COMPARISON OF CONTINUOUS SUPRAINGUINAL FASCIA ILIACA COMPARTMENT BLOCK (S-FICB) WITH CONTINUOUS EPIDURAL IN PATIENTS UNDERGOING CEPHALOMEDULLARY NAILING SURGERY

Riko[1*], I Gusti Ngurah Mahaalit Aribawa[2], I Made Gede Widnyana[3], Tjokorda Gde Agung Senapathi[4]
Anesthesiology and Intensive Care Department, Prof. Dr. dr. IGNG Ngoerah *General Hospital*, Denpasar, Bali, Indonesia[1,4], *Anesthesiology and Intensive Care Department*, Udayana *University General Hospital*, Denpasar, Bali, Indonesia[2,3]
**Corresponding Author :* rikbius2021@gmail.com

ABSTRAK

Penelitian ini bertujuan untuk membandingkan efektivitas analgesia pascaoperasi, kadar inflamasi, stabilitas hemodinamik, dan kualitas pemulihan pada pasien yang menjalani operasi *cephalomedullary nailing* dengan menggunakan analgesia terkendali pasien (*patient-controlled analgesia* atau PCA) berupa blok *suprainguinal fascia iliaca compartment block* (S-FICB) dan blok epidural kontinu. Penelitian ini merupakan uji klinis komparatif dengan desain single-blind yang melibatkan 46 pasien yang memenuhi kriteria inklusi, dan secara acak dibagi menjadi dua kelompok: kelompok S-FICB dan kelompok epidural. Setelah operasi dengan anestesi spinal, kelompok S-FICB menerima bolus *interfascial hydrodissection* sebanyak 30 ml ropivakain 0,2%, sementara kelompok epidural menerima bolus awal ropivakain 0,2% sebanyak 10 ml. Infus ropivakain 0,2% kemudian diberikan secara kontinu dengan laju 2 ml/jam selama 24 jam melalui kateter.Kadar Interleukin-6 diukur sebelum dan 24 jam setelah operasi. Kualitas pemulihan pascaoperasi dievaluasi menggunakan skor QoR-40. Hasil penelitian menunjukkan tidak terdapat perbedaan yang signifikan dalam kualitas analgesia pascaoperasi antara kedua kelompok. Namun, penurunan kadar Interleukin-6 secara signifikan lebih besar pada kelompok S-FICB. Ketidakstabilan hemodinamik lebih sering terjadi pada kelompok epidural. Selain itu, skor median total QoR-40 pada 24 jam menunjukkan bahwa kelompok S-FICB memiliki kualitas pemulihan yang lebih baik. Sebagai kesimpulan, S-FICB memberikan analgesia yang sebanding dengan epidural, namun lebih efektif dalam menurunkan kadar Interleukin-6, meningkatkan stabilitas hemodinamik, dan memperbaiki kualitas pemulihan pascaoperasi.

Kata kunci : analgesia pascaoperasi, blok *suprainguinal fascia iliaca compartment*, blok epidural, *cephalomedullary nailing*, interleukin-6, kualitas pemulihan pascaoperasi, stabilitas hemodinamik

ABSTRACT

This study aimed to compare the effectiveness of postoperative analgesia, inflammation levels, hemodynamic stability, and recovery quality in patients undergoing cephalomedullary nailing surgery using patient-controlled analgesia (PCA) with continuous fascia iliaca block (S-FICB) and continuous epidural block. A continuous infusion of ropivacaine 0.2% was administered at a rate of 2 ml/hour for 24 hours via a catheter. Interleukin-6 levels were measured before and 24 hours after surgery. Postoperative recovery quality was evaluated using the QoR-40 score. The results showed no significant difference in postoperative analgesia quality between the two groups. However, the reduction in Interleukin-6 levels was significantly greater in the S-FICB group. Hemodynamic instability was more frequent in the epidural group. Additionally, the total median QoR-40 score at 24 hours indicated that the S-FICB group had better recovery quality. In conclusion, S-FICB provides comparable analgesia to epidural but is more effective in reducing Interleukin-6 levels, improving hemodynamic stability, and enhancing postoperative recovery quality.

Keywords *: suprainguinal fascia iliaca compartment block, epidural block, cephalomedullary nailing, postoperative analgesia, interleukin-6, hemodynamic stability, qualities of recovery after surgey*

INTRODUCTION

Femur fractures are among the most frequently encountered fractures, accounting for approximately 39% of all cases. Among the various types of femur fractures, unstable intertrochanteric fractures often require surgical intervention to ensure optimal healing and restore lower limb function. One of the most commonly used fixation methods for treating these fractures is cephalomedullary nailing (CMN). CMN has become the preferred choice for treating intertrochanteric fractures for several reasons. Biomechanically, CMN offers superior stabilization, enhances load-bearing capacity, and reduces the risk of fixation failure (Chen et al., 2023). This advantage is attributed to its intramedullary design, which allows for better load distribution along the femur compared to extramedullary fixation methods such as the dynamic hip screw (DHS) (Guo et al., 2015). Additionally, CMN is associated with shorter operative times and reduced blood loss, contributing to faster patient recovery (Boone et al., 2014).

Despite the advantages of CMN, postoperative pain management remains a significant challenge. Acute postoperative pain is primarily caused by tissue trauma due to incisions, dissections, and coagulation during the surgical procedure, as well as potential nerve injuries from transection, compression, or stretching. Effective pain management is crucial in the postoperative care of femur fractures, as inadequate pain control can hinder early mobilization, prolong hospital stays, and increase the risk of complications such as deep vein thrombosis and pneumonia (Carpintero et al., 2014). A multimodal approach is often employed in postoperative pain management, combining systemic analgesics with regional anesthesia techniques. One regional anesthesia technique that has gained attention is the suprainguinal fascia iliaca compartment block (S-FICB). This technique aims to block the femoral, obturator, and lateral femoral cutaneous nerves, all of which contribute to the innervation of the hip and femur (Hebbard et al., 2011).

By blocking these nerves, S-FICB provides effective one-sided analgesia with minimal side effects compared to lumbar epidural analgesia (Dolan et al., 2008). The effectiveness of S-FICB in reducing postoperative pain has been supported by several studies. For instance, a study by (Desmet et al., 2017) demonstrated that S-FICB significantly reduced postoperative morphine consumption in patients undergoing total hip arthroplasty (THA). Furthermore, another study reported that S-FICB was superior to infrainguinal block in achieving complete sensory blockade of the medial, anterior, and lateral thigh areas (Desmet et al., 2017). These findings suggest that S-FICB not only effectively reduces pain but also enhances patient satisfaction and facilitates early mobilization. However, while the existing evidence supports the benefits of S-FICB, further research is needed to confirm these findings in larger populations and with more rigorous study designs.

Additionally, factors such as clinical expertise, availability of ultrasound equipment, and patient-specific conditions should be considered when selecting the most appropriate regional anesthesia technique. With an optimal approach, postoperative pain management in femur fracture patients can be improved, ultimately contributing to faster recovery and better clinical outcomes.

METHOD

This study is a pure experimental research utilizing a single-blind randomized controlled trial design. The subjects were divided into two groups: the experimental group, which received continuous suprainguinal fascia iliaca compartment block (S-FICB), and the control group, which received epidural analgesia. Randomization was performed to assign subjects to either group, and blinding was applied to both the subjects and the researcher. The study evaluated

the total opioid requirement within 24 hours postoperatively using patient-controlled epidural analgesia (PCEA), pre- and postoperative interleukin-6 (IL-6) levels, hemodynamic stability, and recovery quality assessed through the QoR-40 score. Data collection took place in the operating room of the Central Surgical Installation at a teaching hospital from August to October 2024. The inclusion criteria consisted of adult patients aged 18–65 years undergoing cephalomedullary nailing surgery with an American Society of Anesthesiologists (ASA) physical status classification of I–III.

Patients were excluded if they had a drug allergy, infection at the block site, severe cardiovascular disorders, a body mass index (BMI) of ≥30 kg/m², a history of chronic analgesic use, or were on blood thinners that had not been discontinued according to guidelines. Additional exclusion criteria included coagulopathy, refusal by the patient or their guardian to provide informed consent, and impaired consciousness. Dropout criteria encompassed complications such as allergic reactions, severe bleeding, or death, as well as the need for postoperative ventilatory support. In the experimental group receiving the suprainguinal Fascia Iliaca Compartment Block (S-FICB), the procedure was performed after the completion of spinal anesthesia and surgery. The patient was positioned appropriately to facilitate the administration of S-FICB. Using ultrasound guidance, the fascia iliaca was identified through the suprainguinal approach. A linear ultrasound transducer was placed longitudinally at the level of the anterior superior iliac spine to visualize the "Bowtie Sign," which indicates the presence of the profunda circumflex iliac artery and vein. Under aseptic conditions, 3 ml of 2% lidocaine was injected locally to provide infiltration anesthesia. Following this, a Contiplex needle was inserted through the fascia iliaca until a characteristic "pop" sensation was detected, confirming the correct placement.

The needle was then slightly retracted to the superficial boundary of the fascia iliaca, and 1–2 ml of saline was injected to verify the spread between the fascia iliaca and the iliacus muscle. Once proper spread was confirmed, 0.2% Ropivacaine was injected, advancing in a cephalad direction along the iliacus muscle using the hydrodissection technique, requiring a total volume of 30 ml to effectively open the fascia. A perineural catheter was then inserted and secured in place to allow continuous analgesic administration. Postoperatively, the patient received combination analgesia through patient-controlled regional analgesia (PCRA) using 0.2% Ropivacaine at a continuous infusion rate of 2 ml per hour. Additionally, a demand dose of 5 ml was available per activation, with a lockout interval (LOI) of 30 minutes to prevent excessive dosing. Once the patient was transferred to the ward, the Acute Pain Service (APS) team closely monitored pain levels and recorded total opioid consumption within the first 24 hours postoperatively using the PCA machine. Any complications or side effects that occurred during or after the procedure, including hypotension, arrhythmia, bradycardia, nausea, vomiting, intravascular injection, lower extremity muscle weakness, or local anesthesia systemic toxicity, were documented in the evaluation record sheet for further analysis.

In the control group receiving epidural analgesia, the procedure was performed after the completion of spinal anesthesia and surgery. The patient was positioned appropriately to facilitate the administration of epidural analgesia. The identification process began by locating Tuffier's line at the superior aspect of the iliac crest to determine the appropriate puncture site at the L3-L4 level. The procedure commenced with local infiltration of 2% lidocaine at the insertion site of the Tuohy needle. Following this, the Tuohy needle was carefully inserted, and the epidural space was identified using the Loss of Resistance (LOR) technique. Once the epidural space was confirmed, an epidural catheter was inserted through the Tuohy needle, ensuring that 5–6 cm of the multi-hole catheter was correctly positioned within the epidural space. To verify proper placement, a test dose consisting of 3 ml of 2% lidocaine with epinephrine (1:200,000) was administered. Upon confirming a negative test dose, 10 ml of 0.2% Ropivacaine was incrementally administered as the local anesthetic to establish effective

analgesia. ostoperatively, the patient received combination analgesia through patient-controlled regional analgesia (PCRA) using 0.2% Ropivacaine at a continuous infusion rate of 2 ml per hour.

Additionally, a demand dose of 5 ml was available per activation, with a lockout interval (LOI) of 30 minutes to prevent excessive dosing. Once the patient was transferred to the ward, the Acute Pain Service (APS) team closely monitored pain levels and recorded total opioid consumption within the first 24 hours postoperatively using the PCA machine. Any complications or side effects that occurred during or after the procedure, including hypotension, arrhythmia, bradycardia, nausea, vomiting, intravascular injection, lower extremity muscle weakness, or local anesthesia systemic toxicity, were documented in the evaluation record sheet for further analysis. The statistical analysis in this study aims to describe the characteristics of the research subjects and variables based on the treatment groups. Descriptive analysis is conducted to summarize numerical data, which is presented as the mean and standard deviation (SD) if normally distributed, or as the median and interquartile range if not normally distributed. The normality of variables such as age (years), BMI (kg/m²), pain scale distribution, total intravenous opioid consumption, postoperative hemodynamics, IL-6 levels, and postoperative recovery quality is assessed using the Shapiro-Wilk test at a significance level of 0.05.

Data is considered normally distributed if the p-value is greater than 0.05. To evaluate variance homogeneity between groups, Levene's test is applied. If the p-value is greater than 0.05, the variances are considered homogeneous; otherwise, they are classified as non-homogeneous. The comparison of postoperative intravenous opioid consumption, IL-6 levels, and recovery quality (measured by the QoR-40 score) between the control and treatment groups is analyzed using an independent t-test when the data follows a normal distribution. If the data is not normally distributed, the Mann-Whitney test is used as an alternative. Qualitative data, including ASA physical status and hemodynamic stability, are presented using percentages and analyzed through a 2x2 cross-tabulation method. The Chi-Square test is employed for categorical variable analysis. Statistical significance is determined using a 95% confidence interval (CI) and a p-value threshold of $\alpha < 0.05$. All statistical analyses are performed using SPSS software to ensure accurate and reliable results.

RESULTS

The characteristics of the sample can be seen in table 1. All subjects in the case and control groups were comparable.

Table 1. Subject Characteristics

Patient Characteristics	**Group**	**p-value**
	Case (n=23)	**Control (n=23)**
Age (years)	53.61 (±14.22)	52.26 (±13.27)
Gender (%)		
Male	10 (43.5)	10 (43.5)
Female	13 (56.5)	13 (56.5)
BMI (kg/m²)	22.41 (±2.26)	24.10 (±3.05)
ASA Physical Status		
I, n (%)	4 (44.4)	5 (55.6)
II, n (%)	5 (41.7)	7 (58.3)
III, n (%)	14 (56.0)	11 (44.0)

Notes:
T = Independent t-test
C = Chi-Square test, significant if $p < 0.05$.

Comparison of Total Postoperative Analgesia Rescue (Times) in Both Groups

Table 2. Comparison of Total Analgesic Rescue 24 Hours Postoperative Between Two Groups

Variable	Groups	p-value
	P1 (n=23)	P2 (n=23)
Total analgesic rescue 24 hours postoperative (mg)	5 (5)	5 (5)

Note:
M = Mann-Whitney test.

As shown in table 2, the data are presented using the median and interquartile range (IQR) for the amount of additional analgesia required within the first 24 hours postoperatively in both the continuous S-FICB and continuous epidural groups, each amounting to 5 mg (5). Statistical analysis using the non-parametric Mann-Whitney test indicates no significant difference in total values between Group P1 and Group P2 ($p > 0.05$). Supporting data from Table 3 also demonstrate that the comparison of NRS scores at rest and during movement between the two groups shows no significant difference ($p > 0.05$). Therefore, the group receiving continuous S-FICB block required a similar amount of additional analgesia within the first 24 hours postoperatively as the continuous epidural group. Given the minimal need for additional analgesia and the low pain levels experienced by the study subjects within the first 24 hours postoperatively, it can be concluded that the continuous S-FICB block provides an analgesic quality comparable to that of the continuous epidural group.

Comparison of Delta IL-6 Values in Both Groups

Table 3. Comparison of Pre and Postoperative Numerical Rating Scale (NRS) in Both Groups

Variable	Groups	p-value
	P1 (n=23)	P2 (n=23)
Resting NRS		
Preoperative	3 (0)	3 (0)
1 Hour Postoperative	0 (0)	0 (0)
6 Hours Postoperative	0 (0)	0 (2)
8 Hours Postoperative	0 (1)	1 (2)
12 Hours Postoperative	1 (2)	1 (2)
24 Hours Postoperative	0 (0)	0 (0)
Moving NRS		
Preoperative	5 (0)	5 (0)
1 Hour Postoperative	0 (0)	0 (0)
6 Hours Postoperative	0 (0)	0 (0)
8 Hours Postoperative	0 (2)	2 (3)
12 Hours Postoperative	2 (3)	2 (3)
24 Hours Postoperative	0 (0)	0 (0)

Note:
M = Mann-Whitney test.

In this study, delta IL-6 was evaluated by calculating the difference between preoperative IL-6 values and those measured at 24 hours postoperatively in both groups. A normality test using the Shapiro-Wilk method indicated a non-normal distribution of delta IL-6 values. Therefore, the Mann-Whitney test was used to assess significant differences between the two groups. Data are presented as median and interquartile range (IQR). In Group P1 (S-FICB block group), the preoperative IL-6 level had a median of 50.30 ng/L with an IQR of 20.84, while the IL-6 level at 24 hours postoperatively had a median of 37.12 ng/L with an IQR of 22.31.

In Group P2 (epidural analgesia group), the preoperative IL-6 level had a median of 35.74 ng/L with an IQR of 24.40, and the IL-6 level at 24 hours postoperatively had a median of 25.44 ng/L with an IQR of 28.11. Thus, a decrease in the median IL-6 level was observed in both groups at 24 hours postoperatively, with a greater reduction in IL-6 levels in Group P1 (S-FICB block group) compared to Group P2 (epidural analgesia group) (Table 5.4, Figure 5.3). The postoperative delta IL-6 in Group P1 showed a median of -22.75 ng/L with an IQR of 20.18, while in Group P2, the postoperative delta IL-6 had a median of -7.06 ng/L with an IQR of 14.25 (Table 5.5). Statistical analysis of delta IL-6 revealed a significant difference between the median delta IL-6 of Group P1 and Group P2, with a p-value of 0.006 ($p < 0.05$). Therefore, the group receiving the S-FICB block showed a greater reduction in IL-6 levels compared to the epidural analgesia group within 24 hours postoperatively.

Table 4. Comparison of IL-6 Levels Preoperatively and 24 Hours Postoperatively

Interventions	Variables	IL-6 Preoperative (ng/L)	IL-6 24 Hours Postoperative (ng/L)
S-FICB Continuous (n=23)	50.30 (20.84)	37.12 (22.31)	
Epidural Continuous (n=23)	35.74 (24.40)	25.44 (28.11)	

Table 5. Comparison of Delta IL-6 Between the Two Groups

Interventions	Variables	Mann-Whitney	Delta IL-6 (ng/L)	P-Value
S-FICB Continuous (n=23)	-22.75 (20.18)	0.006M		
Epidural Continuous (n=23)	-7.06 (14.25)			

Comparison of Recovery Quality Using the QoR-40 Questionnaire in Both Groups

In this study, recovery quality was assessed 24 hours postoperatively using the QoR-40 questionnaire, which was completed by subjects within the first 24 hours after surgery. The normality test for the total QoR-40 scores indicated a normal data distribution. Therefore, the data are presented as mean and standard deviation: Group P1 (patients receiving continuous S-FICB block postoperatively) had a mean score of 180 (±2.28). Group P2 (patients receiving continuous epidural analgesia) had a mean total score of 159 (±2.23).

Since the data followed a normal distribution ($p < 0.05$), an independent t-test was conducted. The statistical analysis revealed a significant difference between the mean total scores of Group P1 and Group P2 ($p < 0.001$), with the continuous S-FICB block group achieving a higher average score than the continuous epidural group. When comparing the two groups across the four dimensions in Parts A and B of the QoR-40 questionnaire, the normality test indicated a non-normal data distribution ($p < 0.001$). Therefore, a non-parametric Mann-Whitney test was used to assess significant differences between the groups. The data are presented as median and interquartile range (IQR), showing significant differences in four QoR-40 dimensions between Groups P1 and P2 (Table 4):

Part
Comfort: 16 (2) vs. 12 (1) ($p < 0.001$)
Emotions: 13 (2) vs. 11 (1) ($p < 0.001$)
Physical Independence: 18 (1) vs. 17 (2) ($p < 0.001$)
Patient Support: 28 (1) vs. 25 (1) ($p < 0.001$)

Part B:
Comfort: 38 (1) vs. 35 (1) ($p < 0.001$)
Emotions: 28 (1) vs. 25 (1) ($p < 0.001$)
Pain Experienced: 33 (31.5-33) vs. 26 (23.5-29) ($p < 0.001$)

One dimension showed no significant difference between the groups:

Patient Support: 5 (0) vs. 5 (0) (p = 0.685).

The IQR values across the four questionnaire dimensions illustrate the spread or variability in the data, reflecting subjects' responses in the QoR-40 questionnaire. The small IQR values indicate that the data are more concentrated and uniform around the center of the distribution. A smaller IQR reduces the likelihood of outliers, which can distort study results due to measurement errors or data analysis inconsistencies.

Table 6. Comparison of 24-Hour Postoperative QoR-40 Scores

Dimensions	Groups	p-Value
Total QoR-40 Score	P1 (n=23) 180 (±2.28)	P2 (n=23) 159 (±2.23)
A		
Comfort	16 (2)	12 (1)
Emotions	13 (2)	11 (1)
Physical Independence	18 (1)	17 (2)
Patient Support	28 (1)	25 (1)
B		
Comfort	38 (1)	35 (1)
Emotions	28 (1)	25 (1)
Physical Independence	5 (0)	5 (0)
Patient Support	34 (1)	30 (0)

T: Independent t-test
M: Mann-Whitney test

The comparison of most p-values across the QoR-40 questionnaire dimensions revealed significant differences, except for one dimension—patient support in Part B—which showed no significant difference. This was because all subjects in both Group P1 and Group P2 provided the same response, selecting the highest level of support. Overall, the group receiving the continuous S-FICB block had higher QoR-40 questionnaire scores than the continuous epidural group for analgesia in the first 24 hours postoperatively.

DISCUSSION

This study aims to compare the quality of postoperative analgesia between continuous S-FICB block and continuous epidural analgesia in patients undergoing cephalomedullary nailing surgery at Prof. I.G.N.G. Ngoerah Hospital. The researchers evaluated the amount of additional analgesia administered outside the continuous local anesthetic regimen in both groups using PCRA and PCEA devices. Additionally, pain assessment was conducted using the NRS scale at 1, 6, 8, 12, and 24 hours postoperatively. The study found that the amount of additional analgesia required in both groups was the same, with a median of 5 mg, an IQR of 5 mg, and no significant difference (p-value = 0.001, $p<0.05$). This result suggests the effectiveness of both analgesia techniques, as the demand dose was most frequently administered with only a single button press on either the PCRA or PCEA device.

Preoperative and postoperative NRS pain scores, both at rest and during movement (measured at 1, 6, 8, 12, and 24 hours), showed similar median values between the groups. The low NRS scores indicate that both analgesia techniques were equally effective. Although median differences were observed between resting and movement-related NRS scores at 8 hours postoperatively, there was no statistically significant difference between the groups, as all p-values remained above 0.05. Therefore, the quality of postoperative analgesia in both the continuous S-FICB block and continuous epidural groups was equally effective based on additional analgesia requirements and NRS scores. This study is consistent with previous

research by (Bridenbaugh, 2009) which examined 24 patients in the continuous S-FICB group and 24 patients in the continuous epidural group. The study utilized an initial bolus of 0.25% bupivacaine, followed by a continuous infusion of 0.125% bupivacaine at a rate of 5 ml/hr. The comparison of additional total analgesia and NRS scores at rest and during movement showed nearly identical means and standard deviations between the two groups, with no statistically significant differences.

Additionally, rescue opioid (morphine) requirements were similar in both groups, and NRS scores showed no significant variation. Another study by (Okamoto et al., 2015) which compared continuous S-FICB with PCA opioid administration in 157 patients, found that the continuous S-FICB group required significantly less additional tramadol than the control group, indicating superior analgesia in the continuous S-FICB group. In this study, measurements of the pro-inflammatory mediator IL-6 were taken preoperatively and within the first 24 hours postoperatively for both the continuous S-FICB block and continuous epidural groups. The delta IL-6, which represents the difference between preoperative and postoperative IL-6 levels, showed a significantly greater decrease in the continuous S-FICB group compared to the continuous epidural group, with a p-value of 0.006 ($p<0.05$). The median delta IL-6 in the S-FICB group was -22.75 ng/L, whereas it was -7.06 ng/L in the epidural group.

Although both groups exhibited negative delta IL-6 values, indicating a reduction, the decrease was significantly greater in the S-FICB group. IL-6 levels varied widely among patients, with the highest preoperative IL-6 level recorded at 458.89 ng/L in the S-FICB group and the lowest postoperative IL-6 level at 3.57 ng/L in the epidural group. Additionally, patients with elevated IL-6 levels often had comorbid uncontrolled diabetes mellitus managed with insulin, suggesting that chronic inflammation may influence both perioperative and postoperative management. The decrease in IL-6 observed in this study occurred through two distinct pain pathways. The peripheral nerve block S-FICB inhibits pain transmission, preventing both peripheral and central sensitization caused by pro-inflammatory mediators through the local anesthetic's inhibition of nociceptive neuron depolarization. Central sensitization involves hypersensitivity in the central nervous system, triggered by excessive NMDA receptor activation and neurotransmitter release in the spinal cord. In contrast, peripheral sensitization occurs when sensory neurons in the peripheral nerve become hypersensitive due to inflammatory mediators such as prostaglandins, bradykinin, and cytokines at the injury site. Okamoto et al. (2015) highlighted that inhibiting pain transmission reduces the neuroendocrine response, excessive hypothalamic-pituitary-adrenal (HPA) axis activation, and sympathetic nervous system stimulation, which collectively contribute to IL-6 release (Karakaya et al., 2013; Oz Gergin et al., 2019).

Epidurals, on the other hand, function by blocking action potentials through the binding of local anesthetics to sodium-potassium channels on dorsal horn nerve cell membranes. Grosu et al. observed that epidural anesthetics, such as lidocaine and ropivacaine, possess anti-inflammatory properties and modulate central neuroinflammation by reducing pro-inflammatory cytokines released by microglia. However, as explained by Curatolo et al., epidurals do not completely inhibit nerve signals, making their suppression of inflammatory responses less consistent compared to peripheral nerve blocks (Flood et al., 2015; Fu et al., 2021; Gao et al., 2019). The QoR-40 questionnaire, a widely validated tool sensitive to clinical changes, assesses postoperative recovery quality across five dimensions: comfort, emotions, physical independence, support, and pain. In this study, the continuous S-FICB group demonstrated a significantly higher QoR-40 score, with a mean of 180 compared to 159 in the continuous epidural group ($p<0.001$).

Among these dimensions, only patient support in Part B showed no difference, as nearly all patients scored it equally, indicating cognitive stability—a recognized benefit of regional anesthesia. Similar findings were reported by (Basques et al., 2015) who compared FICB and

femoral block groups, and by (Bost et al., 2007) in arthroplasty patients. In addition to QoR-40, Agastya et al. suggested the Pupillary Pain Index (PPI) as an alternative for measuring pain through pupillometry at 12 and 24 hours postoperatively (Curatolo et al., 1995). Although PPI scores significantly decreased between these time points, this index primarily reflects discomfort without accounting for social interaction or other postoperative side effects.

CONCLUSION

This study compared the quality of postoperative analgesia between continuous S-FICB block and continuous epidural analgesia in patients undergoing cephalomedullary nailing surgery at Prof. I.G.N.G. Ngoerah Hospital. The results showed that the additional analgesia requirements in both groups had the same median value of 5 mg, with an IQR of 5 mg, and no significant difference ($p<0.001$, $p<0.05$). Additionally, pain scores measured using the NRS at 1, 6, 8, 12, and 24 hours postoperatively showed similar median values between the groups, both at rest and during movement, indicating that both analgesic techniques were equally effective in pain control. Measurements of the pro-inflammatory mediator IL-6 demonstrated a significantly greater reduction in IL-6 levels in the S-FICB group compared to the epidural group ($p=0.006$, $p<0.05$). The median delta IL-6 in the S-FICB group was -22.75 ng/L, whereas in the epidural group, it was -7.06 ng/L. This reduction suggests that peripheral nerve blocks are more effective in inhibiting IL-6 release compared to epidurals, supported by the mechanism of nociceptive neuron depolarization inhibition, which prevents both peripheral and central sensitization. Postoperative recovery quality, assessed using the QoR-40 questionnaire, showed that the S-FICB group had a significantly higher score than the epidural group (180 vs. 159, $p<0.001$). Significant differences were observed in almost all dimensions of QoR-40 except for patient support, which had similar scores in both groups.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to the Anesthesiology and Intensive Care Department of Prof. Dr. dr. IGNG Ngoerah General Hospital, Denpasar, Bali, Indonesia, for providing invaluable support and resources that contributed significantly to this study. Our heartfelt appreciation also extends to the esteemed lecturers at the Anesthesiology and Intensive Care Department of Udayana University General Hospital, Denpasar, Bali, Indonesia, for their guidance, expertise, and continuous encouragement throughout the research process. Their dedication to advancing medical knowledge and clinical practice has been instrumental in shaping the outcomes of this work.

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