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Supra-inguinal versus infra-inguinal fascia iliaca compartment block for postoperative analgesia in elderly patients undergoing proximal femoral fracture surgery: a prospective randomized double-blind trial

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Abstract

Background

Effective postoperative analgesia is a cornerstone of enhanced recovery after surgery (ERAS) programs in elderly patients undergoing proximal femoral fracture surgery. The fascia iliaca compartment block (FICB) is widely used for this purpose. This study aimed to compare the analgesic efficacy of the supra-inguinal versus infra-inguinal approaches of ultrasound-guided FICB.

Methods

In this prospective, single-center, randomized, double-blind study, 60 patients aged ≥ 65 years scheduled for proximal femoral fracture surgery were allocated to receive either a supra-inguinal FICB (Group S) or an infra-inguinal FICB (Group I). Both groups received 30 mL of ropivacaine 0.2% under ultrasound guidance. The primary outcome was postoperative pain at rest at 12 hours, assessed using the Visual Analog Scale (VAS). Secondary outcomes included pain during positioning for spinal anesthesia, pain scores at 02, 06, 24 and 48 hours postoperatively, time to first analgesic request, total opioid consumption within 48 hours, incidence of motor block, postoperative nausea and vomiting, and patient satisfaction.

Results

Patients in Group S experienced significantly lower pain scores at rest at 12 hours compared with Group I. The supra-inguinal approach was also associated with reduced opioid consumption during the first 48 hours and improved pain control during positioning for spinal anesthesia. No significant differences were observed between groups regarding hemodynamic stability or adverse events.

Conclusions

Ultrasound-guided supra-inguinal FICB provides superior postoperative analgesia compared with the infra-inguinal approach in elderly patients undergoing proximal femoral fracture surgery. Its use may contribute to improved pain control and reduced opioid requirements within ERAS protocols.

Trial registration:

This trial was retrospectively registered on Pan African Clinical Trials Registry (PACTR202603896530278, URL:https://pactr.samrc.ac.za/TrialDisplay.aspx?TrialID=40985) on March 24, 2026, after enrollment of the first participant.

Introduction

Proximal femoral fractures are frequent injuries in the elderly and are associated with significant functional impairment, increased morbidity, and high mortality.[1] Optimal management requires a multidisciplinary approach, including early surgical intervention, rapid mobilization, and effective perioperative pain control.[2] Enhanced recovery after surgery (ERAS) programs aim to reduce postoperative complications, shorten hospital stay, and improve functional outcomes, with multimodal analgesia playing a key role in minimizing opioid consumption while providing adequate pain relief.[3]

Regional anesthesia is a cornerstone of multimodal analgesia for hip and proximal femoral fracture surgery.[4] Among these techniques, the fascia iliaca compartment block (FICB) has gained widespread acceptance due to its simplicity, safety, and effectiveness in providing analgesia to the anterior hip region. When performed under ultrasound guidance, FICB involves

injection of local anesthetic beneath the fascia iliaca, targeting the femoral nerve and potentially other branches of the lumbar plexus.

Two main ultrasound-guided approaches to FICB have been described. The infra-inguinal approach primarily targets the femoral nerve but may result in incomplete blockade of the lateral femoral cutaneous and obturator nerves. In contrast, the supra-inguinal approach allows proximal spread of the local anesthetic above the inguinal ligament, potentially providing more consistent and extensive coverage of the femoral, obturator, and lateral femoral cutaneous nerves.[5]

Recent studies suggest that the supra-inguinal approach may provide superior analgesia, reduced opioid consumption, and improved functional recovery compared with the infra-inguinal technique. [6] However, direct comparative data remain limited, particularly within ERAS protocols for proximal femoral fracture surgery in elderly patients.

The aim of this study was to compare the analgesic efficacy of ultrasound-guided supra-inguinal versus infra-inguinal FICB in elderly patients undergoing proximal femoral fracture surgery. Secondary objectives included postoperative pain during patient positioning for spinal anesthesia, total opioid consumption within 24 hours, time to first analgesic request, incidence of motor block, postoperative nausea and vomiting, and patient satisfaction. The primary outcome was postoperative pain at rest at 12 hours after surgery, measured using the Visual Analog Scale (VAS).

Material and methods

Design and Ethical Approval

This prospective, randomized, comparative study was conducted after approval by the institutional ethics committee. Written informed consent was obtained from all participants before enrollment. The study was performed in accordance with the principles of the Declaration of Helsinki.

This trial was retrospectively registered on Pan African Clinical Trials Registry (PACTR202603896530278, URL:https://pactr.samrc.ac.za/TrialDisplay.aspx?TrialID=40985) on March 24, 2026, after enrollment of the first participant due to administrative constraints; however, all outcomes and analyses were predefined prior to patient enrollment and remained unchanged throughout the study period. All procedures were conducted in accordance with ethical standards and approved by the institutional ethics committee.

Patients

Sixty patients aged ≥ 65 years scheduled for surgical management of proximal femoral fractures were included. Eligibility criteria were American Society of Anesthesiologists (ASA) physical status I–III, ability to understand and use the Visual Analog Scale (VAS) for pain assessment, and eligibility for spinal anesthesia. Exclusion criteria included refusal to participate, known allergy to local anesthetics, coagulation disorders, peripheral neuropathy affecting the lower limbs, infection at the injection site, and contraindications to spinal anesthesia.

Participants were consecutively enrolled between June 1, 2025, and December 31, 2025, representing a total recruitment duration of six months. The study was conducted at the Ben Arous Trauma and Burn Center, Department of Anesthesiology and Critical Care, in collaboration with the Orthopedic Surgery Department.

The study was conducted at a single center, the Ben Arous Trauma and Burn Center, which is equipped to perform ultrasound-guided fascia iliaca compartment blocks. Blocks were performed by anesthesiologists with documented experience in regional anesthesia. Surgical procedures were conducted by orthopedic surgeons credentialed in proximal femoral fracture surgery.

Patients were not involved in the design, conduct, or reporting of this study. Patient satisfaction was collected as an outcome to evaluate the acceptability and perceived effectiveness of the intervention.

Sample Size

The sample size was calculated based on the primary outcome, postoperative pain at rest measured by the Visual Analog Scale (VAS) at 12 hours postoperatively. Due to the lack of prior local data, assumptions were based on previously published studies comparing fascia iliaca compartment block techniques. A minimum clinically significant difference of 1 point in VAS score was assumed, with a standard deviation of 1.2. Using a two-sided alpha level of 0.05 and a power of 80%, 27 patients per group were required. To account for potential dropouts, 30 patients were included per group, resulting in a total sample size of 60. No interim analyses or stopping guidelines were planned.

or stopping rules were applied, and no circumstances required early termination of the study.

Trial Design, Randomization, and Blinding

This was a prospective, randomized, parallel-group, exploratory trial with a 1:1 allocation ratio. The random allocation sequence was generated by an investigator not involved in patient enrollment or outcome assessment using a computer-generated sequence. Simple randomization without restriction was applied. Allocation was concealed using sequentially numbered, opaque, sealed envelopes, opened only at the time of block performance.

Patients were enrolled by an investigator not involved in outcome assessment.

Participants, outcome assessors, and data analysts were blinded to group allocation. The anesthesiologist performing the block could not be blinded, but procedural setup, local anesthetic volume, and concentrations were identical between groups.

Statistical Methods

The primary outcome (VAS at 12 hours) and secondary outcomes (pain during positioning, VAS at 2, 6, 24, and 48 hours, time to first analgesic request, total opioid consumption, incidence of motor block, postoperative nausea and vomiting, and patient satisfaction) were analyzed using two-sided tests. Continuous variables were compared using independent t-tests or Mann–Whitney U tests, and categorical variables using Chi-square or Fisher's exact test. All analyses were performed on an intention-to-treat basis. Missing secondary outcomes were handled using last observation carried forward. No post-hoc or subgroup analyses were performed. Harms were predefined and systematically recorded.

Ultrasound-Guided Fascia Iliaca Compartment Block

All blocks were performed preoperatively in the supine position under ultrasound guidance by an experienced anesthesiologist using a high-frequency linear transducer (6–14 MHz) and strict aseptic technique. In both groups, 30 mL of 0.2% ropivacaine was administered beneath the fascia iliaca using an in-plane approach.

- **- Supra-inguinal approach (Group S)**: the transducer was placed above the inguinal ligament to visualize the iliacus muscle and fascia iliaca. The needle was advanced in-plane beneath the fascia iliaca, taking care to avoid the deep circumflex iliac artery.
- **- Infra-inguinal approach (Group I)**: the transducer was positioned at the inguinal crease to identify the femoral artery, femoral nerve, iliopsoas muscle, and fascia iliaca. The needle was advanced in-plane, and appropriate spread of local anesthetic was confirmed.

All participants received the allocated intervention as planned. Blocks were performed by experienced anesthesiologists using standardized ultrasound-guided techniques. The volume and concentration of local anesthetic were identical across groups. No crossovers or major protocol deviations occurred. All procedures were successfully completed, and adherence to the study protocol was high.

Anesthetic Management

Following block placement, all patients received continuous spinal anesthesia with an initial dose of 3 mg hyperbaric bupivacaine 0.5% combined with 5 μg sufentanil. Additional doses were administered as needed to maintain adequate sensory blockade.

Postoperative Analgesia

Postoperative analgesia was standardized for all patients, including intravenous paracetamol (1 g every 8 hours) and tramadol (50 mg twice daily). Rescue analgesia with intravenous morphine (1 mg titrated) was administered when VAS ≥ 4.

Outcomes and Adverse Events

The primary outcome was VAS at 12 hours postoperatively. Secondary outcomes included pain during positioning, VAS at 2, 6, 24, and 48 hours, time to first analgesic request, total opioid consumption in the first 24 hours, incidence of motor block, postoperative nausea and vomiting, and patient satisfaction. Pain assessments and postoperative data collection were performed by blinded observers. Hemodynamic variables were recorded at 2, 6, 12, and 24 hours.

Predefined adverse events included motor block, local anesthetic systemic toxicity, vascular puncture, hematoma, infection, pneumothorax, and persistent neurological deficit. All events were systematically captured up to 48 hours postoperatively, with severe events adjudicated by an independent anesthesiologist blinded to group allocation.

Changes to trial protocol

No important changes to the trial protocol were made after the study commenced. All outcomes and analyses were prespecified in the protocol.

Results

A total of 60 patients who met the inclusion criteria were enrolled and randomly allocated into two groups, as shown in Fig. 2.

All participants received the allocated intervention as planned. Blocks were performed by experienced anesthesiologists using standardized ultrasound-guided techniques. The volume and concentration of local anesthetic were identical across groups. No crossovers or major protocol deviations occurred. All procedures were successfully completed, and adherence to the study protocol was high.

Thirty patients received an infra-inguinal fascia iliaca compartment block (Group I), while 30 patients received a supra-inguinal fascia iliaca compartment block (Group S).

No severe block related adverse events were observed; specifically, there were no recorded cases of local anesthetic systemic toxicity (LAST), hematoma requiring intervention, infection, or persistent neurological deficit. Minor events included.

No additional subgroup or sensitivity analyses were performed. All analyses were conducted as prespecified in the study protocol, and no post-hoc analyses were undertaken.

Baseline Characteristics

Baseline demographic and clinical characteristics are presented in Table 1. There were no significant differences between Group I and Group S regarding age (73.7 ± 5.8 vs. 71.8 ± 3.5 years; p = 0.137), sex distribution (p = 0.438), or American Society of Anesthesiologists (ASA) physical status classification (p = 0.511). The distribution of surgical procedures, including gamma nail fixation, dynamic hip screw (DHS), and partial hip replacement (PHR), was similar between the groups, with no statistically significant differences observed (p = 0.373).

Table 1
Baseline characteristics

Variables	**Group I (n = 30)**	**Group S (n = 30)**	**P**
Age (years), mean ± SD	73.67 ± 5.81	71.80 ± 3.50	0.137
Sex, n (%)			
• Male	16 (53.3%)	13 (43.3%)	0.438
• Female	14 (46.7%)	17 (56.7%)	
ASA classification, n (%)			
• ASA I	7 (23.3%)	4 (13.3%)	0.511
• ASA II	19 (63.3%)	23 (76.7%)	
• ASA III	4 (13.3%)	3 (10.0%)	
Type of surgical procedure, n (%)			
• Gamma nail	7 (23.3%)	12 (40.0%)	0.373
• DHS	11 (36.7%)	8 (26.7%)	
• PIH	12 (40.0%)	10 (33.3%)	
ASA: American Society of Anesthesiologists; DHS: Dynamic Hip Screw; PIH: Partial Hip Replacement			

Hemodynamic Parameters

Intraoperative hemodynamic parameters, including systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and heart rate (HR), are shown in Table 2. No significant differences were observed between Group I and Group S at any time point from T0 to T90 (all p > 0.05). Hemodynamic profiles remained stable in both groups throughout the intraoperative period.

Table 2
Hemodynamics parameters

Time (mn)	Systolic blood pressure (SBP)			Diastolic blood pressure (DBP)			Mean arterial pressure (MAP)			Heart rate (HR)		
	Group I (n = 30)	Group S (n = 30)	p	Group I (n = 30)	Group S (n = 30)	P	Group I (n = 30)	Group S (n = 30)	P	Group I (n = 30)	Group S (n = 30)	p
T0	144.0 ± 10.03	147.0 ± 6.51	0.175	81.3 ± 10.42	85.3 ± 8.60	0.110	102.2 ± 9.76	105.9 ± 7.67	0.111	97.97 ± 14.83	102.57 ± 14.85	0.235
T10	137.3 ± 7.40	138.3 ± 5.31	0.550	85.3 ± 6.81	87.7 ± 4.30	0.118	102.7 ± 6.40	104.6 ± 4.15	0.180	93.63 ± 11.56	96.20 ± 11.76	0.397
T20	132.7 ± 11.72	135.3 ± 10.42	0.356	80.0 ± 0.00	80.0 ± 0.00	1.000	97.6 ± 3.91	98.4 ± 3.47	0.356	89.60 ± 6.48	92.27 ± 5.90	0.101
T30	134.3 ± 11.94	136.3 ± 9.64	0.478	86.0 ± 4.98	87.7 ± 4.30	0.171	102.1 ± 6.52	103.9 ± 5.61	0.262	91.07 ± 5.36	93.07 ± 4.76	0.132
T40	128.3 ± 6.99	127.7 ± 4.30	0.658	85.3 ± 5.71	87.7 ± 4.30	0.079	99.7 ± 5.20	101.0 ± 4.30	0.284	91.13 ± 7.49	91.63 ± 7.57	0.798
T50	135.3 ± 8.60	137.0 ± 6.51	0.401	80.0 ± 2.63	80.0 ± 0.00	1.000	98.4 ± 3.99	99.0 ± 2.17	0.505	86.87 ± 3.99	88.10 ± 3.90	0.231
T60	139.3 ± 4.50	139.3 ± 2.54	1.000	79.3 ± 3.65	80.0 ± 0.00	0.321	99.3 ± 2.21	99.8 ± 0.85	0.309	91.03 ± 5.10	92.50 ± 4.64	0.249
T70	139.0 ± 7.59	140.3 ± 4.14	0.402	73.0 ± 5.35	71.7 ± 3.79	0.270	95.0 ± 4.69	94.6 ± 2.23	0.641	86.97 ± 4.84	85.50 ± 6.74	0.337
T80	134.3 ± 6.79	133.7 ± 4.90	0.664	77.7 ± 4.30	78.7 ± 3.46	0.325	96.6 ± 3.44	97.0 ± 2.02	0.545	88.47 ± 3.60	86.63 ± 4.17	0.073
T90	133.3 ± 8.44	133.7 ± 4.90	0.852	76.0 ± 5.63	78.0 ± 4.07	0.120	95.1 ± 4.85	96.6 ± 2.05	0.139	88.93 ± 5.52	86.83 ± 7.31	0.214

Early Block Characteristics and Pain Scores

Early postoperative pain scores and block characteristics are summarized in Table 3. Twenty minutes after block placement, patients in Group S reported significantly lower Visual Analog Scale (VAS) scores both at rest (1.77 ± 0.43 vs. 2.43 ± 0.50; $p < 0.001$) and in the semi-sitting position (2.93 ± 0.91 vs. 3.83 ± 0.59; $p < 0.001$) compared with Group I. No significant differences were observed between the groups regarding the onset time of sensory block (3.63 ± 0.99 vs. 3.73 ± 0.98 minutes; $p = 0.697$), onset time of motor block (6.50 ± 1.89 vs. 6.77 ± 1.74 minutes; $p = 0.571$), duration of surgery (71.0 ± 15.8 vs. 76.3 ± 16.3 minutes; $p = 0.204$), or total intrathecal bupivacaine dose administered (6.33 ± 1.32 vs. 6.80 ± 1.50 mg; $p = 0.205$).

Table 3
Postoperative pain scores and block characteristics

Variables	Group I (n = 30)	Group S (n = 30)	p
VAS at 20 min at rest (mean ± SD)	2.43 ± 0.50	1.77 ± 0.43	**< 0.001**
VAS at 20 min in semi-sitting position (mean ± SD)	3.83 ± 0.59	2.93 ± 0.91	**< 0.001**
Onset time of sensory block (min)	3.73 ± 0.98	3.63 ± 0.99	0.697
Onset time of motor block (min)	6.77 ± 1.74	6.50 ± 1.89	0.571
Duration of surgical procedure (min)	76.33 ± 16.29	71.00 ± 15.83	0.204
Total dose of Marcaine (mg)	6.80 ± 1.50	6.33 ± 1.32	0.205
VAS: Visual Analog Scale ; Marcaine: Bupivacaine ; SD: standard deviation.			

Postoperative Pain Scores and Analgesic Consumption

Postoperative pain scores at rest and during movement, as well as analgesic consumption, are presented in Table 4. No significant differences were observed between the groups at 02, 60, 24, or 48 hours postoperatively, either at rest or during movement (all $p > 0.05$). At 12 hours, however, VAS scores at rest were significantly lower in Group S compared with Group I (2.93 ± 0.94 vs. 3.40 ± 0.72; $p = 0.036$). Additionally, Group S demonstrated significantly lower total opioid consumption during the first 24 hours (9.30 ± 1.44 vs. 10.83 ± 1.98 mg; $p = 0.001$) and reduced cumulative tramadol requirements (38.33 ± 38.69 vs. 70.00 ± 53.50 mg; $p = 0.011$). The time to first request for analgesia was significantly prolonged in Group S compared with Group I (10.06 ± 1.03 vs. 7.43 ± 1.17 hours; $p < 0.001$).

Table 4
Postoperative pain scores at rest and on effort, along with analgesic consumption

Variables	Group I (n = 30)	Group S (n = 30)	P
VAS at rest H2	2.80 ± 1.03	2.77 ± 0.94	0.896
VAS at rest H6	3.83 ± 0.65	3.93 ± 0.58	0.532
VAS at rest H12	3.40 ± 0.72	2.93 ± 0.94	0.036
VAS at rest H24	2.60 ± 0.56	2.83 ± 0.79	0.193
VAS at rest H48	1.77 ± 0.43	1.77 ± 0.43	1.000
VAS on effort H2	3.87 ± 1.14	3.43 ± 0.90	0.107
VAS on effort H6	4.73 ± 0.83	4.50 ± 0.82	0.277
VAS on effort H12	3.87 ± 0.68	3.77 ± 0.43	0.499
VAS on effort H24	3.13 ± 0.35	3.23 ± 0.43	0.325
VAS on effort H48	2.07 ± 0.45	2.00 ± 0.00	0.420
Total opioid dose (mg)	10.83 ± 1.98	9.30 ± 1.44	0.001
Tramadol dose (mg)	70.00 ± 53.50	38.33 ± 38.69	0.011
Time to first analgesic dose (h)	7.43 ± 1.17	10.06 ± 1.03	< 0.001
VAS: Visual Analog Scale			

Postoperative Outcomes and Patient Satisfaction

Postoperative outcomes, including complications, length of hospital stay, and patient satisfaction, are summarized in Table 5. The incidence of postoperative nausea and vomiting was higher in Group S compared with Group I (46.7% vs. 23.3%), although this difference did not reach statistical significance (p = 0.103). Quadriceps weakness was observed in 20.0% of patients in Group I and 6.7% in Group S (p = 0.237). The mean length of hospital stay was similar between the groups (2.20 ± 0.41 vs. 2.13 ± 0.35 days; p = 0.497). Patient satisfaction was high in both groups, with no statistically significant difference observed (p = 0.237).

Table 5
Postoperative outcomes, hospital stay, and patient satisfaction

Variables	Group I (n = 30)	Group S (n = 30)	p
Nausea and vomiting after surgery	7 (23.3%)	14 (46.7%)	0.103
Motor block (quadriceps weakness)	6 (20.0%)	2 (6.7%)	0.237
Length of hospital stay (days), mean ± standard deviation	2.20 ± 0.41	2.13 ± 0.35	0.497
Satisfaction			
• Very satisfied	3 (10.0%)	0 (0.0%)	0.237
• Satisfied	27 (90.0%)	30 (100.0%)	

Discussion

In this prospective, randomized study comparing infra-inguinal and supra-inguinal fascia iliaca compartment blocks (FICB) in patients undergoing proximal femoral fracture surgery, the supra-inguinal approach was associated with superior postoperative analgesia, particularly at 12 hours, the primary endpoint. Baseline characteristics, including age, sex, ASA physical status, and type of surgical procedure, as well as intraoperative hemodynamic parameters, were comparable between groups, supporting the validity of the comparison.

A clinically relevant finding was the significant reduction in pain scores during positioning for spinal anesthesia in the supra-inguinal group. Positioning patients with proximal femoral fractures is often associated with severe pain, and effective analgesia facilitates patient comfort and the safe performance of neuraxial anesthesia. This observation is consistent with prior studies by Nidgundi et al., who demonstrated improved preoperative analgesia and comfort during positioning following supra-inguinal FICB.[7] Similarly, Ali et al. reported that supra-inguinal FICB provided superior analgesia compared with systemic fentanyl, allowing more comfortable positioning and reducing additional analgesic requirements.[8]

Regarding postoperative pain control, patients in the supra-inguinal group had significantly lower VAS scores at rest and during movement at 12 hours. Pain scores at other postoperative time points were consistently lower in this group, although differences did not reach statistical significance. These results are in line with findings from Bansal et al., who reported a significant reduction in early postoperative pain with supra-inguinal FICB[5], and Ahluwalia et al., who observed lower pain scores at 12 and 24 hours in the supra-inguinal group[9]. Collectively, these findings suggest that the supra-inguinal approach provides more effective and prolonged analgesia.

The supra-inguinal block was also associated with a longer time to first request for rescue analgesia and reduced opioid consumption in the first 24 postoperative hours, highlighting its opioid-sparing effect. Mustafa et al. similarly demonstrated that supra-inguinal FICB reduced opioid requirements compared with patient-controlled analgesia after hip surgery in elderly patients, with fewer opioid-related adverse effects.[10,11] Other studies, including Bansal et al.[5] and Ben Safa et al.[12], have confirmed the morphine-sparing benefits of this approach.

The systematic use of ultrasound guidance likely contributed to the efficacy of both techniques by allowing accurate deposition of local anesthetic within the fascia iliaca plane[13], increasing block success rates and analgesic reliability[14]. Anatomical studies indicate that supra-inguinal injection allows more consistent cephalad spread to the lumbar plexus, improving blockade of the femoral, lateral femoral cutaneous, and occasionally obturator nerves.[15] This provides a plausible mechanism for the superior analgesic effect observed clinically.

Postoperative nausea and vomiting were low and comparable between groups, likely reflecting the opioid-sparing effects of FICB regardless of the approach used. Patient satisfaction was similarly high in both groups, suggesting that analgesia was adequate from the patient perspective.

This study has several limitations. The anesthesiologist performing the block could not be blinded, although postoperative assessments were conducted by a blinded observer. The study was single-center with a relatively small sample size, which may limit generalizability. Additionally, sensory dermatomal mapping was not performed and ultrasound spread was not quantified, potentially affecting reproducibility of block success. Future multicenter trials with larger sample sizes and standardized sensory assessments are warranted to confirm these findings and further define the role of supra-inguinal FICB in enhanced recovery pathways for proximal femoral fracture surgery.

Overall, supra-inguinal FICB provides clinically meaningful postoperative analgesia, prolongs the time to first analgesic request, and reduces opioid consumption compared with the infra-inguinal approach. Its use may facilitate patient positioning, improve comfort during spinal anesthesia, and contribute to enhanced recovery protocols in elderly patients undergoing proximal femoral fracture surgery.

Conclusion

Effective postoperative analgesia is a cornerstone of enhanced recovery pathways in elderly patients undergoing surgery for proximal femoral fractures. In this context, the fascia iliaca compartment block represents a valuable regional anesthesia technique, improving pain control while minimizing opioid-related adverse effects.[16]

Our study suggests that the supra-inguinal approach may provide advantages over the infra-inguinal technique in terms of analgesic efficacy and integration into enhanced recovery protocols. Its potential superiority is likely due to more reliable cephalad spread of local anesthetic toward the lumbar plexus, resulting in broader sensory coverage. When performed under ultrasound guidance, both approaches appear safe and feasible, supporting their use as part of a multimodal analgesic strategy in this high-risk population.

Although further large-scale, randomized studies are needed to confirm these findings and to evaluate functional outcomes and long-term recovery, our results support the consideration of the supra-inguinal fascia iliaca block as a preferred regional analgesia technique for proximal femoral fracture surgery in elderly patients participating in enhanced recovery programs.

Abbreviations

ERAS
Enhanced recovery after surgery
FICB
fascia iliaca compartment block
ASA
American Society of Anesthesiologists
DHS
Dynamic Hip Screw

PIH
Partial Hip Replacement
VAS
Visual Analog Scale
LAST
Local Anesthetic Systemic Toxicity

Declarations

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The authors used ChatGPT (OpenAI, GPT-5) for language editing and improving clarity. The authors take full responsibility for the content, analysis, and scientific accuracy of the manuscript.

Ethics approval and informed consent

The study protocol was reviewed and approved by the Ethics Committee of the Center of Traumatology and Major Burns of Ben Arous, Tunisia.

According to local regulations, formal reference numbers are not assigned to ethics approvals.

Written informed consent was obtained from all participants prior to their inclusion in the study.

At the time the study was initiated, prospective trial registration was not mandatory in our institution. The absence of prior registration is acknowledged in accordance with CONSORT recommendations.

Consent for publication

Not applicable. No individual patient data, images, or videos requiring consent for publication are included in this manuscript.

Availability of data and materials

The data supporting the findings of this study are not publicly available due to institutional restrictions but are available from the corresponding author upon reasonable request.

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Competing interests

The authors declare that they have no financial or non-financial competing interests in relation to this work.

Authors' contributions

Sabrine Ben Brahem and Hela Ben Said contributed to the conception and design of the study.

Sabrine Ben Brahem and Firas Kalai were responsible for patient recruitment and data acquisition.

Firas Kalai and Hichem Bel Hadj Kacem contributed to the anesthetic and perioperative management of patients.

Ichraf Ardhaoui contributed to orthopedic surgical management and provided clinical expertise relevant to the study.

Sabrine Ben Brahem and Lotfi Rebai performed data analysis and interpretation.

Sabrine Ben Brahem drafted the initial version of the manuscript.

Firas Kalai, Hichem Bel Hadj Kacem, Mohamed Amine Selmene, Ichraf Ardhaoui, and Lotfi Rebai critically revised the manuscript for important intellectual content.

All authors agreed on the journal to which the article was submitted, reviewed and approved the final version of the manuscript, and agree to be accountable for all aspects of the work, ensuring the integrity and accuracy of the data presented.

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Figures

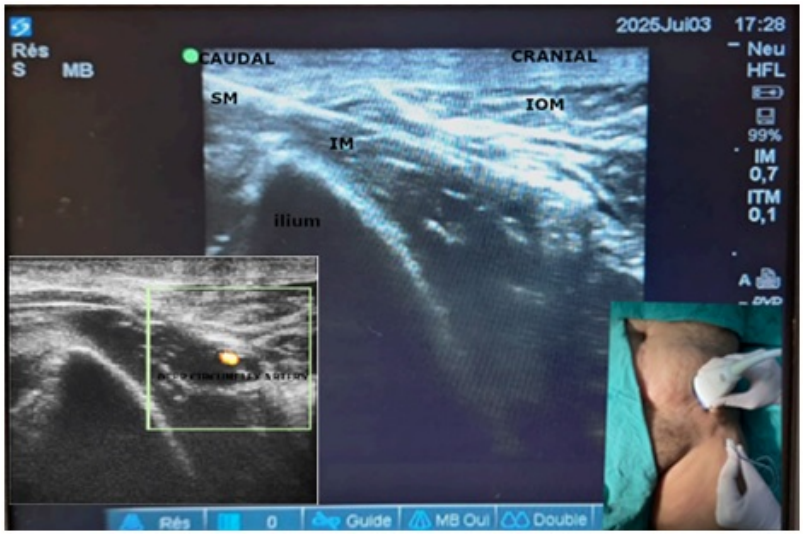


Figure 1

Ultrasound-guided supra-inguinal fascia iliaca compartment block in a patient undergoing proximal femoral fracture surgery.

SM: Sartorius muscle; IM: Iliacus muscle; IOM: Internal oblique muscle; Ilium: bony landmark. The inset shows the needle approach and the transducer position on the patient's hip.

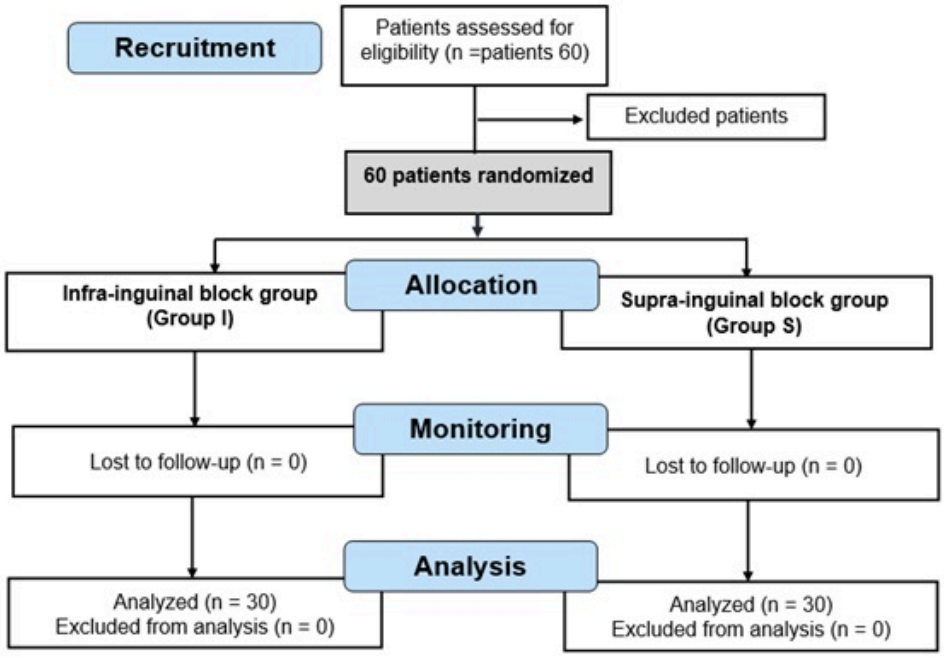


Figure 2

CONSORT Flow Diagram