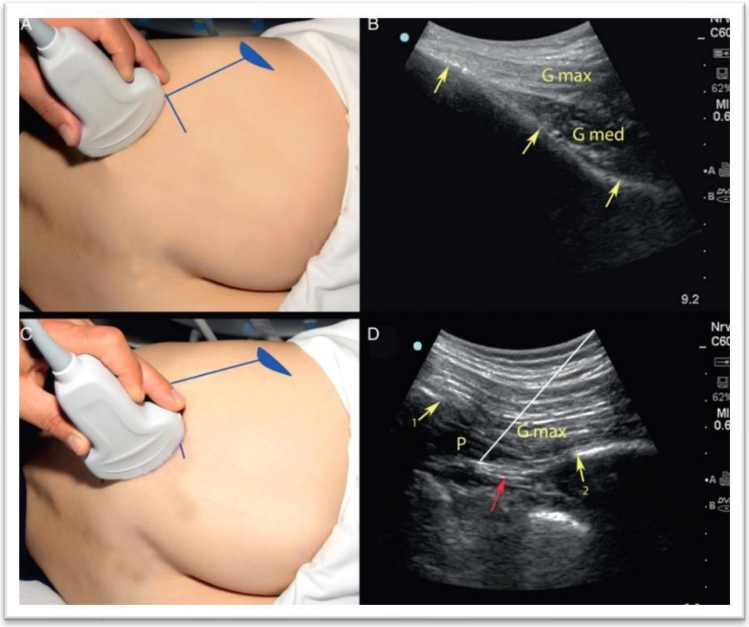

Figure 1: USG and PNS guided parasacral ischial plane block

Femoral nerve block was subsequently performed with the limb positioned in neutral, slight abduction or external rotation as tolerated by the patient. A high-frequency linear ultrasound probe (6–13 MHz) was placed along the inguinal crease to identify the femoral artery, fascia lata, fascia iliaca, and femoral nerve. (Figure 2) Using an in-plane lateral-to-medial approach, a long insulated needle was advanced through the sartorius muscle and fascial layers under ultrasound guidance. After confirming appropriate needle tip placement adjacent to the femoral nerve and negative aspiration, 12 mL of local anaesthetic solution was injected in incremental doses with continuous visualization of local anaesthetic spread and monitoring for signs of discomfort or toxicity.

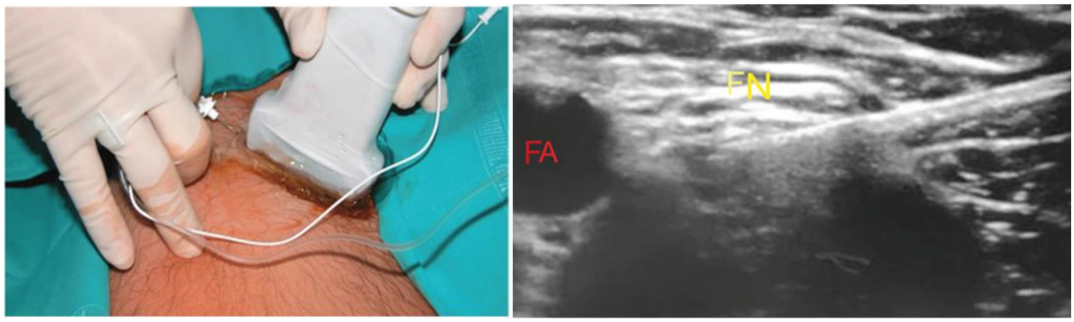

Figure 2: USG and PNS guided Femoral block]

Hemodynamic parameters including pulse rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygen saturation were recorded at baseline and at 5, 10, and 20 minutes after block placement, followed by regular monitoring up to 120 minutes intraoperatively. Sensory block was assessed using a three-point scale, where 0 denoted normal sensation, 1 indicated loss of pinprick sensation, and 2 indicated loss of touch sensation. Sensory onset time, peak effect time, and duration of sensory block were recorded at predefined intraoperative intervals and postoperatively up to 24 hours. Motor block was assessed using the Bromage scale, and the onset time, time to achieve peak motor block, and duration of motor block were documented similarly. Duration of analgesia was defined as the time from completion of local anaesthetic injection to the requirement of first rescue analgesic. Pain intensity was assessed using the 10-point visual analogue scale at regular postoperative intervals up to 24 hours.

All data were collected using clinical observation, multiparameter monitoring, ultrasound imaging, nerve stimulator responses, and visual analogue scale scoring, while maintaining strict confidentiality and data safety. Statistical analysis was performed using MedCalc software, and continuous variables were analysed using the Student's t-test. A p-value of less than 0.05 was considered statistically significant, and a p-value of less than 0.001 was considered highly significant.

Results

The demographic characteristics of the study population are summarized in Table 1. The mean age of patients in the orthopedic group was 58.5 ± 6.67 years, while patients in the general surgery group had a slightly higher mean age of 61.1 ± 6.03 years. Gender distribution was comparable between the two groups, with an equal number of male patients (17 each) in both groups and a slightly higher number of female patients in the general surgery group. The ASA physical status distribution also showed similarity, with a predominance of ASA IV patients in both orthopedic (18 patients) and general surgery (20 patients) groups, confirming a comparable high-risk profile.

Table 2 illustrates the hemodynamic parameters in general surgery patients. Mean arterial pressure showed minimal variation from baseline (97 ± 8.9 mmHg) to intraoperative period (96 ± 8.5 mmHg), and heart rate remained stable with baseline and intraoperative means of 90 ± 12/min and 91 ± 9.1/min respectively. The

differences were statistically insignificant ($p > 0.05$), indicating effective hemodynamic stability during surgery.

Table 3 depicts hemodynamic changes in orthopedic surgery patients. Baseline mean arterial pressure was 98 ± 8.6 mmHg, which remained stable intraoperatively at 97 ± 8.4 mmHg. Heart rate values also remained consistent, with baseline and intraoperative means of 91 ± 11/min and 91 ± 9.5/min respectively. The absence of statistically significant changes ($p > 0.05$) reflects the adequacy of the regional anesthesia technique in maintaining cardiovascular stability.

Block performance characteristics are presented in Table 4. The mean onset time of sensory block was 13 ± 1.7 minutes, while motor block onset occurred at 21 ± 1.6 minutes. The duration of sensory block was prolonged, averaging 760.40 ± 35.26 minutes, whereas motor block duration averaged 652.42 ± 21.55 minutes, indicating effective and sustained neural blockade suitable for prolonged postoperative analgesia.

Table 5 shows the duration of analgesia following combined parasacral ischial plane block and femoral nerve block. The overall duration of analgesia was 853.58 ± 128.02 minutes. Patients undergoing orthopedic surgery had a mean analgesia duration of 805.20 ± 141.58 minutes, whereas those undergoing general surgery demonstrated a longer duration of analgesia of 901.96 ± 114.47 minutes, suggesting effective postoperative pain control across both surgical groups.

Table 1: Demographic data of the study population

Parameters	Orthopedic patients	General surgery patients
Age (years)	58.5 ± 6.67	61.1 ± 6.03
Sex (Male : Female)	17 : 15	17 : 21
ASA Grade (III : IV)	14 : 18	18 : 20

Table 2: Hemodynamic parameters in general surgery patients

Parameter	Baseline Range	Baseline Mean ± SD	Intraoperative Range	Intraoperative Mean ± SD	p value
MAP (mmHg)	70–108	97 ± 8.9	75–122	96 ± 8.5	>0.05
HR (/min)	90–110	90 ± 12	90–112	91 ± 9.1	>0.05

Table 3: Hemodynamic parameters in orthopedic surgery patients

Parameter	Baseline Range	Baseline Mean ± SD	Intraoperative Range	Intraoperative Mean ± SD	p value
MAP (mmHg)	72–110	98 ± 8.6	75–122	97 ± 8.4	>0.05
HR (/min)	85–105	91 ± 11	91–110	91 ± 9.5	>0.05

Table 4: Assessment of block characteristics

Block parameter	Mean ± SD
Sensory block onset (min)	13 ± 1.7
Motor block onset (min)	21 ± 1.6
Duration of sensory block (min)	760.40 ± 35.26
Duration of motor block (min)	652.42 ± 21.55

Table 5: Duration of analgesia

Surgical category	Duration of analgesia (Mean ± SD, min)
Overall	**853.58 ± 128.02**
Orthopedic surgery	**805.20 ± 141.58**
General surgery	**901.96 ± 114.47**

Discussion

The present prospective observational study evaluated the performance characteristics and clinical efficacy of ultrasound-guided parasacral ischial plane block combined with femoral nerve block in high-risk patients undergoing below-knee surgeries. The results demonstrate that this regional anesthesia technique provides stable hemodynamics, reliable sensory and motor blockade, and prolonged postoperative analgesia, making it a suitable anesthetic option for patients with significant systemic comorbidities. High-risk patients classified as ASA III and IV are particularly vulnerable to the adverse hemodynamic effects of general and neuraxial anesthesia, and regional techniques that preserve cardiovascular stability are therefore of paramount importance.

Hemodynamic parameters remained remarkably stable throughout the intraoperative period in both orthopedic and general surgery patients, with no statistically significant differences observed between baseline and intraoperative mean arterial pressure and heart rate. These findings are consistent with previous studies demonstrating that sacral plexus–based regional techniques minimize sympathetic blockade and avoid the sudden drops in systemic vascular resistance commonly associated with central neuraxial anesthesia [11]. The preservation of cardiovascular stability observed in this study supports the use of parasacral approaches in elderly and comorbid patients where even minor hemodynamic fluctuations can result in adverse outcomes.

The block performance characteristics observed in the present study further highlight the efficacy of this technique. Sensory block onset occurred at a mean of 13 minutes, while motor block onset was achieved at approximately 21 minutes, indicating a predictable and clinically acceptable onset profile. These findings align with earlier reports suggesting that ultrasound-guided parasacral approaches allow accurate deposition of local anesthetic near the sacral plexus, thereby facilitating faster onset and reliable block establishment [12]. The use of ultrasound guidance combined with nerve stimulation likely contributed to precise needle placement and optimal spread of local anesthetic, enhancing block success rates.

The duration of sensory and motor blockade observed in this study was notably prolonged, with sensory block lasting over 12 hours on average and motor block persisting for nearly 11 hours. Such prolonged blockade is advantageous in high-risk surgical populations, as it reduces the need for repeated analgesic interventions and minimizes exposure to systemic opioids. Prior investigations have similarly reported extended duration of analgesia with sacral plexus blocks, particularly when long-acting local anesthetics and adjuvants such as dexamethasone are used [13]. Prolonged sensory blockade without excessive motor impairment is especially beneficial in facilitating early postoperative comfort while allowing gradual return of motor function.

Postoperative analgesia was effective and sustained in both orthopedic and general surgery patients, with an overall duration of analgesia exceeding 14 hours. Interestingly, patients undergoing general surgery demonstrated a slightly longer duration of analgesia compared to orthopedic patients, which may be attributed to differences in surgical tissue trauma and nociceptive stimulus. The extended analgesic duration observed in this study is in agreement

with literature emphasizing the role of combined peripheral nerve blocks in providing superior postoperative pain control compared to single-nerve or systemic analgesic techniques [14]. Effective postoperative analgesia is particularly crucial in high-risk patients, as inadequate pain control can precipitate sympathetic activation, respiratory compromise, and delayed recovery.

The combination of parasacral ischial plane block with femoral nerve block ensured comprehensive coverage of both posterior and anterior components of below-knee innervation. This comprehensive blockade likely contributed to the absence of intraoperative block failure and the minimal need for supplemental analgesia. Previous authors have emphasized that combined lumbar and sacral plexus–based approaches are essential for achieving complete anesthesia for below-knee procedures, particularly in patients where conversion to general anesthesia would be undesirable [15]. The findings of the present study reinforce this concept and demonstrate the practical feasibility of such combined blocks in routine clinical practice.

Overall, the results of this study suggest that ultrasound-guided parasacral ischial plane block with femoral nerve block is a safe, effective, and hemodynamically stable anesthetic technique for below-knee surgeries in high-risk patients. The predictable onset, prolonged duration of blockade, and excellent analgesic profile observed in this study support its wider adoption, particularly in tertiary care settings managing elderly and comorbid surgical populations.

Conclusion

The present study concludes that ultrasound-guided parasacral ischial plane block combined with femoral nerve block provides effective surgical anesthesia with excellent hemodynamic stability, reliable block performance, and prolonged postoperative analgesia in high-risk patients undergoing below-knee surgeries. This regional anesthesia technique represents a valuable alternative to general and neuraxial anesthesia in ASA III and IV patients, offering improved perioperative safety and enhanced postoperative pain control.

References

Hadzic A, Vloka JD, Kuroda MM, Koorn R, Birnbach DJ. The practice of peripheral nerve blocks in anesthesia. *Anesthesiology*. 2004;101(5):1234–1246.

Capdevila X, Biboulet P, Bouregba M, Rubenovitch J, d'Athis F. Comparison of general and regional anesthesia in high-risk surgical patients. *Anesth Analg*. 1998;86(2):273–279.

Gray AT, Collins AB, Schafhalter-Zoppoth I. Ultrasound guidance for regional anesthesia: principles and practical implementation. *Reg Anesth Pain Med*. 2006;31(3):282–289.

Taha AM. Ultrasound-guided sacral plexus block: description of a new technique. *Br J Anaesth*. 2012;108(3):486–493.

Bendtsen TF, Lönnqvist PA, Jepsen KV. Preliminary results of a new ultrasound-guided approach to block the sacral plexus: the parasacral parallel shift technique. *Br J Anaesth*. 2011;107(2):278–280.

Hadzic A, Dilberovic F, Shah S, Kulenovic A, Kapur E, Zaciragic A. Combination of femoral and sciatic nerve blocks for lower extremity surgery. *Anesthesiology*. 2004;101(1):212–218.

Ilfeld BM, Le LT, Ramjohn J, Loland VJ, Mariano ER. The effects of regional anesthesia on postoperative outcomes. *Anesth Analg*. 2011;113(4):904–911.

Chelly JE, Casati A, Fanelli G. Continuous peripheral nerve blocks in acute pain management. *Br J Anaesth*. 2005;95(2):155–165.

McCartney CJL, Duggan E, Apatu E. Should we add clonidine or dexamethasone to local anesthetics for peripheral nerve block? *Reg Anesth Pain Med*. 2007;32(4):330–338.

Mariano ER, Ilfeld BM. Peripheral nerve blocks for postoperative analgesia: a review of benefits and risks. *Reg Anesth Pain Med*. 2011;36(5):504–515.

Kopp SL, Peters MS, Horlocker TT. Regional anesthesia in patients with cardiovascular disease. *Anesthesiology*. 2015;122(3):659–672.

Karmakar MK, Li X, Ho AMH, Kwok WH, Chui PT. Ultrasound-guided sacral plexus block: a comparison with nerve stimulator technique. *Reg Anesth Pain Med*. 2007;32(4):330–338.

Desmet M, Braems H, Reynvoet M, Plasschaert S, Van Cauwelaert J, Pottel H. Dexamethasone prolongs the duration of interscalene brachial plexus block. *Br J Anaesth*. 2013;111(3):445–452.

Ilfeld BM, Vandenborne K, Duncan PW, Sessler DI, Enneking FK, Shuster JJ. Ambulatory continuous peripheral nerve blocks for postoperative pain control. *Anesthesiology*. 2002;97(4):959–965.

Hebl JR, Kopp SL, Ali MH, Horlocker TT. Regional anesthesia for orthopedic surgery in high-risk patients. *Anesth Analg*. 2010;110(6):1683–1692.