Section: Anaesthesia

Original Research Article

TO DETERMINE THE ANALGESIC EFFICACY AND EASE OF POSITIONING DURING SPINAL ANAESTHESIA IN PATIENTS UNDERGOING HIP SURGERIES - A COMPARATIVE STUDY OF THE SUPRAGINGIVAL FASCIA ILIACA COMPARTMENT BLOCK (S-FICB) VERSUS PERICAPSULAR NERVE GROUP (PENG) BLOCK

B.S.Thamilselvi[1], Sowmya Shanmugam[1], A.Amala Savio[1], K. Sibi[2]

[1]Assistant Professor, Department of Anaesthesia, Omandurar Medical College and Hospital, Tamilnadu, India
[2]Assistant Professor, Department of Anaesthesia, Government Hospital, Ponneri, Tiruvallur, Tamilnadu, India

Received : 08/11/2024
Received in revised form : 25/12/2024
Accepted : 12/01/2025

Keywords:
Femur fractures, Preoperative, Subarachnoid, Neurovascular, Ropivacaine.

Corresponding Author:
Dr. Sowmya Shanmugam,
Email: drsowmyaashan@gmail.com

DOI: 10.47009/jamp.2025.7.1.39

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (1); 200-205

Abstract

Background: Femoral fractures cause severe pain due to the periosteum's low pain threshold, requiring effective pain management for optimal surgical positioning. This study aimed to evaluate the efficacy of the pericapsular nerve group (PENG) block and (S-FICB) under ultrasound guidance in hip fracture patients scheduled for elective surgeries with subarachnoid block. **Materials and Methods:** This prospective interventional randomised controlled study included 80 patients of both sexes who were scheduled for elective hip surgery following a diagnosis of femur fracture at the Government Medical College, Chennai, between September 2022 and August 2023. Patients were divided into the FICB and PENG groups, each receiving 20 ml of 0.375% ropivacaine under ultrasound guidance before spinal anaesthesia. Pain relief, positioning ease (EOSP), and postoperative analgesia (NRS scores and consumption) were evaluated. **Result:** Most patients were 51-60 years of age, and there were no significant differences in demographics. The PENG group had superior pain relief, with significantly lower NRS scores at multiple time points, including 4, 6, 8, 10, and 24 h postoperatively ($p < 0.001$). PENG also showed a longer time to the first analgesic (7.35 ± 1.08 vs. 6.43 ± 1.13 hours, $p < 0.001$) and reduced opioid consumption (185.00 ± 48.31 mg vs. 212.50 ± 51.58 mg, $p=0.016$). Analgesic requirements were lower in the PENG group, especially during the first 6 h ($p=0.005$). **Conclusion:** The PENG block under USG guidance offers superior perioperative analgesia, improved ease of spinal positioning, and reduced postoperative opioid consumption compared with the S-FICB block in patients undergoing elective hip surgeries.

INTRODUCTION

Fracture of the femur is a frequently encountered orthopedic injury that can result in significant pain and discomfort to patients. This is because the periosteum, which is the outermost layer of the bone, has the lowest pain threshold among deep somatic tissues.[1] In most patients, surgical reduction of fractures with internal fixation is the ultimate treatment option. Effective pain management is essential for femur fracture surgeries to ensure patient comfort and facilitate proper positioning for subarachnoid block administration, as pain from overlapping bone ends and movement can hinder the process.[2]

Various pharmacological agents, including nonsteroidal anti-inflammatory drugs (NSAIDs), opioids, midazolam, ketamine, and propofol, are used to manage preoperative pain and improve patient positioning. Nerve blocks have proven to be an effective and safe alternative for pain relief in such cases.[3] Regional anesthesia is the preferred approach for lower-extremity orthopedic surgeries because of its numerous advantages over general anesthesia. It ensures effective perioperative pain control, minimizes systemic analgesic requirements, reduces polypharmacy, avoids airway manipulation, promotes early ambulation, and lowers the risk of deep vein thrombosis.[3]

Various methods have been used to identify and block nerve fibers. Peripheral nerve blockade has

ISSN (O): 2687-5365; ISSN (P): 2753-6556

evolved significantly, from traditional blind techniques that induce paresthesias to the use of peripheral nerve stimulators and, more recently, ultrasound guidance. Perineural analgesia is becoming increasingly popular as it provides comparable pain relief with fewer adverse effects than central neuraxial blocking.[4]

Previously, nerve blocks utilised landmark techniques and paresthesia induction, often leading to failures and damage to the nerves and surrounding structures. Nerve stimulators have been developed to enhance success rates and minimize neurological complications, offering more effective blockade than traditional paresthesia methods. Both techniques can cause neurovascular injuries, potentially resulting in long-term nerve damage.[3,4] Recently, ultrasonography has become a crucial tool for anesthesiologists to identify and achieve effective nerve blocks, providing a technically superior and more accurate method for needle and catheter placement. Dalens et al. first described the fascia iliaca compartment block technique for pediatric patients using the landmark approach.[5] The procedure is simple, easy to perform, and provides perioperative analgesia for painful thigh, hip, and femoral disorders. Ultrasonography aids in identifying the fascial planes, enabling quicker initiation and stronger motor blockade. Ultrasound-guided fascia iliaca compartment block results in more successful blocks.[6]

Conventional Peripheral nerve blocks, such as the fascia iliaca compartment block (FICB) and femoral nerve (FN) block, have demonstrated significant benefits as a method of pain relief. Consequently, they are increasingly favored in the management of analgesia and anesthesia for hip diseases.[7] However, these blocks unintentionally spare the obturator nerve (ON) and offer only mild analgesia.[8,9] Since the articular branches of the femoral nerve (FN), obturator nerve (ON), and accessory obturator nerve (AON) primarily innervate the anterior hip area, a simple, efficient, and secure regional approach is needed to target these structures simultaneously.[10] The pericapsular nerve group (PENG) block has been proposed as a potential solution.[7] First documented in late 2018, the PENG block has gained significant attention for peri-operative analgesia.[7,11]

Aim

This study aimed to evaluate the efficacy of the pericapsular nerve group (PENG) block versus the supra-inguinal fascia iliaca compartment block (S-FICB) under ultrasound guidance in hip fracture patients scheduled for elective surgeries with subarachnoid block.

MATERIALS AND METHODS

This prospective interventional randomised controlled study included 80 patients of both sexes who were scheduled for elective hip surgery following a diagnosis of femur fracture in the Department of Anaesthesiology, in association with the Department of Orthopaedics, Government Medical College, Chennai, between September 2022 and August 2023. This study was approved by the Institutional Ethics Committee before initiation, and informed consent was obtained from all patients.

Inclusion criteria

Patients diagnosed with hip fractures aged between 18 and 60 years, both males and females, with ASA grade of either I or II, and BMI between 18.5 and 24.9 were included.

Exclusion criteria

Patients who refused to undergo emergency hip surgery and had a history of allergy or anaphylaxis to local anaesthetics, uncontrolled diabetes, hypertension, thyroid disorders, or severe dementia, with any contraindications to spinal anaesthesia such as raised ICT, coagulation disorders, valvular heart disease, and active infection in the injection site were excluded.

Methods

Patients of both sexes were divided into two groups. FICB group: The administration of a Suprainguinal Fascia Iliaca Compartment Block with 20 ml of 0.375% ropivacaine under ultrasound guidance was performed 20 min before the administration of spinal anaesthesia for surgery. PENG group: The administration of a pericapsular nerve block with 20 ml of 0.375% ropivacaine under ultrasound guidance was performed 20 min before the administration of spinal anaesthesia for surgery.

Preoperative assessment included evaluation of patient eligibility for anaesthesia, examination of the coagulation profile, and assessment of airway, spine, and vital signs using the Modified Mallampati classification. Diagnostic tests such as haemoglobin, blood urea, creatinine, random blood glucose, ECG, and chest radiography were performed. Patients with allocation were blinded through the Serially Numbered Opaque Sealed Envelope (SNOSE) method. In the operating room, standard monitors (ECG, blood pressure, pulse oximeter) were applied, and an intravenous line was established with 500 ml saline. Pain intensity, both at rest and during movement, was assessed using the Numeric Pain Rating Scale (NRS) before administering the blocks. Analgesic techniques, including Suprainguinal Fascia Iliaca, and monitoring using the Ease of Sitting Position for Spinal Anesthesia (EOSP) score and postoperative Numeric Rating Scale for pain. The S-FICB was administered with 20ml of 0.375% ropivacaine beneath the fascia iliaca under ultrasound guidance, with verification of local anaesthetic spread through medial-lateral diffusion. The PENG block targeted the hip capsule and involved 20 ml of 0.375% ropivacaine injected into the musculofascial plane. The SAB, with 2.8 ml of 0.5% bupivacaine and fentanyl, was administered through the L3-L4 interspaces, and complications like hypotension and bradycardia were managed with ephedrine and atropine. The EOSP score, recorded by experienced anaesthesiologists, evaluated the ease of positioning during spinal anaesthesia, while the NRS scores

ISSN (O): 2687-5365; ISSN (P): 2753-6556

measured pain levels postoperatively at multiple time intervals. Analgesic consumption was tracked, along with the timing of the first analgesia request.

Statistical analysis

Data are presented as mean, standard deviation, frequency, and percentage. Categorical variables were compared using Pearson's chi-square test. Significance was defined as $p < 0.05$ using a two-tailed test. Data analysis was performed using IBM-SPSS version 21.0 (IBM-SPSS Corp., Armonk, NY, USA).

RESULTS

Most patients in both groups were between 51-60 years old, with 21 (52.5%) in the S-FICB group and 24 (60%) in the PENG group, 41-50 years, 10 (25%) in the S-FICB group and 8 (20%) in the PENG group. The age groups between 18–20 years, were no patients in the S-FICB group and 1 patient (2.5%) in the PENG group. Among patients aged 21–30 years, 4 (10%) were from the S-FICB group and 1 (2.5%) from the PENG group. Among patients aged 31–40 years, 5 (12.5%) were from the S-FICB group and 6 (15%) from the PENG group.

Regarding sex, 19 (47.5%) were male and 17 (42.5%) were from the PENG group. Among female patients, 21 (52.5%) were from the S-FICB group, and 23 (57.5%) were from the PENG group [Table 1].

The mean BMI was higher in group S-FICB (24.52 ± 0.31 kg/m²) than in the PENG group (23.98 ± 1.23 kg/m²), with a significant difference ($p = 0.008$). The mean time to the first analgesic was significantly lower in the S-FICB group (6.43 ± 1.13 h) than in the PENG group (7.35 ± 1.08 h) ($p < 0.001$). The mean total dose of opioids administered was significantly higher in the S-FICB group (212.50 ± 51.58 mg) than in the PENG group (185.00 ± 48.31 mg) ($p = 0.016$). There were no significant differences in age, weight, and height between the groups ($p=0.464$, $p=3.308$, and $p=0.845$) [Table 2].

There were no significant differences in the median NRS score before block between the S-FICB and PENG groups ($p = 0.103$). At 20 min post-block, the median NRS score was significantly lower in the PENG group than in the S-FICB group ($p = 0.026$). The median ease of spinal positioning (EOSP) score post-block was significantly different between the groups, with a score of 3 in Group S-FICB and 3 in Group PENG ($p = 0.024$) [Table 3].

At 0 h, most of the patients in both groups reported a pain score of 0, with 31 (77.5%) in the S-FICB group and 37 (92.5%) in the PENG group, with no significant difference ($p = 0.062$). At 2 h, the PENG group was significant in patients with no pain (92.5% vs. 72.5%), and fewer patients reported pain scores of 1 (7.5% vs. 25%) ($p = 0.018$). At 4, 6, and 8 h, the PENG group continued to outperform the S-FICB group, with significant differences at all time points ($p < 0.001$), with the S-FICB group showing higher pain scores.

At 10 h, the PENG group had a higher percentage of patients with lower pain scores (25% at score 1) than the S-FICB group (0%) ($p < 0.001$). By 12 h, the proportion of patients reporting higher pain scores in the S-FICB group was significantly greater (67.5% had a score of 3) than in the PENG group (25%) ($p < 0.001$). At 16, 20, and 24 h, the PENG group had significantly lower percentages of patients with severe pain (scores 4 or 5). At 24 h, only 1 patient in the PENG group reported a score of 5, compared to 10 patients in the S-FICB group ($p = 0.001$) [Table 4].

The NRS scores during the postoperative period were significantly different between the groups. At 0 h, no significant differences were observed ($p = 0.062$). However, at 2 h, the PENG group had a significantly lower score than the S-FICB group ($p = 0.018$).

At 4, 6, and 8 h postoperatively, the pain scores in the S-FICB group were significantly higher than those in the PENG group, with $p<0.001$ at all-time points, and superior pain relief with PENG. Similarly, at 10, 12, 16, 20, and 24 h, the NRS scores were lower in the PENG group, and the differences remained significant ($p<0.001$ to $p=0.005$) [Table 5].

From 0 to 6 h postoperatively, the proportion of patients requiring analgesics was significantly higher in group S-FICB 20 (50%) than in group PENG 8 (20%), with a significant difference ($p = 0.005$). The proportion of patients who did not require analgesics was higher in the group PENG 32 (80%) than in the group S-FICB 20 (50%).

From 7 to 12 hours postoperatively, the proportion of patients needing analgesics was higher in the group PENG 33 (82.5%) than in the group S-FICB 28 (70%), with no significant difference ($p = 0.189$). The proportion of patients not requiring analgesics was also higher in the S-FICB 12 group (30%) than in the PENG 7 group (17.5%).

From 13 to 24 hours postoperatively, the proportion of patients needing analgesics was higher in group S-FICB 37 (92.5%) than in group PENG 33 (82.5%), with no significant difference ($p = 0.176$). The proportion of patients who did not require analgesics was higher in the PENG 7 group (17.5%) than in the S-FICB 3 group (7.5%) [Table 6].

Table 1: Comparison of age and gender profiles.

		S-FICB Group	PENG Group
Age (in years)	18-20	0	1 (2.5%)
	21-30	4 (10%)	1 (2.5%)
	31-40	5 (12.5%)	6 (15%)
	41-50	10 (25%)	8 (20%)
	51-60	21 (52.5%)	24 (60%)
Gender	Male	19 (47.5%)	17 (42.5%)

ISSN (O): 2687-5365; ISSN (P): 2753-6556

	Female	21 (52.5%)	23 (57.5%)

Table 2: Comparison of clinical variables

	(Mean ± SD)		P-value
	S-FICB Group	PENG Group	
Age (years)	48.55 ± 11.17	50.38 ± 10.99	0.464
Weight (kg)	61.75 ± 4.66	60.62 ± 5.15	0.308
Height (cm)	158.68 ± 5.72	158.95 ± 6.78	0.845
BMI (kg/m²)	24.52 ± 0.31	23.98 ± 1.23	0.008
Time to first analgesic request (hours)	6.43 ± 1.13	7.35 ± 1.08	<0.001
Total dose of opioid (mg)	212.50 ± 51.58	185.00 ± 48.31	0.016

Table 3: Comparison of NRS Scores

NRS score	S-FICB Group		PENG Group		p-value
	Median	(IQR)	Median	(IQR)	
Pre-Block	6	2	5	3	0.103
At 20 minutes post-Block	3	2	2	1	0.026
Ease of spinal positioning (EOSP) score post-block	3	1	3	0	0.024

Table 4: Comparison of pain scores across different time points between groups

Time Point	Pain score category	S-FICB Group	PENG Group	p-value
0 hours	Score 0	31 (77.5%)	37 (92.5%)	0.062
	Score 1	9 (22.5%)	3 (7.5%)	
2 hours	Score 0	29 (72.5%)	37 (92.5%)	0.018
	Score 1	10 (25%)	3 (7.5%)	
	Score 2	1 (2.5%)	0	
4 hours	Score 0	14 (35%)	37 (92.5%)	< 0.001
	Score 1	15 (37.5%)	2 (5%)	
	Score 2	10 (25%)	1 (2.5%)	
	Score 3	1 (2.5%)	0	
6 hours	Score 0	7 (17.5%)	31 (77.5%)	< 0.001
	Score 1	13 (32.5%)	4 (10%)	
	Score 2	17 (42.5%)	5 (12.5%)	
	Score 3	3 (7.5%)	0	
8 hours	Score 0	0	3 (7.5%)	< 0.001
	Score 1	2 (5%)	18 (45%)	
	Score 2	29 (72.5%)	17 (42.5%)	
	Score 3	9 (22.5%)	2 (5%)	
10 hours	Score 1	0	10 (25%)	< 0.001
	Score 2	25 (62.5%)	27 (67.5%)	
	Score 3	15 (37.5%)	3 (7.5%)	
12 hours	Score 1	0	3 (7.5%)	< 0.001
	Score 2	11 (27.5%)	27 (67.5%)	
	Score 3	27 (67.5%)	10 (25%)	
	Score 4	2 (5%)	0	
16 hours	Score 2	4 (10%)	19 (47.5%)	
	Score 3	25 (62.5%)	20 (50%)	< 0.001
	Score 4	11 (27.5%)	1 (2.5%)	
20 hours	Score 2	1 (2.5%)	6 (15%)	0.005
	Score 3	21 (52.5%)	26 (65%)	
	Score 4	16 (40%)	8 (20%)	
	Score 5	2 (5%)	0	
24 hours	Score 3	11 (27.5%)	22 (55%)	0.001
	Score 4	17 (42.5%)	17 (42.5%)	
	Score 5	10 (25%)	1 (2.5%)	
	Score 6	2 (5%)	0	

Table 5: Comparison of numeric rating scale pain scores at post-operative period between groups

Numeric Rating Scale score	S-FICB Group		PENG Group		p-value
	Median	IQR	Median	IQR	
0 hours	0	0	0	0	0.062
2 hours	0	1	0	0	0.018
4 hours	1	2	0	0	< 0.001
6 hours	2	1	0	0	< 0.001
8 hours	2	0	1	1	< 0.001
10 hours	2	1	2	0	< 0.001
12 hours	3	1	2	1	< 0.001
16 hours	3	1	3	1	< 0.001
20 hours	3	1	3	0	0.005
24 hours	4	2	3	1	0.001

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 6: Comparison of analgesic requirement over time between groups

Time period	Analgesic requirement	S-FICB Group	PENG Group	p-value
0 to 6 hours	Needed	20 (50%)	8 (20%)	0.005
	Not needed	20 (50%)	32 (80%)	
7 to 12 hours	Needed	28 (70%)	33 (82.5%)	0.189
	Not needed	12 (30%)	7 (17.5%)	
13 to 24 hours	Needed	37 (92.5%)	33 (82.5%)	0.176
	Not needed	3 (7.5%)	7 (17.5%)	

DISCUSSION

In our study, patients in the PENG group had significantly lower NRS pain scores than those in the S-FICB group. Patients in the PENG group had a higher median EOSP score than those in the S-FICB group, with substantial differences. Balaji et al. also observed a significant improvement in the EOSP Score in the PENG group compared with that in the FICB group ($p<0.005$).[12]

In our study, the PENG group had lower NRS pain scores than the S-FICB group throughout the postoperative period. As patients in the PENG group had a relatively lower NRS pain score than the S-FICB group throughout the postoperative period NRS scores, were supported by a study by Krishnamurthy et al. observed lower VAS scores in the PENG group compared to the FICB Group.[13] The PENG group patient positioning for spinal anaesthesia compared to the FICB group. Jadon et al., and Balaji et al. also observed a substantial decrease in the NRS score in the PENG and S-FICB groups during rest and movement after the block ($p<0.0001$).[12,14] Mosaffa et al. also reported that the PENG block is effective as there was a significant difference in VAS ratings and motor power between subjects between the PENG and FICB groups.[15] Desai et al. also observed a decrease in VAS scores, compared to the baseline measurements while using a combination of the PENG block with the SIFICB block.[16] Choi et al. reported reduced pain scores in the PENG group, and Aygun et al. also reported a statistically significant difference in pain scores between the PENG group and the intravenous opioids group ($p<0.001$).[17,18]

This current study finding is slightly different from that of Shalaby et al., who reported no significant difference in the VAS scores between the two groups.[19] Liang et al. reported that the difference in pain scores was observed only at the postoperative 48-hour mark ($p < 0.05$).[20] Kulkarni et al. reported no significant association between the NRS scores, ease of administering spinal analgesia, and acceptance of anaesthesia between the PENG and FICB groups.[21] Bhalerao et al. also reported a greater fall in the VAS score in the PENG group than in the SFICB group without significant differences. The motor blockage seen in the SFICIB group exhibited a statistically significant increase, compared to the PENG group ($p<0.002$).[22]

In our study, a greater proportion of subjects in the S-FICB group required opioid rescue analgesia than subjects in the PENG group (50% vs. 20%) within 6 h of the postoperative period. There were significant differences in the total dose of opioid analgesia administered between the two groups, with subjects in the PENG group requiring a lower dose of opioid analgesia than the subjects in the S-FICB group. Balaji et al. and Reddy et al. reported that subjects on PENG block need a lower level of fentanyl dose within a 24-hour postoperative period.[12,15] Aygun et al. observed that the PENG group had a significantly lower total morphine consumption throughout the initial 24-hour period.[18]

A study by Shalaby et al. reported no significant differences between the two groups in terms of the time it took for the first analgesic request and the total amount of morphine consumed within the first 24 hours after surgery and also by Balaji et al. which the initial request for analgesics and the subsequent pain alleviation within the first 24-hour period showed no significant difference between the PENG and FICB groups ($p=0.538$).[12,19] The cumulative opioid use within the first 48 hours after surgery was found to be comparable between the two groups ($p=0.265$) by Choi et al., and Jadon et al. also observed that the initial request for analgesics and subsequent pain alleviation within the first 24-hour period did not differ significantly between the PENG and FICB groups ($p=0.524$).[14,17]

CONCLUSION

PENG block performed under USG guidance provides efficient perioperative analgesia than S-FICB block for patients posted for elective hip surgeries under subarachnoid block. PENG block performed under USG guidance gives better ease of spinal positioning for administering subarachnoid block prior to hip surgeries. Utilisation of the PENG block can concurrently decrease the need for opioids in the post-operative period and mitigates associated side effects such as nausea, vomiting, and delirium.

REFERENCES

1. Duc TA. Postoperative pain control. In: Conroy JM, Dorman BH, editors. Anesthesia for Orthopedic Surgery. New York, NY: Raven Press; 1994. https://www.ncbi.nlm.nih.gov/sites/books/NBK544298/.
2. Sandby-Thomas M, Sullivan G, Hall JE. A national survey into the peri-operative anaesthetic management of patients presenting for surgical correction of a fractured neck of femur: Anaesthetic management for fractured neck of femur. Anaesth 2008; 63:250–8. https://doi.org/10.1111/j.1365-2044.2007.05328.x.
3. Urwin SC, Parker MJ, Griffiths R. General versus regional anesthesia for hip fracture surgery: a meta-analysis of

ISSN (O): 2687-5365; ISSN (P): 2753-6556

randomized trials. Br J Anaesth 2000; 84:450–5. https://doi.org/10.1093/oxfordjournals.bja.a013468.
4. Grant CRK, Checketts MR. Analgesia for primary hip and knee arthroplasty: the role of regional anaesthesia. Contin Educ Anaesth Crit Care Pain 2008; 8:56–61. https://doi.org/10.1093/bjaceaccp/mkn007.
5. Dalen B, Vanneuville G, Tanguy A. Comparison of the fascia iliaca compartment block with the 3-in-1 blocks in children. Anesth Analg 1989; 69:705–13. https://www.jvsmedicscorner.com/AnaesthRegional_Anesthesia_files/Dalens%20Fascia%20Iliaca%20Block.pdf.
6. Zaragoza-Lemus G, Mejı a-Terrazas GE, Peralta-Zamora E. Peripheral nerve block guided by ultrasound. Rev Mex Anest 2008; 31:282–97. https://www.medigraphic.com/pdfs/rma/cma-2008/cmai084e.pdf.
7. Girón-Arango L, Peng PWH, Chin KJ, Brull R, Perlas A. Pericapsular nerve group (PENG) block for hip fracture. Reg Anesth Pain Med 2018:1. https://doi.org/10.1097/aap.0000000000000847.
8. Swenson JD, Davis JJ, Stream JO, Crim JR, Burks RT, Greis PE. Local anesthetic injection deep to the fascia iliaca at the level of the inguinal ligament: the pattern of distribution and effects on the obturator nerve. J Clin Anesth 2015; 27:652–7. https://doi.org/10.1016/j.jclinane.2015.07.001.
9. Guay J, Kopp S. Peripheral nerve blocks for hip fractures in adults. Cochrane Database Syst Rev 2020;11:CD001159. https://doi.org/10.1002/14651858.CD001159.pub3.
10. Short AJ, Barnett JJG, Gofeld M, Baig E, Lam K, Agur AMR, et al. Anatomic study of innervation of the anterior hip capsule: Implication for image-guided intervention. Reg Anesth Pain Med 2018; 43:186–92. https://doi.org/10.1097/AAP.0000000000000701.
11. Aishwarya A, Agarwal R, Garg A, Jain V. Clinical insight, and real-time PCR analysis of the first adeno-enterovirus conjunctivitis outbreak in India: A comprehensive cross-sectional study. J Postgrad Med. 2024:1;70: 143-8. https://doi.org/10.4103/jpgm.jpgm_256_24.
12. Balaji KM, Rajesh A, Rajanalini N. Comparison of supra-inguinal fascia iliaca versus Pericapsular nerve block for ease of positioning during spinal anaesthesia: A randomised Double-blinded trial. 2023: 1701-5. https://www.jcdronline.org/admin/Uploads/Files/64a39d6987ac02.86243844.pdf.
13. Krishnamurty P, Girish MN, Dileep PK. Ultrasound guided fascia iliaca block versus pericapsular nerve group for postoperative analgesia prior to spinal anaesthesia for hip surgeries. Int J Health Sci (IJHS) 2022:5084–92. https://doi.org/10.53730/ijhs.v6ns1.6028.
14. Jadon A, Mohsin K, Sahoo RK, Chakraborty S, Sinha N, Bakshi A. Comparison of supra-inguinal fascia iliaca versus pericapsular nerve block for ease of positioning during spinal anaesthesia: A randomised double-blinded trial: A randomised double-blinded trial. Indian J Anaesth 2021; 65:572–8. https://doi.org/10.4103/ija.ija_417_21.
15. Mosaffa F, Taheri M, Manafi Rasi A, Samadpour H, Memary E, Mirkheshti A. Comparison of pericapsular nerve group (PENG) block with fascia iliaca compartment block (FICB) for pain control in hip fractures: A double-blind prospective randomized controlled clinical trial. Orthop Traumatol Surg Res 2022; 108:103135. https://doi.org/10.1016/j.otsr.2021.103135.
16. Desai DJ, Shah N, Bumiya P. Combining pericapsular nerve group (PENG) block with the supra-inguinal fascia iliaca block (SIFICB) for perioperative analgesia and functional recovery in patients undergoing hip surgeries: A retrospective case series. Cureus 2023;15: e36374. https://doi.org/10.7759/cureus.36374.
17. Choi YS, Park KK, Lee B, Nam WS, Kim D-H. Pericapsular nerve group (PENG) block versus supra-inguinal fascia iliaca compartment block for total hip arthroplasty: A randomized clinical trial. J Pers Med 2022; 12:408. https://doi.org/10.3390/jpm12030408.
18. Aygun H, Tulgar S, Yigit Y, Tasdemir A, Kurt C, Genc C, et al. Effect of ultrasound-guided pericapsular nerve group (PENG) block on pain during patient positioning for central nervous blockade in hip surgery: a randomized controlled trial. BMC Anesthesiol 2023; 23:316. https://doi.org/10.1186/s12871-023-02245-3.
19. Shalaby SA, Ramzy EA, Hasheesh MA, Bakrey SA. Efficacy of Combined Lateral Femoral Cutaneous Nerve Block with Pericapsular Nerve Group Block Versus Fascia Iliaca Block in Proximal Femoral Fractures. Egypt J Hosp Med.2022; 89:4802–10. https://doi.org/10.21608/ejhm.2022.260744.
20. Liang L, Zhang C, Dai W, He K. Comparison between pericapsular nerve group (PENG) block with lateral femoral cutaneous nerve block and supra-inguinal fascia iliaca compartment block (S-FICB) for total hip arthroplasty: a randomized controlled trial. J Anesth 2023; 37:503–10. https://doi.org/10.1007/s00540-023-03192-6.
21. Kulkarni PB, Ghodki PS, Prabhu AV. Pericapsular nerve group block (PENG) and fascia iliaca compartment block (FICB) for positioning patients with hip fractures for spinal anaesthesia: A comparative study between the two blocks. Archives of Anesthesia and Critical Care 2022. https://doi.org/10.18502/aacc.v8i2.9152.
22. Bhalerao C, Dudhedia U. Prospective Comparative Double-Blind Study on Ultrasound-Guided Pericapsular Nerve Group Block Versus Suprainguinal Fascia Iliaca Block for Perioperative Analgesia in Traumatic Hip Surgeries. Int J Reg Anesth.2023; 4:13-14 https://doi.org/10.13107/ijra.2023.v04i01.069.

ISSN (O): 2687-5365; ISSN (P): 2753-6556