A Comparative Study Between Femoral Nerve Block and Suprainguinal Fascia Iliaca Compartment Block for Post-Operative Analgesia in Femur Fracture Fixation

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ABSTRACT

Introduction: Femur fractures and their surgical fixations are common. Adequate postoperative pain relief is mandatory as it facilitates rapid recovery by enhancing early ambulation and mitigating stress response. This is barely achievable with conventional pain control methods. Ultrasound-guided regional blocks like femoral nerve block and supra-inguinal fascia iliaca compartment block are simple yet promising techniques for postoperative analgesia in femur fractures. **Aims:** To compare post-operative analgesia duration and satisfaction attained between the patients receiving ultrasound-guided femoral nerve block with, those receiving ultrasound-guided supra-inguinal fascia iliaca compartment block, after femur fracture fixation. **Methods:** Seventy-four patients, aged 16−85 years, of either sex, ASA I−II, who underwent femur fracture surgical fixations under spinal anesthesia, were randomly divided into two equal groups: groups 1 and group 2. Postoperatively, Group 1 (n= 37) received a femoral nerve block with 15 ml 2.5% bupivacaine whereas Group 2 (n = 37) received a supra-inguinal fascia iliaca compartment block with 30 ml 2.5% bupivacaine. Duration of analgesia, patients' level of satisfaction, visual analogue scale scores, and hemodynamic parameters at different time intervals were recorded in the first 24 hours postoperatively and compared. **Results:** The demographic profiles between the two groups were comparable. Group 2 had a significantly longer duration of analgesia than Group 1, with the means 795.14 vs 538.65 minutes respectively, and a P value of .002. Although group 1 patients had predominantly 3 and 4 levels of satisfaction whereas group 2 had 4 and 5, there was no statistically significant difference in patients' level of satisfaction between the groups (P=.249). **Conclusion:** Supra-inguinal fascia iliaca block provides a longer duration of analgesia than femoral nerve block in femur fracture fixation. The level of satisfaction in both groups is high and comparable.

Keywords: Femoral nerve block, Femur fracture fixation, Post-operative analgesia, Supra-inguinal fascia iliaca compartment block

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INTRODUCTION

Femur fractures are the most common orthopedics injury requiring hospitalization.[1] The pain after the fracture and its fixation leads to a stress response, which is characterized by inflammatory and hormonal changes. This increases the chances of delayed wound healing, delayed fracture repair, delayed mobilization, prolonged hospitalization, and sometimes even severe cardiovascular, neurological, and metabolic events.[2,3] Although multimodal analgesia is almost always used in orthopedics trauma patients, there is still widespread under-treatment of pain after femur fractures.[4] Epidural analgesia, opioids, non-steroidal anti-inflammatory drugs (NSAIDs), and paracetamol are frequently used for multimodal analgesia but are not devoid of major complications.[4,5,6] Femur is supplied by femoral, obturator and sciatic nerve.[7] In search of better analgesics, the use of femoral nerve blocks (FNB) and supra-inguinal fascia iliaca compartment block (SFICB) for hip, femur, and knee injuries has increased with the advent of ultrasonography in anesthesia.[8] The Success rate of both FNB and SFICB is around 90% under ultrasound-guidance.[9,10] Some studies show the effective post-surgical analgesia after FNB and SFICB is similar and begin to decrease after 8 hours while some studies show FNB has significantly shorter effective analgesia than SFICB.[2,11] There are limited studies that compare

the post-operative analgesic effect of FNB and SFICB in femur fracture surgeries. As per today's need, in this study, we compared the two blocks for their post-operative analgesic superiority, along with the patient satisfac-tion they provide.

METHODS

This comparative study is a prospective double-blinded study, conducted from 21 September 2023 to 4 April 2024 in Nepalgunj Medical College Teaching Hospital, Nepalgunj. This study was conducted in patients who were operated for all types of femur fractures and belonging to ASA I-II, after obtaining institutional review committee permission and patient' consent. Patient were randomly assigned into the two groups with 1:1 ratio, after doing concealment with sequential numbered opaque sealed envelope technique.

Sample size calculation: The study by Gupta M and Kamath SS was used as a sample size calculation reference.[11] Sample size calculation was done with a formula for a two independent groups comparative study with continuous outcome, taking 95% confidence interval, 80% β power, and 10% dropout rate.[12]

Sample size: 2 SD2 (Z α/2 + Z β)2 / d2 = 37 each group

In our study, the primary objectives were to compare the time duration for the requirement of the first analgesic after the block and patient satisfaction, regarding analgesia for the first 24 hours, between the two groups. The comparison of visual analogue scale score and the variability of pulse rate and mean arterial pressure from their baseline values, between the two groups, at different time intervals were taken as the secondary objectives.

Inclusion Criteria:

•Femur fracture of all types

•ASA I-II

•16 years - 85 years

•Patients planned for spinal anesthesia

Exclusion criteria:

•Patient not giving consent for the procedure

•Local infection at the injection site

•Allergic to local anesthetic drugs

•Poly Trauma

•Patient dependent on narcotics, alcohol

•Patient difficult to communicate

•Patient on antipyretics, antidepressants and antipsy chotics.

After obtaining written consent, all the patients included in the study had routine pre-anesthetic checkups and routine premedication. On arrival to the operation room, their vitals were monitored, preload was done and spinal anesthesia was given with 2.7 ml bupivacaine. Intraoperative monitoring was continued. Once the surgery was over, under an aseptic technique, either ultra-sound-guided FNB or SFICB, with standard volume and concentration for each group was given to the patients by an experienced anesthesiologist.

Group 1-Femoral nerve block with 15 ml of 0.25% Bupivacaine

Group 2-Supra-inguinal Fascia iliaca compartment block with 30 ml of 0.25% Bupi-vacaine

The patients were blinded to the block type, as there was no pain during the blocks, due to spinal effect. After the blocks were given, the patients were shifted to the post-operative ward. The anesthesiologist was also blinded, as patients' vitals and VAS scores were recorded and noted in a proforma sheet by trained nurses at 30min, 1hr, 2hrs, 12hrs and 24hrs postoperatively. Patients' satisfaction was recorded with a scale from 0 (unsatisfied) to 5 (extremely satisfied), as per the Likert Scale of satisfaction after 24 hours. Any complications that occurred were recorded.

1	Extremely Not Satisfied
2	Not Satisfied
3	Moderately Satisfied
4	Very Satisfied
5	Extremely satisfied

Table I: Five-point Likert Scale for Satisfaction[13]

Statistical Analysis:

Data was analyzed with SPSS. T-test was applied for continuous data to compare the groups and either the chi-square test or Fisher's exact test (when more than 20% of cells had expected cell counts less than 5) was applied for ordinal data for comparing the two groups. Repeated measure ANOVA test was used for repeated measurements within each group.

RESULT

The demographic profiles between the two groups were comparable. The mean age in group 1 was 50 and in group 2 was 47, and statistically indifferent with a p-value of 0.583. Both groups had a higher number of males than females. The male:female ratio in group 1 was 23:14 and in group 2 was 28:9 and in total 51:23. Groups compared with Pearson 'Chi-square test, showed significant value of .209.

S.N		Group 1	Group 2	P value
1	Duration of Analgesia in minutes	538±295	795±376	.002
2	VAS at first Analgesia	4.46±1.23	4.30±1.19	.569

Table II: Comparison of duration of analgesia and VAS score at the first analgesia, between the groups (T-test)

Duration of analgesia was significantly greater in group 2 whereas VAS score was similar in both groups.

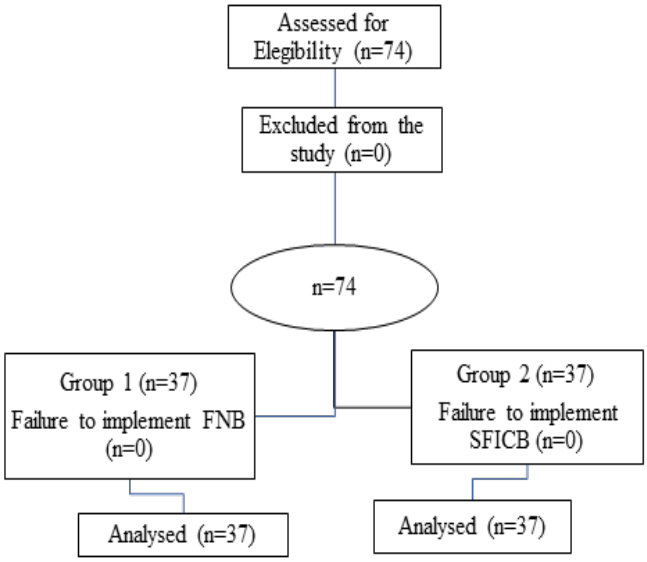

Figure 1: Flow diagram

			Group		Total	Exact sig. (2-sided)
			1	2		
Level of Satisfaction	2	Count	1	2	3	
		% within Group	2.7%	5.4%	4.1%	
	3	Count	11	5	16	
		% within Group	29.7%	13.5%	21.6%	.249
	4	Count	16	15	31	
		% within Group	43.2%	40.5%	41.9%	
	5	Count	9	15	24	
		% within Group	24.3%	40.5%	32.4%	
Total		Count	37	37	74	
		% within Group	100.0%	100.0%	100.0%	

Table III: Comparison of the level of satisfaction between the groups (Fisher's exact test)

Although the difference in level of satisfaction between the group was statistically not significant, the percentage of level 5 satisfaction was higher in group 2.

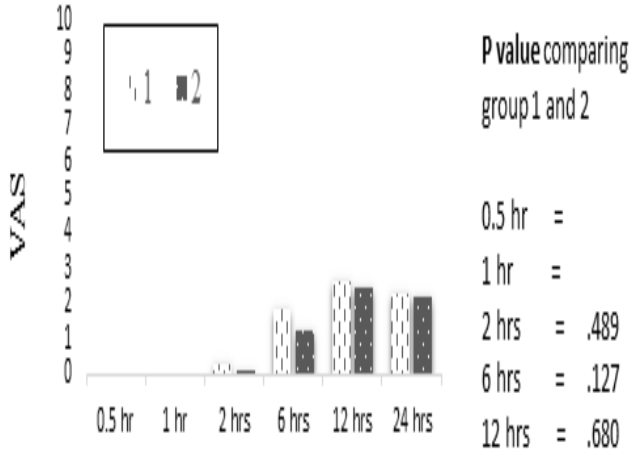

Figure 2: Comparison of VAS score at different time intervals between groups (T test)

VAS score at different time intervals between the groups was statistically not significant.

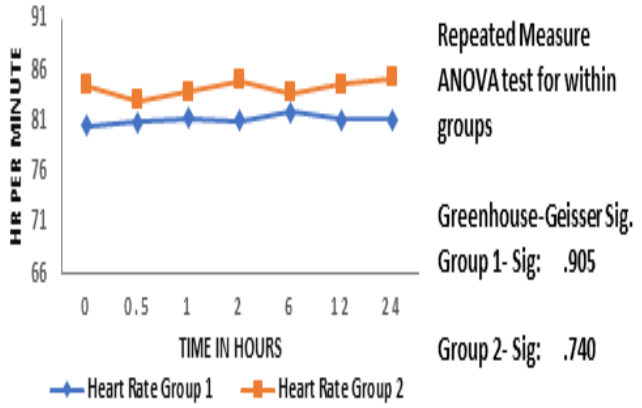

Figure 3: Comparison of heart rate at different time intervals within and between groups (Re-peated measure ANOVA test)

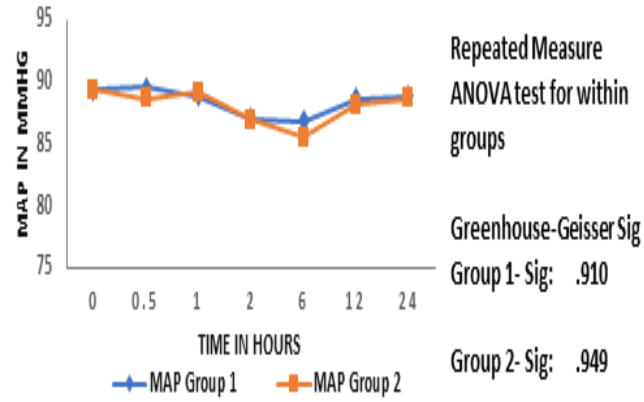

Figure 4: Comparison of mean arterial pressure at different time intervals within and between groups (Repeated measure ANOVA test)

The heart rate and the mean arterial pressure were statistically similar within each group at the recorded time intervals.

DISCUSSION

Opioids, although considered good analgesics, when used as a part of multimodal analgesia for optimal pain control, are frequently associated with hypoxemia, hypotension, nausea, vomiting, and delayed hospital discharge.[14] Analgesia with opioid-sparing effects, such as epidural analgesia, peripheral nerve block, periarticular injection, local infiltration of local anesthetic solution, NSAIDs, and acetaminophen, for post-operative analgesia have been recommended by enhanced recovery after surgery (ERAS) protocols.[15] NSAIDS are associated with peptic ulcers, gastroin-testinal bleeding and nephrotoxicity.[6] Epidural analgesia although very effective for postoperative pain, has disadvantages of urinary retention, hypotension, and bilateral muscle weakness.[4] Hence, Peripheral nerve blocks are being effectively used as an alternate method for post-operative pain control. It has been shown that peripheral nerve block accelerates rehabilitation, reduces systemic analgesic doses, and shortens hospital stays.[16]

In our study, the duration of analgesia in group 1 was 538± 295 minutes, and in group 2 was 795± 376 minutes i.e. 8.96 ± 4.91 hrs vs 13.25 ± 6.2 hrs. The difference was statistically significant with a p-value of .002. Similarly, in a study done by Gupta M et al in 70 patients who underwent proximal femur fracture surgeries, the mean first rescue analgesia time for the FICB was 7.1 ± 2.1 hours, while for the FNB it was 5.2 ± 0.7 hours. The P value was less than 0.001, which was statistically significant.[11]

In contrast to our study, a study by Shukla U et al in 105 patients posted for DHS and PFN were given either FNB or infrainguinal FICB. They found that the first requirement of analgesic in the FNB group was 8.24±1.880 hrs and in the infrainguinal FICB group was 8.09±1.869, which had statistically no significant difference, with a p-value of 0.72.[2]

In our study, though group 1 patients' had predominantly 3 and 4 levels of satisfaction, group 2 had mostly 4 and 5 levels of satisfaction. When a statistical comparison was made, there was no significant difference in overall level of satisfaction between the groups. The p-value was .249. This study is consistent with the meta-analysis by Li XD et al which included 13 trials. They concluded no significant difference occurred in patients' level of satisfaction between the groups with a P value of 0.99.17 In the same meta-analysis, VAS scores recorded at different time intervals during the first 24 hours of post-block were statistically indifferent, except at 4 hours where a decrease of the VAS score was seen in the FICB group.[17] Similarly, in our study, the 24-hour VAS score when compared did not show any statistically significant difference between the two groups with p values .489, .127, .680, and .663 at 2 hours, 6 hours, 12 hours and 12 hours post block. VAS was 0 in both groups, at the time of block injection, at the first half hour and one hour post block, which could be due to persistent spinal effect.

VAS at the time of the first analgesia in Group 1 was 4.46±1.23 and in Group 2 was 4.30±1.19. the difference was statistically not significant, with a p-value of .569.

The post-operative heart rate and mean arterial pressure taken at 2-hour intervals during the first 24 hours within each femoral block group and fascia iliaca compartment block group were statis-tically not different in a study done by Gupta M et al.[11] Similarly, repeated measure ANOVA test applied within each group of our study showed no significant statistical variability in the heart rate and the mean arterial pressures in the first 24 hours.

No local anesthesia and block-related complications were seen in either group, similar to the study done by Shukla U et al.[2]

LIMITATIONS

No control group was made in our study. It is better to do other studies where a control group is also added along with the block groups for comparison.

CONCLUSION

Supra-inguinal fascia iliaca block provides a longer duration of analgesia than femoral nerve block in femur fracture fixation. The level of satisfaction regarding analgesia in both groups is high but comparable. No significant side effects are seen with either block type.

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