ORIGINAL ARTICLE

Nepal Orthopedic Association Journal
NOAJ

Fascia Iliaca Compartment Block for Alleviating Pain During Positioning for Spinal Anaesthesia in Patients with Hip or Proximal Femur Fractures

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https://doi.org/10.59173/noaj.20261202j

Abstract

Background: Patient positioning for performing subarachnoid blockade in hip or proximal femur fracture patients causes extreme pain which may require substantial amount of analgesic for patient cooperation and success of block. This study aimed to assess the analgesic efficacy of fascia iliaca compartment block (FICB) to alleviate pain during positioning of spinal anaesthesia in hip or proximal femur fracture patients undergoing surgery.

Methods: This was a randomized, controlled prospective study. Sixty patients between 18 and 90 years, of either sex, ASA PS I to III posted for hip or proximal femur fracture surgery having pain of numerical rating scale (NRS) more than three. In group I, FICB was given thirty minutes prior to spinal anaesthesia, whereas group II patients did not receive any block. Injection Fentanyl 1mcg/kg IV was given during positioning if NRS score was four or more in both groups. Heart rate, SPO2, MAP, NRS at the time of positioning, time to perform spinal anaesthesia, ease of positioning, and number of rescue analgesia were recorded.

Results: The mean NRS score was reduced from 7.53 to 2.40 in group I and from 7.07 to 5.40 in group II during positioning for spinal anaesthesia which was statistically significant (P-value < 0.001). Similarly, the mean time to perform spinal anaesthesia was 61.57 second in group I and 114.60 second in group II which was statistically significant (P<0.001).

Conclusion: FICB effectively provides analgesia to alleviate pain during positioning for spinal anaesthesia in patients with hip or proximal femur fracture surgeries.

Keywords: Fascia iliaca compartment block, Positioning, Proximal femur fracture, Spinal Anaesthesia.

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Introduction

The estimated annual prevalence of hip fractures globally is expected to reach 4.5 million by 2050.[1] Regional anaesthesia is most frequently used anaesthetic technique for femoral fractures surgeries which is associated with lower mortality and pulmonary complications compared to general anaesthesia.[2] However positioning of these patients for spinal anaesthesia is troublesome and is extremely painful. Adequate pain relief before administering spinal blockade increases patient's cooperation which can be provided in the form of systemic analgesics, local anaesthesia, or femoral nerve block. Fascia iliaca compartment block (FICB) is another modality that produces a more intense analgesic effect than other modalities to facilitate the sitting position for spinal anaesthesia.[3] Unlike opiates, FICB has less incidence of side effects associated with systemic analgesics. Hence, our study aimed to assess the analgesic efficacy of fascia iliaca compartment block to alleviate pain during positioning of spinal anaesthesia in hip or proximal femur fracture patients undergoing surgery.

Methods

This prospective comparative study was conducted from March 2019 to February 2020 after obtaining ethical approval [295(6-11-E)2/075/076] from the Institutional Review Committee of Institute of Medicine (IOM), Kathmandu. To detect difference of 1 unit in NRS between two groups and using larger standard deviation value of NRS at the time of positioning during spinal anaesthesia (0.96 in previous studies),[3] and using formula $n= 2 (Z_a +Z_b)^2 S^2/ d^2 =2(1.96+1.65)^2 (0.96)^2/ (1)^2 = 24.02 = 25$ per group where, Za =1.96 at 95% confidence interval (CI), Z_b =1.65at 95% power, S =Pooled standard deviation (0.96), d =Mean difference of one unit (1).The study enrolled 30 patients in each group adding chances of 10% for losses. Sixty patients of ages 18-90 years, either sex, ASA PS I to III, posted for hip or proximal femoral surgery under spinal anaesthesia having NRS > 3 preoperatively were included in the study. Exclusion criteria were patient refusal, any other bone fractures, dementia, non-verbal patient, contraindication to spinal anaesthesia, known allergy to study drug. Informed consent was taken.

Patients were transferred to pre-operation room one hour prior to surgery and IV access was secured with 18 G cannula. Baseline vitals (HR, MAP and SpO2) and baseline NRS score were recorded. The patients were randomly assigned into two groups using the lottery system. The patients were asked to choose among the two folded chits mentioning the group number I or II.Group I patients received FICB with 30ml of 0.25% Ropivacaine using a linear ultrasound probe (HFL38xi/13-6 MHz of Sonosite Edge II) 30 minutes prior to spinal anaesthesia. All the blocks were performed by an experienced anaesthesiologist. Patients in Group II were transferred to operation theatre without any intervention.

Vitals parameters were recorded again. The patients were then kept in sitting position for spinal anaesthesia. If NRS score was four or more, injection fentanyl 1mcg/kg was given as rescue analgesia and repeated after 5 minutes if required. After obtaining the comfortable and appropriate sitting position, spinal anaesthesia was performed. NRS score at the time of positioning during spinal anaesthesia, time required to perform spinal anaesthesia defined as time between insertion of the spinal needle to complete deposition of drug in the subarachnoid space were noted. The ease of patient positioning during spinal anaesthesia was subjectively rated as unsatisfactory, good or optimal and any complications related to FICB throughout the perioperative period were recorded. All the data were collected by investigator who was involved in patient management but not aware of performance of FICB.

Data were collected in a preformed data collection sheet. The statistical analysis of data was done by using SPSS 20. Independent t-test was used to compare age, weight, NRS score, time to perform spinal anaesthesia, heart rate and blood pressure in two groups. Fisher exact test was used to compare ease of positioning and number of rescue analgesia in two groups. Chi square test was used to compare ASA PS and sex in two groups. P-value of < 0.05 was considered statistically significant.

Results

Total of 60 patients were studied (30 in each group). The age, weight, sex and ASA PS of the patients in the two groups were comparable (Table 1,2,3).

The NRS scores in preparation room thirty minutes before spinal anaesthesia were comparable in two groups. The mean NRS score in group I was 7.53 with SD 1.28 and that of group II was 7.07 with SD 1.36 without statistical significance with p-value of 0.177. After FICB, at the time of positioning during spinal anaesthesia the mean NRS score in group I was 2.40 with SD 1.00 and that of group II was 5.40 with SD 1.35 with statistically significant P-value of <0.001 (Table 4). However, the NRS score in group II was decreased from 7.07 to 5.4 which was statistically significant as well.

The ease of positioning was obtained as unsatisfactory, good and optimal during spinal anaesthesia. In group II, 21 out of 30 (70%) patients obtained unsatisfactory, whereas in group I, 5 out of 30 (16.7%) patients obtained unsatisfactory position. The optimal position was obtained in 3 patients in group I, whereas optimal position was not obtained in group II. In group I, 22 out of 30 (73.3%) patients fell in good position category, whereas 9 out of 30 (30%) patients fell in this category which was statistically significant (P-value<0.001) (Table 5)

Time to perform spinal anaesthesia within 61.57 second in the group I compared to 114.60 second

Table 1. Age and weight distribution of patients

	Group I (n=30)	Group II (n=30)	P-value
	Mean (SD)	Mean (SD)	
Age (years)	63.60 (15.76)	60.57 (16.45)	0.469
Weight (Kg)	58.73 (5.75)	59.90 (6.21)	0.453

Table 2. Sex wise distribution of patients

	Group I (n=30)	Group II (n=30)	P-value
Female	16(53.3%)	17(56.7%)	0.795
Male	14(46.7%)	13(43.3%)	

Table 3. ASA PS wise distribution of patients

	Group I (n=30)	Group II (n=30)	P-value
I	18(60%)	22(73.3%)	0.273
II	12(40%)	8(26.7%)	

Table 4. NRS score in preparation room thirty minutes before, and at the time of positioning during Spinal Anaesthesia (SA)

NRS	Group I (n=30)	Group II (n=30)	P-value
	Mean (SD)	Mean (SD)	
30 minutes before SA	7.53 (1.28)	7.07 (1.36)	0.177
At the time of positioning during SA	2.40 (1.00)	5.40 (1.35)	<0.001

Table 5. ASA PS wise distribution of patients

Ease of Positioning	Group I (n=30)	Group II (n=30)	P-value
Unsatisfactory	5(16.7%)	21(70%)	<0.001
Good	22(73.3%)	9(30%)	
Optimal	3(10%)	0(0%)	

in the group II which was statistically significant with the P-value of <0.001 (Table 6).

In group I, 27 out of 30(90%) patients did not receive rescue analgesia, whereas in group II only 2 out of 30 (6.7%) patients did not receive rescue analgesia. In group II, 9(30%) out of 30 patients required rescue analgesia twice but not a single patient required rescue analgesia twice in group I (Table 7).

There were no adverse effects related to FICB in patients post-operatively.

Table 6. Time to perform Spinal Anaesthesia (SA)

Parameter	Group I (n=30)	Group II (n=30)	P-value
	Mean (SD)	Mean (SD)	
Time to perform SA (secconds)	61.57 (6.67)	114.60 (14.89)	<0.001

Table 7. Rescue analgesia in group I and group II

Number of Rescue Analgesia	Group I (n=30)	Group II (n=30)	P-value
0	27(90%)	2(6.7%)	<0.001
1	3(10%)	19(63.3%)	
2	0(0%)	9(30%)	

Discussion

In the present study analgesic efficacy of ultrasound guided single shot fascia iliaca compartment block to alleviate pain during positioning for spinal anaesthesia in patients with hip or proximal femur fracture patient was assessed.

The demographic characteristics of the patients in both the groups were comparable in our study. There was no significant difference in patient distribution in terms of age, weight, sex, ASA PS and hemodynamic parameters.

The mean NRS score in preparation room thirty minutes prior to spinal anaesthesia in group I was 7.53 and in group II was 7.07 which was not statistically significant (P-value=0.177). The mean NRS score at the time of positioning during spinal anaesthesia in group I was reduced to 2.40, whereas in group II, it was 5.40, which was statistically significant (P-value <0.001). The clear difference in NRS between FICB group and group that did not receive any block before spinal anaesthesia showed the efficacy of FICB by alleviating the pain in patients with hip and proximal femoral fractures during positioning for spinal anaesthesia. Similar result was obtained in a study conducted by M. Sendilmurukan et al.[4] where they compared FICB with IV fentanyl and found statistically significant difference in relation to NRS

score during positioning between FICB group (mean=1.13, SD=1.25) and fentanyl group (mean=2.27, SD=1.55). The mean NRS score during positioning was significantly lesser in FICB group compared to fentanyl group by a mean difference of 1.13 scoring points (50% lesser). This difference was significant with a P-value of 0.0029. In a similar study by Diakomi M et al.[5] the mean NRS score in IV fentanyl group was 7.5 (SD: 2.4), whereas in group FICB was 3.2 (SD: 1.8) which was statistically significant (P-value <0.001). Though their drug concentration, volume and technique were different, results in this study were similar to ours. Similar result was seen in the study conducted by M.J. Yun et al.[6] and the study compared the analgesic effect of FICB with that of IV alfentanil which showed NRS score at the time of positioning was lower in FICB group than IV alfentanil group [2.0 (1-4) vs 3.5 (2-6); P<0.001]. In their study, FICB was done twenty minutes before spinal anaesthesia, whereas in our study FICB was done thirty minutes before spinal anaesthesia. Similarly, the study conducted by Madhubushi R et al.[7] found NRS score reduced significantly in both groups. However the drop in NRS score after procedure was significantly higher in FICB group in comparison to IV fentanyl group. The technique (landmark vs ultrasound) and Ropivacaine concentration (0.375% vs 0.25%) used were different in their study compared to our study. The study conducted by N.J. Kacha et al.[3] compared the analgesic effect of fascia iliaca compartment block for positioning of patients with hip and proximal femur fractures by using 30ml of 0.25% ropivacaine in group I vs sham block with 30ml of normal saline in group II. The mean NRS score before FICB was 8.02 in group I which reduced to 2.28 while positioning during spinal anaesthesia, whereas in group II the mean NRS score was reduced from 7.98 to 7.90 only.
FICB provides good analgesia as well as paralysis of some muscle (quadriceps) groups.[7] This result shows that FICB alleviates the pain during spinal anaesthesia in patients with hip or proximal femur fracture. In our study FICB group patients were placed comfortably for spinal anaesthesia as compared with the patients who did not receive FICB. This has been observed by the time to perform spinal anaesthesia in the two groups. Mean time to achieve spinal anaesthesia was shorter in the FICB group compared to group II [61.57 seconds versus 114.60 seconds] which was statistically significant (p-value of <0.001). Similarly, a study conducted by Ghimire A et al.[8] showed that the time required to perform spinal anaesthesia was shorter in FICB group than in femoral nerve block group (109.6±28.2 seconds versus 134.8±31.9 seconds; P<0.05). In a study conducted by M.J. Yun et al.[6] the mean (SD) time to achieve spinal anesthesia was shorter in the FICB group compared with another group of patients who received IV alfentanil (6.9±2.7 min versus 10.8±5.6min, p=0.009). The total duration of time to perform spinal anaesthesia was shorter in our study as compared to their study because we defined time required to perform spinal anaesthesia as time between insertion of spinal needle to complete deposit of drug in the subarachnoid space, whereas in their study they defined total duration of spinal anaesthesia as started from painting to complete deposition of drug in the subarachnoid space.

In our study the ease of patient positioning were found mostly good in group I (FICB group) which was 73.3%, whereas it was only 30% in group II. In group II, 70% patients fell in unsatisfactory ease of positioning. The optimal ease of positioning was also achieved in 10% of patient in FICB group, whereas none were found in group II. The study conducted by Diakomi M et al.[26] showed that the quality of patient positioning was better in FICB group than the IV fentanyl. Similarly the study conducted by Kumar D et al.[9] showed that the positioning during spinal anaesthesia after receiving ultrasound guided FICB with 30ml of 0.5% ropivacaine was unsatisfactory in 4%, satisfactory in 10%, good in 50% and excellent in 36%.
The number of rescue analgesia required during positioning was less in FICB group compared to the patient who did not receive FICB. In our study 90% patient in group I did not require rescue analgesia, whereas most of the patients required rescue analgesia either once or twice in group II.

There was no significant change in hemodynamic parameters and no reported cases of local anaesthetic systemic toxicity of ropivacaine, infection, temporary or permanent nerve damage or any others complications noted throughout the study period.

Conclusion

Fascia iliaca compartment block alleviates pain during positioning for spinal anaesthesia in patients with hip or proximal femur fracture patients undergoing surgical management under spinal anaesthesia without any significant complications.The parameters like ease of positioning during subarachnoid block and time to perform spinal anaesthesia were also significantly improved in patients who received fascia iliaca compartment block hence improving overall quality and efficiency of care.

Conflict of interest: None
Source of Funding: None
Acknowledgement: None

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