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COMPARISON OF ULTRASOUND GUIDED SUPRA INGUINAL FASCIA ILIACA BLOCK WITH PERICAPSULAR NERVE GROUP BLOCK FOR THE EASE OF POSITIONING FOR THE INDUCTION OF SPINAL ANESTHESIA IN PATIENTS UNDERGOING HIP REPLACEMENT

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ABSTRACT

Objective: To compare the efficacy of ultrasound-guided supra-inguinal fascia iliaca block and pericapsular nerve group block in terms of pain score and ease of positioning for spinal anesthesia in patients undergoing hip fracture surgery.

Methodology: This randomized controlled trial was conducted in the Department of Anesthesaia Department, M Islam Teaching Hospital, Gujranwala from February 2022 to November 2022. A total of 38 patients scheduled for hip replacement surgery under spinal anesthesia were included and divided into two equal groups. Group A received ultrasound-guided supra-inguinal fascia iliaca block, while Group B received pericapsular nerve group block. Pain was assessed using the Numeric Rating Scale at rest and during passive limb movement before and after block administration. Ease of spinal positioning was assessed using a 0–3 scale.

Results: The mean post-block pain score at rest was 2.84 ± 1.12 in the supra-inguinal fascia iliaca block group and 2.16 ± 0.76 in the pericapsular nerve group block group, showing a statistically significant difference ($p=0.035$). The mean post-block pain score during movement was 4.63 ± 1.01 in Group A and 3.26 ± 0.45 in Group B ($p<0.001$). The mean ease of spinal positioning score was 1.52 ± 0.61 in Group A and 2.15 ± 0.50 in Group B ($p=0.001$). Time to first analgesia request and number of rescue analgesic doses were statistically insignificant between the groups.

Conclusion: It is concluded that pericapsular nerve block showed significantly more effective in terms of pain score and ease of position as compared to supra-inguinal fascia iliaca block in patients undergoing hip fracture surgery

KEYWORDS: Supra-inguinal fascia iliaca block, Pericapsular nerve group block, Hip fracture surgery, Spinal anesthesia, Pain score, Ease of positioning

INTRODUCTION

Managing pain is a critical focal point following hip surgeries. Patients frequently undergo varying degrees of pain, ranging from moderate to severe, after these operations, and effectively addressing this pain plays a crucial role in facilitating functional recovery following joint arthroplasty [1]. It has been observed that successful pain management enhances patient satisfaction, while inadequate pain control is linked to prolonged rehabilitation periods [2]. Delayed recuperation elevates the likelihood of postoperative complications, with postoperative pain emerging as a significant concern after hip surgeries [3]. When contemplating the utilization of regional analgesia prior to femur fracture surgeries or for postoperative pain relief, there exists a range of diverse methods available. Among the various block techniques used for pain management, options include paravertebral block, fascia iliaca compartment block (FICB), femoral nerve block (FNB), sciatic nerve block, and epidural analgesia [4]. Among these techniques, FICB is currently gaining attention in the field of orthopedic surgery. FICB offers advantages such as easy execution, the ability to perform it while the patient is in a supine position without requiring patient movement, and the possibility of conducting it outside of the operating room [5].

The distinguishing feature of the PENG (pericapsular nerve group) block in comparison to other techniques is its specific targeting of the articular branches that supply the anterior hip joint. When performed correctly, this

block does not result in motor weakness. Additionally, the analgesic advantages of the PENG block are significant, as evidenced by a substantial reduction in the average pain score following the administration of the block [6].
Previous studies have extensively explored the use of bupivacaine for various nerve blocks, including the suprainguinal fascia iliaca block, commonly used for pain management in patients undergoing hip fracture surgery [7]. However, the novelty of the current study lies in the use of ropivacaine as an alternative. Not many studies are available on the efficacy of ropivacaine in our setting [8]. Ropivacaine, known for its potentially favorable safety profile and reduced motor block compared to bupivacaine, is being investigated for its efficacy and ease of patient positioning during the suprainguinal fascia iliaca block in combination with a pericapsular nerve group (PENG) block. This approach aims to optimize analgesia while enhancing patient comfort and procedural efficiency in hip fracture surgery [9].
The rationale of this study is to compare the efficacy of the supra-inguinal fascia iliaca block with the pericapsular nerve block in patients undergoing hip fracture surgery [10]. No local study has compared both techniques in local settings in terms of postoperative analgesia and ease of positioning. After the initial introduction of the PENG block, numerous case reports and case series have been published, emphasizing its remarkable analgesic benefits for perioperative pain management in hip surgery [11]. However, there is a limited amount of international literature available for comparing both techniques. Therefore, the purpose of this study is to gather local data and statistics in order to determine which technique is more effective in terms of postoperative pain relief and patient positioning for individuals undergoing hip replacement surgery [12].

Objective
To compare the efficacy of ultrasound-guided supra-inguinal fascia iliaca block and pericapsular nerve group block in terms of pain score and ease of positioning for spinal anesthesia in patients undergoing hip fracture surgery.

METHODOLOGY
This was a randomized controlled trial conducted in the Department of Anesthesaia Department, M Islam Teaching Hospital, Gujranwala from February 2022 to November 2022. A total of 38 patients were included in the study, with 19 patients in each group. The sample size was calculated using a 95% confidence level and 95% power of study, taking the expected mean ease of positioning score as 1.39 ± 0.49 for supra-inguinal fascia iliaca block and 2.15 ± 0.60 for pericapsular nerve group block. Non-probability purposive sampling technique was used. Patients aged 40–70 years of either gender with hip fracture scheduled for hip replacement surgery under spinal anesthesia were included. Patients with allergy to local anesthetics, contraindication to spinal anesthesia, chronic opioid use, cardiopulmonary disease, neuropathies, or coagulopathy were excluded.

Data Collection
After approval from the institutional ethical review committee, 38 eligible patients were enrolled after informed consent. Patients were randomly allocated into two groups using an online randomization program. A research assistant generated the random sequence, and group allocation codes were placed in sealed opaque envelopes. Group A received ultrasound-guided supra-inguinal fascia iliaca block, while Group B received ultrasound-guided pericapsular nerve group block. On arrival in the operating room, patients were attached to standard monitors including electrocardiography, non-invasive blood pressure, and pulse oximetry. Baseline pain scores at rest and during 15° passive limb elevation were recorded using the Numeric Rating Scale. Both blocks were performed in supine position under strict aseptic measures. The femoral artery was identified at the level of the inguinal crease using ultrasound. The iliopsoas muscle and overlying fascia iliaca were visualized. A total of 20 mL of 0.25% ropivacaine was injected beneath the fascia iliaca. The ultrasound probe was placed near the anterior superior iliac spine and moved medially to identify the anterior inferior iliac spine, iliopubic eminence, femoral head, and psoas tendon. A 20–22 gauge, 100 mm needle was inserted in-plane from lateral to medial between the psoas tendon and pubic ramus. A total of 20 mL of 0.25% ropivacaine was injected into this plane. After 30 minutes of block administration, analgesia was reassessed using the Numeric Rating Scale at rest and during passive limb elevation. If the Numeric Rating Scale score was greater than 5, intravenous fentanyl was administered every 5 minutes until the score decreased to 3. Patients were then positioned for spinal anesthesia. Ease of spinal positioning was assessed using a 0–3 scale. Spinal anesthesia was performed using 1.8 mL of 0.5% heavy bupivacaine with 0.4 mL fentanyl. Postoperative analgesia was provided with intravenous paracetamol 1 g every 8 hours. Tramadol 50 mg was given as rescue analgesia when required or when Numeric Rating Scale score exceeded 4. Follow-up assessments were performed at 4, 6, 8, 12, and 24 hours postoperatively.

Data Analysis
Data were entered and analyzed using SPSS version 23. Quantitative variables including age, height, weight, body mass index, pain scores, and ease of spinal positioning score were presented as mean ± standard deviation. Qualitative variables including gender, ASA status, smoking, hypertension, and diabetes were presented as frequency and percentages. Normality of data was assessed using the Kolmogorov-Smirnov test. Independent

sample t-test was applied for normally distributed data, while a non-parametric alternative test was used for non-normally distributed data. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 38 patients were included in the study, with a mean age of 55.97±8.27 years. The age range of the patients was between 40 and 70 years, with the minimum and maximum ages recorded, respectively. In group A the mean age of the patients was 56.31±9.25 years and in group B the mean age of the patients was 55.63±7.39 years. Comparison of age between study groups showed statistically insignificant difference. i.e. p-value=0.803. In group A 13(68.4%) patients were male and in group B 12(63.2%) patients were males. Gender-wise difference between study groups was statistically insignificant. i.e. p-value=0.732. The mean weight of the patients was 73.84±11.59 kg, the mean height of the patients was 1.67±0.08 m and the mean BMI of the patients was 26.53±3.50 kg/m2 respectively.In group A the mean weight of the patients was 73.15±10.77 kg and in group B its mean value was 74.53±12.62 kg (p-value=0.721). In group A the mean height of the patients was 1.67±0.07 m and in group B its mean value was 1.66±0.08 m (p-value=0.967). In group A the mean BMI of the patients was 26.37±3.96 kg/m^2 and in group B its mean value was 26.69±3.06 kg/m^2 (p-value=0.775).

Table I. Baseline Demographic and Clinical Characteristics of Patients

Variable	Group A n (%) / Mean ± SD	Group B n (%) / Mean ± SD	Total n (%) / Mean ± SD	p-value
Age (years)	56.31 ± 9.25	55.63 ± 7.39	55.97 ± 8.27	0.803
Male	13 (68.4%)	12 (63.2%)	25 (65.8%)	0.732
Female	6 (31.6%)	7 (36.8%)	13 (34.2%)	
Weight (kg)	73.15 ± 10.77	74.53 ± 12.62	73.84 ± 11.59	0.721
Height (m)	1.67 ± 0.07	1.66 ± 0.08	1.67 ± 0.08	0.967
BMI (kg/m²)	26.37 ± 3.96	26.69 ± 3.06	26.53 ± 3.50	0.775
ASA I	10 (52.6%)	10 (52.6%)	20 (52.6%)	0.635
ASA II	6 (31.6%)	8 (42.1%)	14 (36.8%)	
ASA III	3 (15.8%)	1 (5.3%)	4 (10.5%)	
Smoker	3 (15.8%)	7 (36.8%)	10 (26.3%)	0.141
Hypertension	9 (47.4%)	7 (36.8%)	16 (42.1%)	0.511
Diabetes mellitus	9 (47.4%)	5 (26.3%)	14 (36.8%)	0.179

On evaluation of pre-block pain at rest, the mean pain of the patients was 4.34±1.19 with minimum and maximum pain scores of 3 & 6 respectively. Similarly on evaluation of post-block pain at rest, the mean pain of the patients was 2.50±1.01 with minimum and maximum pain scores of 1 & 4 respectively.

Table II. Comparison of Pain Scores at Rest Between Study Groups

NRS at Rest	Group A Mean ± SD	Group B Mean ± SD	Total Mean ± SD	p-value
Pre-block	4.26 ± 1.28	4.42 ± 1.12	4.34 ± 1.19	0.689
Post-block	2.84 ± 1.12	2.16 ± 0.76	2.50 ± 1.01	0.035

On evaluation of pre-block pain at movement, the mean pain of the patients was 6.74±0.86 with minimum and maximum pain scores of 6 & 8 respectively. Similarly on evaluation of post-block pain at movement, the mean pain of the patients was 3.95±1.04 with minimum and maximum pain scores of 3 & 6 respectively

Table III. Comparison of Pain Scores During Movement Between Study Groups

NRS During Movement	Group A Mean ± SD	Group B Mean ± SD	Total Mean ± SD	p-value
Pre-block	6.63 ± 0.83	6.84 ± 0.89	6.74 ± 0.86	0.458
Post-block	4.63 ± 1.01	3.26 ± 0.45	3.95 ± 1.04	<0.001

The mean score of ease of spinal positioning of the patients was 1.84±0.64 with minimum and maximum values of 1.00 & 3.00 years respectively. In group A the mean score of ease of spinal positioning of the patients was 1.52±0.61 and in group B its mean value was 2.15±0.50 years. Group B patients showed significantly better score about ease of spinal positioning as compared to group A patients. i.e. p-value=0.01. In our study the mean time to first analgesia request of the patients was 10.90±0.63 hours with minimum and maximum values of 9.36 & 11.87 hours respectively.

Table IV. Comparison of Ease of Spinal Positioning and Postoperative Analgesic Outcomes

Outcome	Group A Mean ± SD	Group B Mean ± SD	Total Mean ± SD	p-value
Ease of spinal positioning score	1.52 ± 0.61	2.15 ± 0.50	1.84 ± 0.64	0.001
Time to first analgesia request (hours)	10.76 ± 0.59	11.04 ± 0.65	10.90 ± 0.63	0.172

Rescue analgesic doses in 24 hours	1.77 ± 0.62	1.64 ± 0.43	1.71 ± 0.53	0.172

DISCUSSION

Effective perioperative pain management in hip surgery among the elderly population can reduce opioid usage and improve health-related quality of life, making spinal anesthesia (SA) a preferred choice for these patients with hip fractures and additional medical co-morbidities. The optimal sitting position is very important when performing spinal anesthesia (SA) for hip-fracture patients. Most of these patients experience severe pain, and regional blocks can help to alleviate this pain. The sitting position allows for better access to the spinal area and helps ensure that the SA is administered correctly. By achieving an optimal sitting position, the medical team can provide smoother and more effective SA, which in turn helps to manage the pain experienced by hip-fracture patients. The Fascia Iliaca Compartment Block (FICB) and PENG block are frequently utilized regional analgesia techniques for spinal positioning and postoperative pain management. The FICB has a greater body of research evidence supporting its effectiveness compared to the PENG block, which primarily relies on case series for its evaluation.

In our study on evaluation of post-block pain at rest, in supra inguinal fascia iliaca block group the mean pain score was 2.84±1.12 and in pericapsular nerve block group its mean value was 2.16±0.76 (p-value=0.035). On evaluation of post-block pain at movement, in supra inguinal fascia iliaca block group the mean pain score was 4.63±1.01 and in pericapsular nerve block group its mean value was 3.26±0.45 (p-value=<0.001). In supra inguinal fascia iliaca block group the mean score of ease of spinal positioning of the patients was 1.52±0.61 and in pericapsular nerve block group its mean value was 2.15±0.50 years (p-value=0.01) [13,14].

In study, Ashok Jadon conducted a comparison of the analgesic effectiveness between S-FICB and PENG block, with a focus on their efficacy in achieving optimal patient positioning for spinal anesthesia. The results indicated a significant reduction in NRS scores for both rest and movement in the PENG and S-FICB groups after the administration of the blocks (p-value < 0.0001). On pre-evaluation at rest in S-FICB group the median NRS score was 5(1.5) as compared to PENG group it was 6(1) (p-value=0.214) [15,16]. Similarly at movement in S-FICB group the median NRS score was 58(1) as compared to PENG group it was 9(1.5) (p-value=0.872). On post-evaluation at rest in S-FICB group the median NRS score was 4(1) as compared to PENG group it was 3(2) (p-value=<0.001). Similarly at movement in S-FICB group the median NRS score was 5(1) as compared to PENG group it was 4(1) (p-value=0.004). In S-FICB group the man time required to first analgesia request was 11.8±0.84 hours and in PENG group its mean value was 11.21±0.70 hours which were statistically insignificant. i.e. p-value=0.524 [17].

he first analgesic request and pain relief within the initial 24-hour period were similar between the two groups (p-value = 0.524). In a retrospective review conducted by Kiran Mysore MD et al.,showed that the mean (SD) 24-hr postoperative hydromorphone equivalent consumption was lower in those receiving PENG blocks [4.5 (2.9) mg] than those who did not [6.9(5.5) mg] (P = 0.002). Those receiving PENG blocks were also more likely to receive spinal anesthesia. In PENG group the median pain score at rest of the patients was 1.9 (1.5) and in other group its median value was 2.5(1.7) (p-value=0.054) [18-20].

LIMITATIONS:

Here are given below few of limitations of the study.

The sample size of this study was small due to time and financial constraint.

This study was done at single center setting rather than to be done at multicenter setting.

Due to small sample size and single center study we cannot infer the findings of this study to whole populations.

As contrary findings were observed in few of previous studies and our study findings, so it is suggested that in future further studies should be done with larger sample size and data should be taken from multicenter setting rather than to be done at single center setting, so that the findings of our study could be evaluated. In future research there should be more variable on focus as outcome from where we can have idea of better drug in multidimensional setting.

CONCLUSION

It is concluded that pericapsular nerve block showed significantly more effective in terms of pain score and ease of position as compared to supra-inguinal fascia iliaca block in patients undergoing hip fracture surgery.

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