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Comparison of Continuous Fascia Iliaca Plane Block and Epidural Analgesia for Postoperative Analgesia in Patients Undergoing Hip Fracture Surgery: A Retrospective Cohort Study

Murathan Aldemir

murathanaldemir@gmail.com

Kutahya Saglik Bilimleri Universitesi

Merve Yaman

Kutahya Saglik Bilimleri Universitesi

Serkan Telli

Kutahya Saglik Bilimleri Universitesi

Süleyman Camgöz

Kutahya Saglik Bilimleri Universitesi

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Abstract

Background

Hip fracture is common among older adults and is associated with high mortality and morbidity. Effective postoperative analgesia is of critical importance in this population for early mobilization and the prevention of complications. Continuous epidural analgesia has long been used but carries a risk of motor block and hemodynamic instability, whereas continuous fascia iliaca plane block (FIPB) has been proposed as a motor-sparing alternative. This study compared continuous FIPB with epidural analgesia for postoperative analgesia in patients undergoing hip fracture surgery.

Methods

This retrospective cohort study included 60 patients who underwent hip fracture surgery at a single center between 1 September 2024 and 30 September 2025 and met the eligibility criteria (FIPB catheter group, n = 30; epidural catheter group, n = 30). The primary outcome was pain at rest and on movement, assessed at postoperative hours 3, 6, 12, 24, and 48. Secondary outcomes were the need for rescue analgesia, patient-controlled analgesia (PCA) consumption, and the Oxford quadriceps muscle strength score.

Results

Baseline demographic and clinical characteristics were comparable between groups (all $p > 0.05$). Pain scores at rest and on movement were significantly lower in the epidural group at postoperative hours 3, 6, and 12 ($p < 0.05$), and these differences were no longer evident at hours 24 and 48. The FIPB group required more rescue analgesia and activated the PCA device more frequently during the early postoperative period. In contrast, quadriceps muscle strength was significantly better preserved in the FIPB group from hour 6 onward, with the between-group difference progressively increasing through hour 48 ($p < 0.001$). Morphine requirements during positioning before the neuraxial procedure were significantly greater in the epidural group ($p < 0.001$). No clinically meaningful differences between groups were observed in hemodynamic parameters.

Conclusions

Continuous epidural analgesia provided more effective pain control in the early postoperative period, whereas continuous FIPB may better preserve quadriceps muscle strength and thereby facilitate early mobilization. The choice of analgesic technique should be individualized, balancing the patient's need for pain control against mobilization goals.

Key Messages

1. In elderly hip fracture patients receiving anticoagulant therapy, CSE provides significantly lower pain scores than FIPB in the first 24 postoperative hours (rVAS, mVAS, NRS; all $p<0.05$).

2. After hour 24, the two methods achieve statistically and clinically equivalent analgesic efficacy.

3. In the FIPB group, the degree of motor block is lower, and the need for rescue analgesia is higher in the early period.

4. This study provides real-world evidence to support individualized postoperative analgesia decisions in an elderly population receiving anticoagulant therapy.

5. Prospective, multicenter studies with larger sample sizes are needed to clarify the long-term efficacy of FIPB.

BACKGROUND

Hip fractures are among the clinical conditions most frequently encountered in the elderly population and carry serious consequences owing to their high mortality and morbidity rates[1][2]. With increasing life expectancy, the growing prevalence of osteoporosis and the rising risk of falls have led to a marked increase in hip fracture-related hospital admissions over the years[3]. Reports in the literature of one-year mortality rates exceeding 20% in this patient population indicate that hip fracture should be regarded not merely as an orthopedic surgical condition but as a major public health problem, given its systemic effects and the need for a multidisciplinary approach[4].

Patients with hip fracture frequently experience severe pain both before and after surgery[5]. This pain, which intensifies particularly with movement, delays mobilization, complicates the rehabilitation process, and may increase the risk of complications[6]. Inadequate postoperative analgesia has been associated with delirium, cardiovascular and respiratory complications, thromboembolic events, the development of chronic pain, and a permanent decline in functional independence. For this reason, the use of regional anesthesia and analgesia techniques in hip fracture patients has been widely supported in the literature, both for providing effective and rapid pain control and for reducing opioid consumption[7].

Epidural analgesia has long been used in hip fracture surgery, both as an anesthetic technique during surgery and for effective pain control in the postoperative period. Continuous local anesthetic infusion via the epidural route can alleviate the limiting effect of pain on rehabilitation, particularly by reducing pain that emerges with movement[8]. Some studies in the literature report that epidural analgesia provides superior postoperative pain control, reduces opioid requirements, and may lower the risk of cardiac complications and mortality in certain patient groups[9]. However, epidural analgesia has also been associated with adverse effects and complication risks such as hypotension, loss of motor function, urinary retention, difficulties in catheter placement, and the possibility of neuraxial hematoma in

patients receiving anticoagulant therapy[10]. These potential risks may particularly influence the analgesic technique preferred by clinicians in elderly hip fracture patients with multiple comorbidities who are receiving anticoagulant or antiplatelet therapy[5].

In recent years, the fascia iliaca compartment block, which primarily targets the femoral and lateral femoral cutaneous nerves, with variable involvement of the obturator nerve, has been increasingly used to provide analgesia in patients undergoing hip surgery[11]. The block can be performed under ultrasound guidance using either an infrainguinal or a suprainguinal approach and may be administered as a single injection or as a continuous infusion through a catheter[6]. For hip fracture repair, the PROSPECT recommendations support the use of a single-injection femoral nerve block or fascia iliaca compartment block as part of multimodal analgesia and favor the suprainguinal approach because of its broader distribution of local anesthetic[11]. Separately, the 2026 updated PROSPECT guideline for total hip arthroplasty identified the suprainguinal fascia iliaca compartment block as one of the preferred regional analgesic techniques based on its relatively consistent analgesic efficacy and opioid-sparing effect[12]. However, because these updated recommendations apply specifically to total hip arthroplasty, their direct extrapolation to elderly patients undergoing hip fracture surgery should be approached with caution[12].

The aim of this study was to compare the effects of continuous suprainguinal fascia iliaca plane block with continuous epidural analgesia administered after combined spinal-epidural anesthesia on postoperative pain control and quadriceps muscle strength in patients undergoing hip fracture surgery. Our primary outcome was pain scores at postoperative hours 3, 6, 12, 24, and 48; our secondary outcomes were the need for rescue analgesia, patient-controlled analgesia consumption, and quadriceps muscle strength.

METHODS

Study design

This retrospective cohort study was conducted at a single-center hospital after obtaining ethics committee approval from the local Clinical Research Ethics Committee (decision no. 2025/13-14). The study was designed and reported in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) statement for reporting observational studies.

Participants

Patients aged 18 years and older who underwent surgery for hip fracture in the operating room of our hospital between 1 September 2024 and 30 September 2025 were included in the study. Exclusion criteria were: age under 18 years, missing anesthesia or postoperative follow-up data in the medical records, presence of multitrauma, pathological fractures, revision surgery, pregnancy, conversion from spinal to general anesthesia, and patients operated on under general anesthesia.

The process by which patients operated on for hip fracture during the specified period were included in the study is summarized in Table 1. Because ultrasound-guided suprainguinal FIPB catheter placement can only be performed at our clinic by senior resident physicians or anesthesiology specialists, the number of patients eligible for this technique with complete data during the study period was found to be 30, and all were included in the analysis. During the same period, the number of patients who received continuous epidural analgesia was 38; to standardize the sample size between groups, a number of patients equal to that of the FIPB group (n=30) was consecutively selected from this pool, and the remaining 8 patients were excluded from the analysis. Thus, a total of 60 patients were analyzed, with n=30 in each group. This method of equalizing group sizes means that not all patients eligible for epidural analgesia, but rather a subset that underwent a specific selection process, were included in the analysis; the possible effects of this issue are discussed further in the Limitations section.

Table 1. Patient inclusion process

Stage	Number of patients, n
Number of patients screened	177
Operated under general anesthesia (excluded)	48
PENG block performed (excluded)	5
Underwent multiple surgeries due to multitrauma (excluded)	25
Pathological fracture (excluded)	9
Missing data (excluded)	22
Total meeting inclusion criteria	**68**
Eligible for FIPB	30
Eligible for epidural	38
Epidural patients excluded for numerical matching	8
Total included (analyzed)	**60**
Epidural catheter group	30
FIPB catheter group	30

Data management

Patient data were obtained by the investigator from the hospital electronic record system and anesthesia follow-up forms. The accuracy of data entry was independently verified by a second investigator. Continuous variables were examined for possible outliers using IBM SPSS Statistics software.

Procedure

Continuous epidural analgesia after combined spinal-epidural anesthesia and continuous ultrasound-guided suprainguinal FIPB are, independently of this study, routine postoperative analgesia protocols already used at our clinic for patients undergoing hip fracture surgery. At our clinic, catheter placement for epidural or ultrasound-guided plane blocks can be performed by resident physicians in their 4th year of anesthesiology training or above, or by anesthesiology specialists. The attending anesthesiologist selects the analgesia technique individually, taking into account the patient's clinical characteristics. In this study, the existing records of patients who received one of these two routine methods during the specified period were retrospectively reviewed.

At our clinic, the first choice for hip fracture surgery is spinal anesthesia administered with the patient in the lateral position. In the epidural catheter group, IV morphine is routinely administered to prevent procedural pain arising during positioning. The epidural catheter, placed using a standard technique, is secured with a sterile adhesive dressing without subcutaneous tunneling.

In patients scheduled for FIPB catheter placement, a catheter is inserted into the suprainguinal fascia iliaca plane under ultrasound guidance. For the block, 30 mL of 0.25% bupivacaine is administered below the fascia iliaca.

After surgery, all patients are admitted to the Post-Anesthesia Care Unit. Continuous regional analgesia is initiated at postoperative hour 1 as patient-controlled analgesia (PCA) via an infusion pump connected to the epidural or fascia iliaca catheter. The same PCA prescription is used in both groups: 0.1% bupivacaine, prepared by diluting 0.5% bupivacaine (Marcaine®; Aspen Pharma) with normal saline, is administered at a fixed infusion rate of 5 mL/hour, with an on-demand 5 mL bolus dose and a 60-minute lockout period. As part of the institutional multimodal analgesia protocol, all patients routinely receive 1 g IV paracetamol every 8 hours during postoperative ward follow-up. When the resting VAS score is ≥4, 400 mg IV ibuprofen is administered as rescue analgesia.

Outcomes

The primary outcome was resting (rVAS) and dynamic (mVAS) pain scores and numeric rating scale (NRS) scores assessed at postoperative hours 3, 6, 12, 24, and 48. Secondary outcomes were the need for rescue analgesia (ibuprofen), bupivacaine consumption calculated from the number of PCA demands, the dose of morphine administered during preoperative positioning, and the Oxford quadriceps muscle strength score (0-5).

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics (IBM Corp., Armonk, NY, USA) software. The normality of distribution of continuous variables was assessed using Q-Q plots, histograms, and skewness/kurtosis values; non-parametric methods were preferred when the assumption of normal distribution was not met. Continuous variables are presented as mean ± standard deviation or median

(IQR/min-max), and categorical variables as number (%). The Mann-Whitney U test was used for between-group comparisons, and the chi-square test or, where appropriate, Fisher's exact test was used for categorical variables. Repeated measures were analyzed using the Friedman test, followed by Bonferroni-corrected pairwise comparisons when significant. The course of hemodynamic parameters over time was assessed using mixed ANOVA. The relationship between variables was examined using Spearman correlation analysis. $p<0.05$ was considered statistically significant. Because of the retrospective design of the study, the sample size was not based on a prior power calculation but was determined by screening the available hospital records during the specified period; this issue is discussed further in the Limitations section.

RESULTS

The demographic characteristics and comorbidity distribution of the patients are summarized in Table 2. No statistically significant differences were found between groups in age, body mass index, sex distribution, ASA physical status score, or comorbidities.

Table 2. Demographic and clinical characteristics of the patients

Variable	FIPB Group (n=30)	Epidural Group (n=30)	Total	p
Sex, n (%)				0.542
Female	22 (73.3%)	24 (80.0%)	46 (76.7%)	
Male	8 (26.7%)	6 (20.0%)	14 (23.3%)	
Age (years), median (IQR)	76.5 (60-82)	74.5 (67-79)	75.5	0.657
BMI (kg/m²), median (IQR)	25.0 (22-30)	27.5 (23-31)	26.0	>0.05
ASA II, n (%)	9 (30.0%)	6 (20.0%)	15 (25.0%)	0.371
ASA III, n (%)	21 (70.0%)	24 (80.0%)	45 (75.0%)	
Diabetes mellitus, n (%)	11 (36.7%)	14 (46.7%)	25 (41.7%)	0.432
Hypertension, n (%)	17 (56.7%)	19 (63.3%)	36 (60.0%)	0.598
Coronary artery disease, n (%)	4 (13.3%)	9 (30.0%)	13 (21.7%)	0.117
COPD, n (%)	1 (3.3%)	3 (10.0%)	4 (6.7%)	0.301

BMI: Body mass index; COPD: Chronic obstructive pulmonary disease. Mann-Whitney U test or chi-square test.

Pain scores at rest (rVAS), on movement (mVAS), and on the numeric rating scale (NRS) are presented in Table 3. At postoperative hours 3, 6, and 12, pain scores on all three measures were statistically significantly higher in the FIPB group than in the epidural group ($p<0.05$); no significant difference

between groups was observed at postoperative hours 24 and 48. The course of postoperative resting pain scores over time and the between-group comparison are visualized in Fig. 1.

Table 3. Postoperative pain scores (rVAS, mVAS, NRS), median (IQR)

Time	rVAS FIPB	rVAS Epidural	p	mVAS FIPB	mVAS Epidural	p	NRS FIPB	NRS Epidural	p
Hour 3	1.0 (0-3)	0.0 (0-1)	**0.005***	2.0 (0-3)	0.0 (0-1)	**<0.001***	2.0 (1-3)	1.0 (0-2)	**0.002***
Hour 6	2.0 (1-3)	1.0 (0-2)	**0.003***	2.0 (2-4)	1.0 (0-3)	**0.002***	3.0 (1-3)	1.0 (0-3)	**0.016***
Hour 12	4.0 (3-4)	2.0 (1-3)	**<0.001***	4.0 (3-5)	3.5 (2-4)	**0.008***	4.0 (3-5)	3.0 (1-4)	**0.004***
Hour 24	3.0 (2-3)	2.0 (1-3)	0.217	3.0 (2-4)	3.0 (2-5)	0.254	2.0 (1-4)	3.0 (2-4)	0.178
Hour 48	1.0 (0-2)	1.0 (1-2)	0.155	1.5 (0-2)	2.0 (1-3)	0.127	1.5 (0-2)	2.0 (1-3)	0.058

*Mann-Whitney U test. *: p<0.05. rVAS: visual analog scale at rest; mVAS: visual analog scale on movement; NRS: numeric rating scale.*

When the clinically significant pain threshold (rVAS≥4) was used as the reference point, no difference between groups was observed at postoperative hours 3 and 6 (both p=0.237). Postoperative hour 12 represented a turning point in analgesic efficacy; at this time point, the proportion of patients with rVAS≥4 in the FIPB group was markedly higher than in the epidural group (60.0% vs 13.3%; p<0.001). At postoperative hour 24, the difference was not significant (p=0.748); at hour 48, no patients in either group exceeded the threshold value, so a comparison could not be performed. Details are visualized in Fig. 2.

Postoperative bupivacaine consumption calculated via the PCA device is presented in Table 4. In the early period (3-6 and 6-12 hour intervals), bupivacaine consumption was significantly higher in the FIPB group than in the epidural group (p=0.002; p<0.001), whereas in the late period (12-24 and 24-48 hour intervals) this pattern reversed, with consumption being higher in the epidural group than in the FIPB group (p=0.027; p=0.024). This finding is visualized in Fig. 3.

Table 4. Postoperative bupivacaine consumption (mg), median (IQR)

Time interval	FIPB Group (n=30)	Epidural Group (n=30)	p
0-3 h	10 (4-15)	5 (0-10)	0.072
3-6 h	15 (10-15)	5 (0-15)	**0.002***
6-12 h	20 (15-25)	12.5 (5-15)	**<0.001***
12-24 h	10 (4-15)	15 (10-15)	**0.027***
24-48 h	0 (0-10)	10 (4-15)	**0.024***

*Mann-Whitney U test. *: p<0.05.*

When postoperative rescue analgesic (ibuprofen) use was examined, the rate of rescue analgesic use was significantly higher in the FIPB group than in the epidural group only during the 0-3 hour period (26.7% vs 0.0%; p=0.002). No significant difference between groups was found in the other time intervals (3-6, 6-12, 12-24, 24-48 hours; p=0.095, 0.301, 0.118, and 0.448, respectively).

Preoperative and postoperative Oxford quadriceps muscle strength scores are presented together in Table 5. From postoperative hour 6 onward, muscle strength was significantly higher in the FIPB group than in the epidural group, and this difference progressively increased up to hour 48. The result is visualized in Fig. 4.

Table 5. Preoperative and postoperative Oxford quadriceps muscle strength scores, median (IQR)

Time Point	FIPB Catheter Group (n=30) Median (IQR)	Epidural Catheter Group (n=30) Median (IQR)	p value
Preoperative	2 (1-3)	2 (1-3)	>0.05
Postoperative Hour 3	1 (1-2)	1 (1-2)	0.287
Postoperative Hour 6	3 (2-4)	2 (1-3)	**0.016***
Postoperative Hour 12	3.5 (3-4)	3 (2-3)	**0.031***
Postoperative Hour 24	4 (3-5)	3 (2-4)	**0.004***
Postoperative Hour 48	4.5 (4-5)	3 (2-4)	**<0.001***

*Mann-Whitney U test. *: p<0.05. Oxford muscle strength score is graded from 0 (no movement) to 5 (full strength).*

Before the procedure, the dose of morphine administered to control pain arising during lateral positioning was statistically significantly higher in the epidural catheter group than in the FIPB group (median 5 mg (4-5) vs 2 mg (2-2); $p<0.001$). The between-group comparison is presented in Fig. 5.

Regarding hemodynamic parameters, no significant difference was found between groups in heart rate at any time point, whereas mean arterial pressure was significantly higher in the FIPB group only at the post-spinal measurement (95 mmHg (89-107) vs 89 mmHg (79-94); $p=0.005$); however, median values did not fall below the clinical hypotension threshold (<65 mmHg) at any time point. The correlation between postoperative pain intensity (NRS) and mean arterial pressure and heart rate was significant and weak-to-moderate ($\rho\approx0.30$; $p<0.05$) only at postoperative hour 12, with no significant relationship observed at the other time points.

DISCUSSION

Hip fracture surgery represents a fragile patient population that, owing to advanced age, multiple comorbidities, and limited physiological reserve, requires both effective analgesia and preservation of functional stability in the postoperative period[5]. Inadequate postoperative analgesia has been associated with adverse outcomes such as respiratory complications, delirium, delayed mobilization, thromboembolic events, and prolonged hospital stay [11, 13]. Although numerous studies in the literature have compared the efficacy and safety profiles of different regional analgesia strategies, evidence regarding which approach is more advantageous in which patient group and time period remains variable[11]. In this context, the fact that the findings of our study are not limited to pain scores alone but are considered together with motor function and analgesic requirements allows the clinical performance of analgesic techniques to be evaluated from a holistic perspective.

The study groups were found to be similar in terms of baseline demographic and clinical characteristics (age, body mass index, sex distribution, ASA score, comorbidities). This homogeneous distribution allows the differences observed in the postoperative period to be attributed to the characteristics of the analgesic techniques applied, rather than to patient-related confounding factors.

Pain assessments at rest (rVAS), during movement (mVAS), and using the NRS showed a consistent temporal pattern. At postoperative hours 3 and 6, pain scores were significantly higher in the FIPB group than in the epidural group, although they generally remained below the predefined threshold for clinically significant pain (rVAS ≥ 4). At postoperative hour 12, however, the proportion of patients with rVAS ≥ 4 was markedly higher in the FIPB group than in the epidural group, indicating a clinically relevant difference in analgesic efficacy at this time point. The central and segmental inhibition of nociceptive transmission produced by epidurally administered local anesthetics may have contributed to the more effective control of resting pain during the early postoperative period[10]. In contrast, the analgesic effect of FIPB depends on the distribution of local anesthetic within the fascia iliaca compartment, and interindividual variability in injectate spread may result in inconsistent coverage of the targeted nerves

and relatively higher early pain scores[14]. The between-group differences were no longer evident at postoperative hours 24 and 48, suggesting that analgesic outcomes converged over time.

Consistent with this pattern, in the early period (3–12 hours), both PCA demand frequency and the need for rescue analgesia were higher in the FIPB group than in the epidural group; conversely, this difference reversed in the 24–48 hour interval, with analgesic consumption being higher in the epidural group. In interpreting these findings, it should be taken into account that the same PCA prescription was used for both catheters. The epidural space and the fascia iliaca plane differ in terms of local anesthetic spread, targeted neural structures, and tissue absorption[10, 14]. Therefore, applying the same infusion and bolus regimen used for epidural analgesia to the FIPB catheter does not necessarily mean that equivalent or optimal dosing was achieved for both techniques. It is thought that this regimen, which was not specifically optimized for the FIPB catheter, may have partly contributed to the higher demand for rescue analgesia observed in the early period.

The absence of a difference between groups in preoperative quadriceps muscle strength indicates that the study groups were homogeneous in terms of motor function before surgery. The lack of a significant difference between groups up to postoperative hour 6 may be explained by the residual effect of spinal anesthesia persisting in both groups during this period. From postoperative hour 6 onward, quadriceps muscle strength was significantly better preserved in the FIPB group than in the epidural group, and this difference progressively increased up to hour 48. The slower motor recovery observed in the epidural group may be related to the segmental motor block produced by local anesthetics in the lumbar region; this finding is consistent with studies reporting that the effect on motor fibers is more pronounced with central blocks than with peripheral nerve blocks and may delay early mobilization[10]. Given the well-known beneficial effects of early mobilization on preventing thromboembolic complications and accelerating functional recovery, this finding is clinically as well as statistically significant[13, 15]. Our study suggests that FIPB may be a reliable analgesic option that better preserves motor function than epidural analgesia and may thereby support early mobilization; these results are consistent with the literature reporting that peripheral nerve blocks facilitate early mobilization by preserving motor function in hip fracture surgery[14].

The finding of significantly higher morphine requirement in the epidural catheter group during preprocedural lateral positioning is one of the notable results of our study. The fact that the FIPB catheter can be placed in the preoperative assessment room while the patient is in the supine position, with the block effect beginning before the neuraxial procedure, may have contributed to a reduction in the mechanical pain associated with positioning for combined spinal-epidural anesthesia. In contrast, higher doses of systemic opioids may have been required to control positioning pain in the epidural catheter group. This finding is consistent with studies reporting that positioning markedly increases pain in hip fracture patients and that fascia iliaca blocks, which can be performed in the supine position, can reduce opioid requirements during this period[16].

When hemodynamic parameters were evaluated, no significant difference between groups was found in heart rate at any time point, whereas mean arterial pressure was found to be significantly more stable in the FIPB group only at the post-spinal measurement, although this difference did not affect the clinical hypotension threshold. This limited difference is consistent with the literature reporting that peripheral nerve blocks may provide a more predictable hemodynamic profile than central blocks[17]. The finding that the correlation between postoperative pain intensity and hemodynamic parameters was significant and weak-to-moderate only at hour 12 confirms that vital signs alone are not a reliable indicator of pain intensity[18].

Taken together, these results suggest that epidural analgesia may provide more effective analgesia and reduce analgesic requirements during the early postoperative period, whereas the fascia iliaca plane block may better preserve motor function and reduce opioid requirements during preprocedural positioning. Hemodynamic profiles were broadly comparable between the groups, with only a limited difference observed after spinal anesthesia. Therefore, the choice of analgesic technique after hip fracture surgery should not be based on a single criterion of superiority but should be individualized according to the patient’s need for early pain control, mobilization goals, and functional priorities.

Strengths and Limitations

Our study has important strengths. Multimodal pain assessment using three validated tools (rVAS, mVAS, NRS) at five postoperative time points was supported by data on cumulative local anesthetic consumption, rescue analgesic requirement, motor function, and hemodynamics. This study presents real-world clinical data reflecting routine perioperative practice in a high-risk population receiving concurrent anticoagulant or antiplatelet therapy.

Our study also has important limitations. First, the fact that the analgesia technique was determined by the individual clinical judgment of the attending anesthesiologist rather than by randomization does not exclude the possibility of confounding by indication related to unmeasured clinical factors (e.g., the physician's individual preference, ease of catheter placement, etc.), even though the measured baseline characteristics were similar between the two groups. Second, because the number of patients meeting the criteria in the FIPB group was limited to 30, the first 30 consecutive eligible patients were selected and included in the epidural group to achieve numerical equality between groups; this means that not all eligible patients in the epidural group were included in the analysis, which may constitute an additional source of selection bias. Third, the retrospective design carries an inherent risk of selection bias and unmeasured confounding variables; the sample size was not based on a prior power calculation but was determined by screening the available hospital records during the specified period. Therefore, the possibility of a type II error should be considered, particularly for borderline comparisons (p values close to 0.05). Fourth, the use of the same patient-controlled analgesia infusion regimen for both catheter types raises the possibility that the early analgesic performance of the FIPB catheter may have been due to the dosing regimen applied rather than to the technique itself; future studies should compare infusion protocols separately optimized for each technique. In addition, motor function assessment was based

on the clinical Oxford scoring system, and objective methods such as dynamometric measurement were not used; patient-centered outcome measures such as patient satisfaction, duration of functional independence, and mobilization success were also not included in the study. Finally, hemodynamic assessment was based on non-invasive monitoring, and variables such as perioperative fluid management and vasopressor use were not standardized. Future studies are recommended to be conducted with prospective, randomized, multicenter designs using standardized analgesic protocols and objective patient-centered outcome measures.

CONCLUSIONS

This study shows that central and peripheral block techniques offer different clinical advantages in the management of analgesia after hip fracture surgery. While continuous epidural analgesia provides stronger pain control and lower analgesic requirements in the early postoperative period, continuous fascia iliaca plane block offers important advantages in terms of preserving quadriceps muscle strength, preoperative patient comfort, and a predictable hemodynamic course. Although both methods demonstrate a safe analgesic profile, neither is superior across all clinical priorities. Therefore, it is recommended that the choice of analgesic method be individualized, balancing the patient's need for early pain control against the goals of early mobilization and functional recovery.

Abbreviations

ASA: American Society of Anesthesiologists; BMI: Body mass index; COPD: Chronic obstructive pulmonary disease; CSE: Combined spinal-epidural; FIPB: Fascia iliaca plane block; MAP: Mean arterial pressure; mVAS: Visual analog scale on movement; NRS: Numeric rating scale; PCA: Patient-controlled analgesia; rVAS: Visual analog scale at rest; STROBE: Strengthening the Reporting of Observational Studies in Epidemiology; VAS: Visual analog scale.

Declarations

Ethics approval and consent to participate

This study was approved by the Kütahya Health Sciences University Non-Interventional Clinical Research Ethics Committee (decision no. 2025/13-14, dated 18 November 2025). The study was conducted in accordance with the Declaration of Helsinki and relevant institutional and national guidelines and regulations. This was a retrospective cohort study based exclusively on existing medical records, with no prospective intervention or additional research procedure. Individual informed consent to participate was not obtained. The Ethics Committee reviewed and approved the retrospective medical-record review and its supporting documentation, which did not include an informed consent form.

Consent for publication

Not applicable.

Availability of data and materials

The data are not publicly available because they contain potentially identifiable clinical information. Requests for access should be directed to the corresponding author and will be considered subject to applicable institutional and ethical requirements.

Competing Interests

The authors declare that they have no competing interests.

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Authors' contributions

Surgical and Medical Practices - M.A.; Concept - M.A., M.Y.; Design - M.A., M.Y.; Data Collection and/or Processing - M.A., M.Y.; Analysis and/or Interpretation - M.A., M.Y., S.T., S.C.; Literature Review - M.A., M.Y., S.T., S.C.; Writing - M.A., M.Y.

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Figures

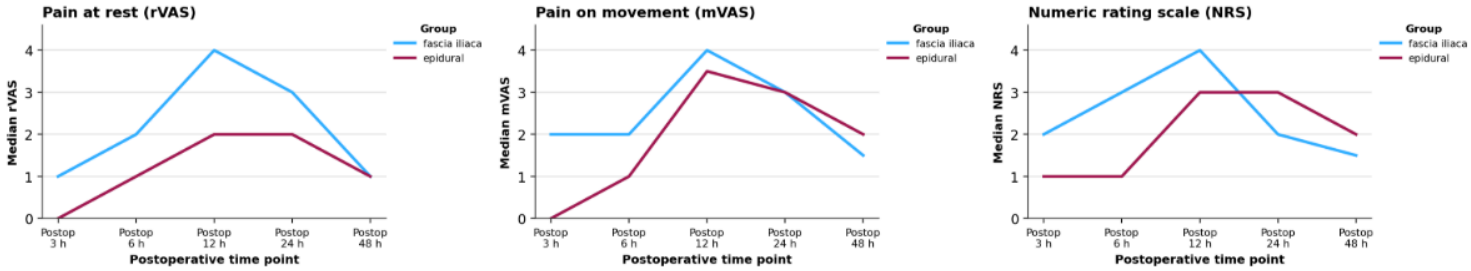

Figure 1

Postoperative pain scores over time

(Median values of a. pain at rest (rVAS), b. pain on movement (mVAS), and c. numeric rating scale (NRS) scores at postoperative hours 3, 6, 12, 24, and 48 are shown for the FIPB catheter group (blue) and the epidural catheter group (red).)

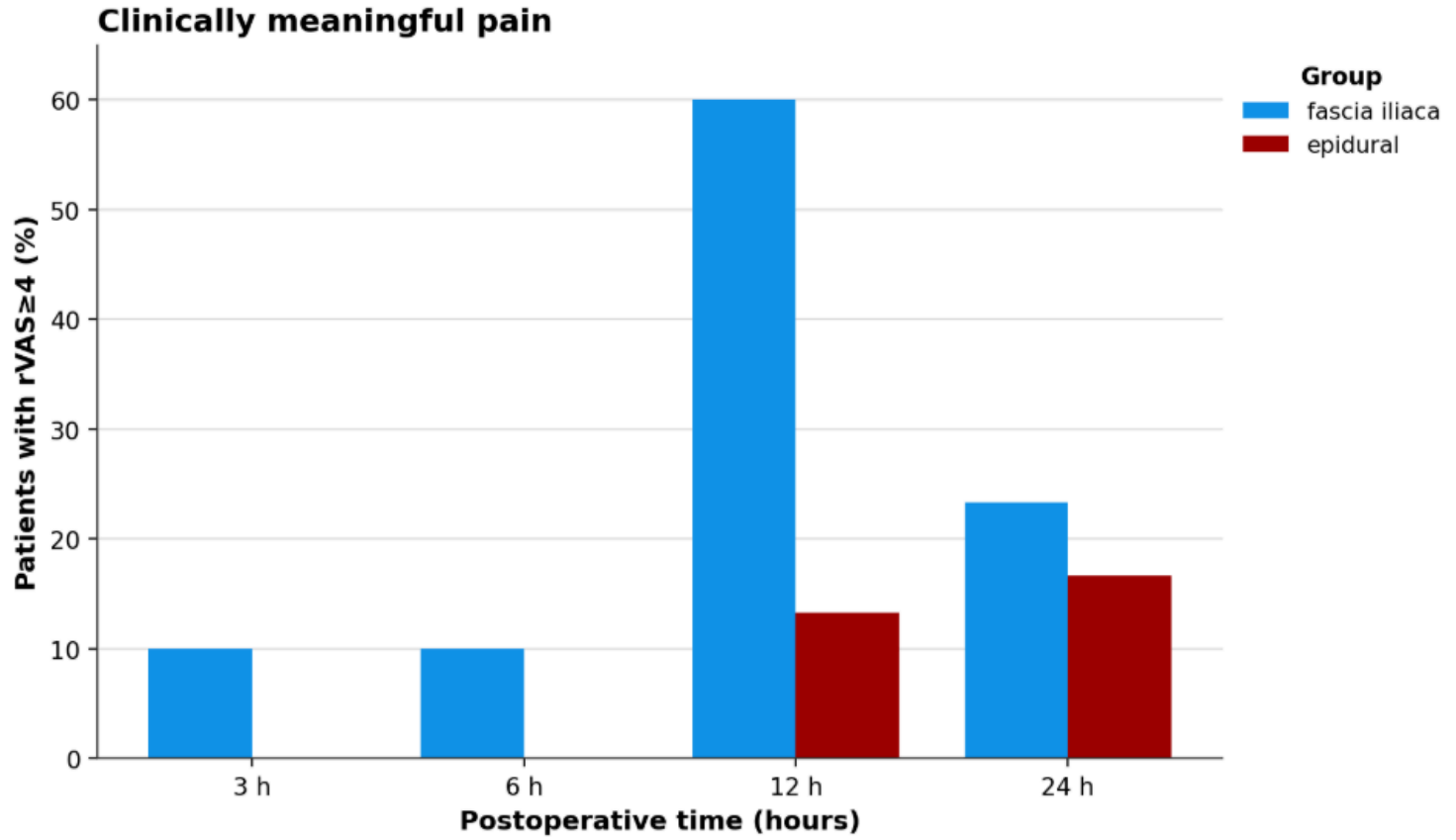

Figure 2

Frequency of the clinically significant pain threshold (rVAS≥4) over time

(The proportion (%) of patients with postoperative rVAS≥4 is shown.)

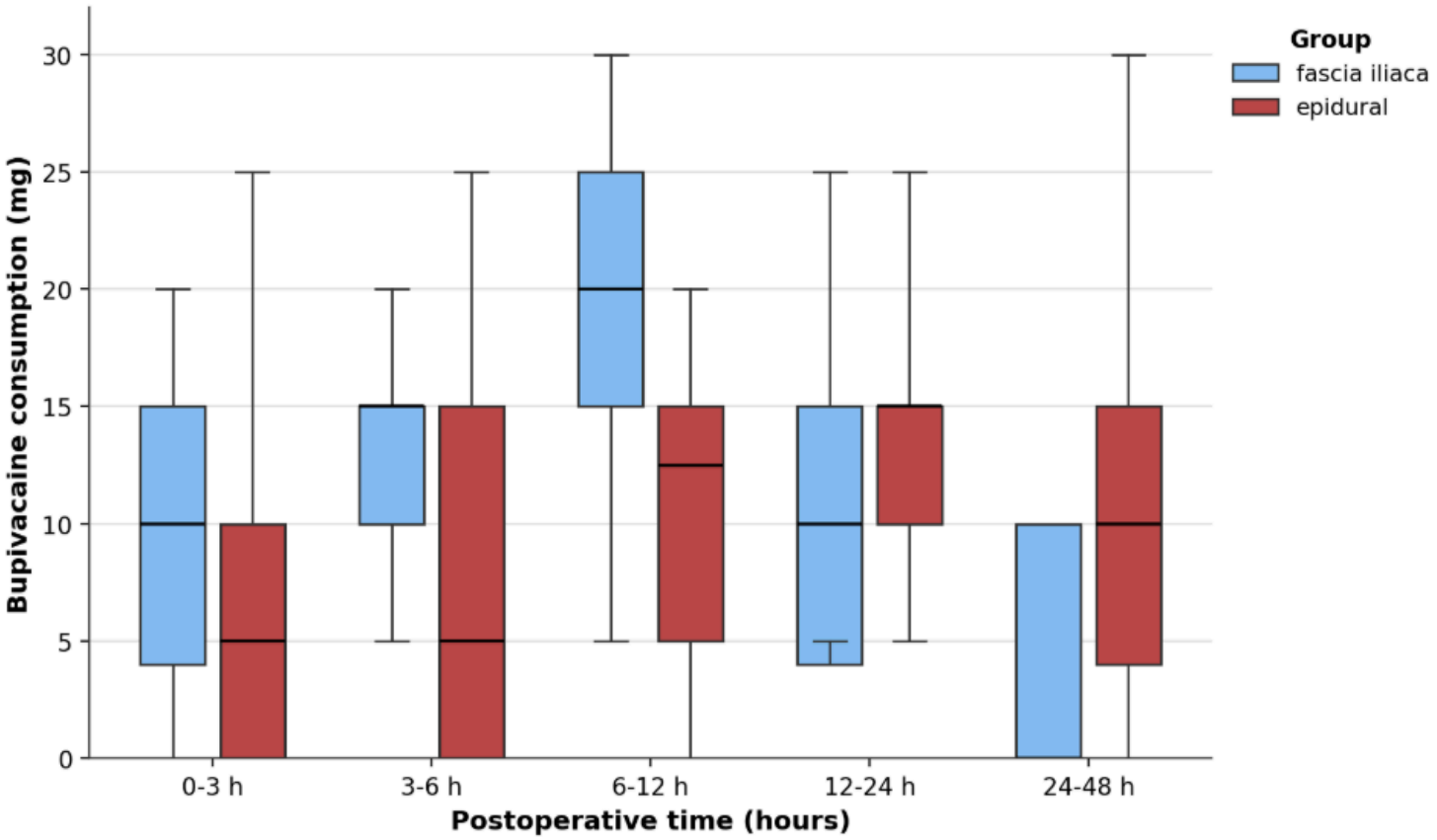

Figure 3

Distribution of postoperative bupivacaine consumption (mg) over time

(In the box plots, the boxes represent the interquartile range (IQR: 25th-75th percentile), the line within the box represents the median, and the error bars (whiskers) represent the min-max range.)

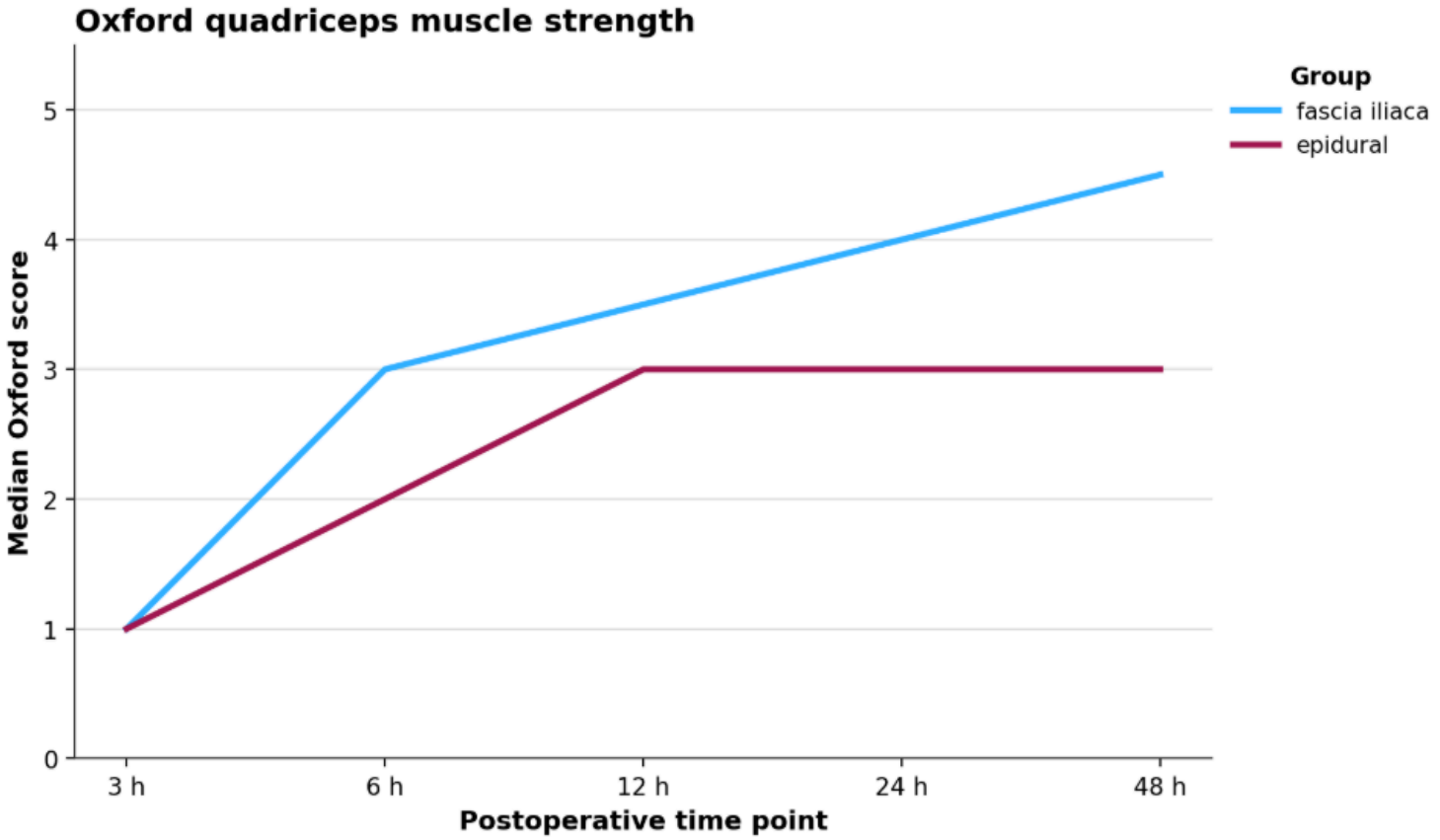

Figure 4

Change in Oxford quadriceps muscle strength over time in the postoperative period

(Median Oxford quadriceps muscle strength scores (0-5) are shown for the FIPB catheter group (blue) and the epidural catheter group (red) from postoperative hour 3 to hour 48; preoperative values are not shown in the figure and are presented in Table 5.)

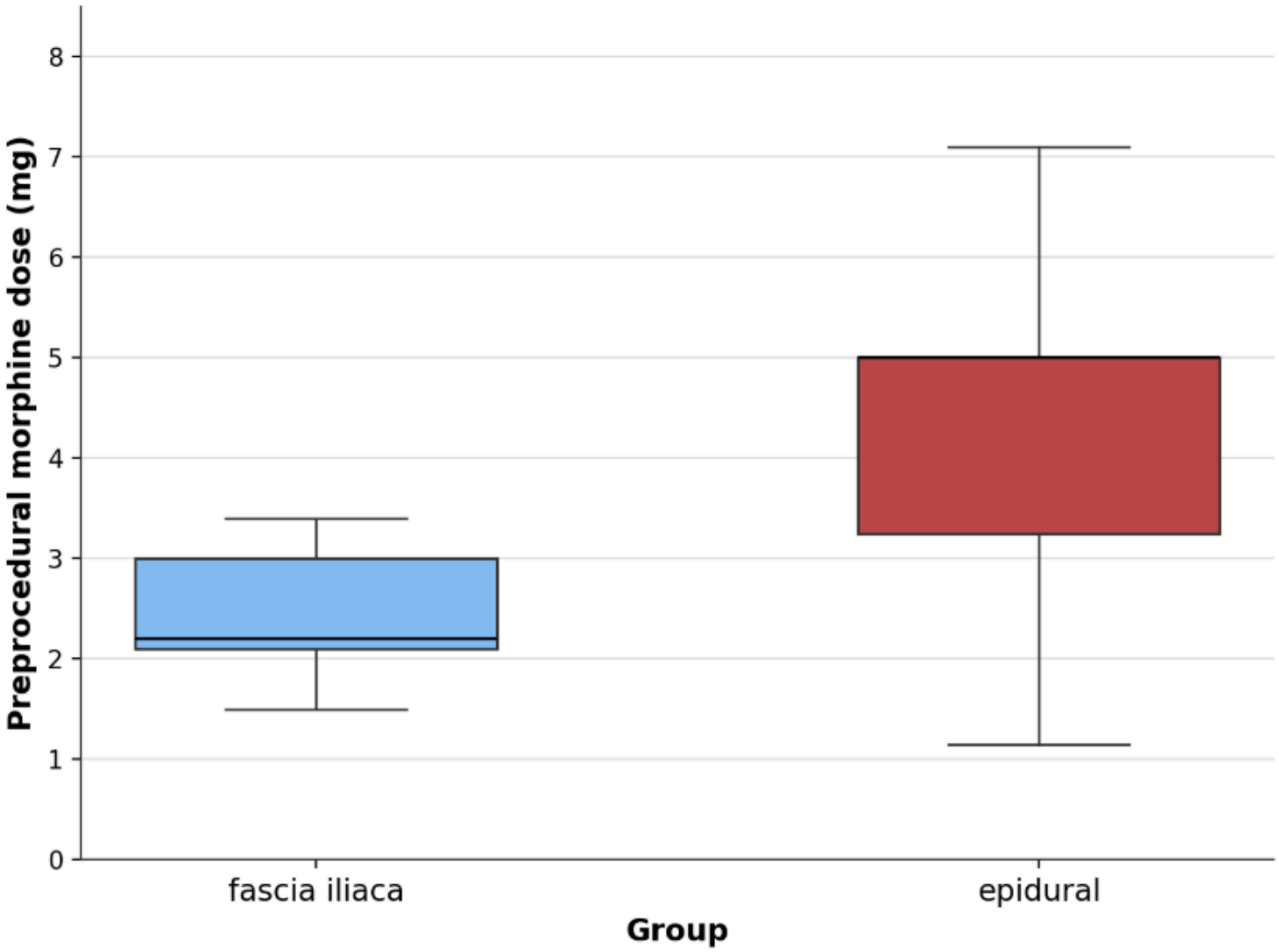

Figure 5

Distribution of the morphine dose administered during preprocedural lateral positioning, by group

(In the box plots, the boxes represent the interquartile range (IQR: 25th-75th percentile), the line within the box represents the median, and the error bars (whiskers) represent the min-max range excluding outliers.)