International Journal of Medical Anesthesiology

E-ISSN: 2664-3774
P-ISSN: 2664-3766
www.anesthesiologypaper.com
IJMA 2020; 3(1): 236-240
Received: 10-11-2019
Accepted: 12-12-2019

Noopur Dasmit Singh
Department of Anesthesiology, Shrimati Kashibai Navale Medical College and General Hospital, Pune, Maharashtra, India

Poonam Sachin Ghodki
Department of Anesthesiology, Shrimati Kashibai Navale Medical College and General Hospital, Pune, Maharashtra, India

Corresponding Author:
Poonam Sachin Ghodki
Department of Anesthesiology, Shrimati Kashibai Navale Medical College and General Hospital, Pune, Maharashtra, India

Ultrasound guided fascia iliaca compartment block versus femoral nerve block for positioning for spinal anesthesia in patients with hip fracture

Noopur Dasmit Singh and Poonam Sachin Ghodki

DOI: https://doi.org/10.33545/26643766.2020.v3.i1d.94

Abstract
This was a prospective, randomized, double blind study. Group FICB (n=30) received ultrasound guided Fascia iliaca compartment block and group FNB (n=30) received ultrasound guided Femoral nerve block using a mixture of 2% lignocaine adrenaline and 0.25% bupivacaine. For data analysis, t test, Mann Whitney test and Chi-square test were applied. While positioning the patients for spinal anaesthesia, the mean NRS scores for pain were lesser in Group FICB as compared to Group FNB (p value 0.030). Also, a higher number of patients could be positioned optimally in the FICB group as compared to the FNB group. (p value 0.0449). Ultrasound guided FICB is more effective in relieving the pain of positioning for spinal anaesthesia than the ultrasound guided FNB in patients of hip fractures. The anaesthetist's satisfaction regarding the quality of patient positioning is also more with FICB.

Keywords: Nerve block, hip fractures, patient positioning, spinal, ultrasonography

1. Introduction

Positioning geriatric patients with hip fractures in either sitting or lateral decubitus position for administering spinal anaesthesia is quite often extremely painful for the patients. Already there are technical difficulties in giving spinal anaesthesia to these elderly patients who may have fibrosclerosis, reduced intervertebral spaces, poor flexibility, confusion etc. and inadequate positioning only adds to the travails of the anaesthetist. Giving optimum position for spinal anaesthesia maybe extremely painful for these patients and the neurohormonal stress response which is provoked may produce undesirable consequences like tachycardia, high blood pressure and arrhythmias [1]. This could be hazardous in these patients who often have comorbidities like ischaemic heart disease, diabetes, hypertension, chronic respiratory diseases etc.

To reduce this pain, analgesia is provided by conventional modes of pain relief like non-steroidal anti-inflammatory drugs (NSAIDs), opioids and also by peripheral nerve blocks like the femoral nerve block, 3 in 1 block and the fascia iliaca compartment block [2, 3]. But opiates may produce respiratory depression, confusion, drowsiness, nausea and vomiting[3].

The use of femoral nerve block for effective analgesia in the peri-operative period and to reduce other analgesic requirements in these patients was described in as early as 1973 [4, 5]. Administering FICB pre-operatively has been reported to alleviate this pain and to make it easier to position the patient comfortably and satisfactorily for giving neuraxial block [6, 7]. The use of ultrasound guidance has made the techniques of giving FNB and FICB easy and accurate as we can visualize the needle tip, reach the target under vision and observe the spread of the drug.

The present study was undertaken to compare the efficacy of FNB and FICB in patients of hip fractures for facilitating the positioning of patients for neuraxial blocks, increasing the patient satisfaction and assessing the comfort of the anaesthesiologist while administering the block.

2. Material and Methods

This was a prospective, randomized, controlled, double blind study carried out after obtaining institutional ethics committee approval and written informed consent from all patients.

All patients underwent pre-anaesthesia check-up. The study was conducted from July 2018 to June 2019 and was compiled in accordance with the consolidated standards of reporting trials CONSORT guidelines.

ASA Grade I and II patients of either sex between the ages of 35 to 75 years scheduled for hip fracture repair surgeries viz. Dynamic Hip Screw DHS, Inter- trochanteric fractures or Proximal Femoral Nail (PFN) implantation were included in this study. Patients refusing spinal anaesthesia and patients with peripheral neuropathy, mental disorders, ischaemic heart disease, valvular heart disease, diabetes mellitus, COPD, morbid obesity and coagulation disorders were excluded from the study.

Allowing an alpha error of 0.05, a beta error of 0.20 and a power of 0.80, it was estimated that, to show a 25% difference in pain scores between the two groups at positioning, a minimum of 12 patients per group would be required. Most of the studies included at least 30 patients in each group to show significant results. Therefore we included sixty patients in our study who were randomly allocated into two groups of thirty each:

Group FICB

Group FNB

Vitals were checked in the pre-operative room. On arrival in the operation theatre, Numeric Rating Scale (NRS) scores (0 indicative of no pain to 10 maximal pain) were clearly explained to the patients. Peripheral vascular access was obtained with an 18G intravenous cannula in all patients. Ringer lactate infusion was started at a rate of 5ml/kg per hour and a face mask providing supplemental oxygen (5 l/min) was applied. No sedative or analgesic medications were administered. Blood pressure, heart rate and peripheral oxygen saturation were checked by non-invasive methods and monitored in all patients.

Under all aseptic precautions, a trained anaesthetist gave a USG guided block, either FICB or FNB to patients randomized as per computer generated numbers. Each patient received a prick but was unaware of the type of block.

2.1 Techniques: The blocks were performed with dynamic sonographic guidance utilizing a Sonosite Nanomaxx high-frequency 5-10 MHz linear transducer using sterile technique. The procedures were performed with the patients in the supine position 15 minutes before positioning for spinal anaesthesia. All blocks were performed by experienced anesthetist; not involved in the study.

2.1.1 FICB: A line was drawn between the pubic tubercle and the anterior superior iliac spine. A point dividing this line into medial two thirds and lateral one third was marked. The USG probe was placed in a transverse orientation on the thigh 1cm below this point. The two fascial planes, the fascia lata and the fascia iliaca were sonographically visualized as two hyperechoic lines. The femoral artery and the iliacus muscle lateral to it, covered by the fascia iliaca, were identified. A 22 gauge needle was introduced through the skin in a lateral to medial orientation and directed in parallel with the transducer to allow visualization of the full length of the needle throughout the procedure. The needle tip was visualized penetrating the fascia lata and then the fascia iliaca (appreciating the give way as the fascia was perforated). After puncturing the fascia iliaca, 10ml of 2% lignocaine-adrenaline and 20ml of 0.25% bupivacaine was injected with concomitant pressure applied caudally to the puncture site in order to favour proximal spread of the local anaesthetic. An expanding anechoic collection just below the fascia iliaca is visual confirmation of correct placement of the anaesthetic drug. After needle withdrawal, a brief massage is given to the region in a distal to proximal direction, in order to assist diffusion of the local anaesthetic to the fascia iliaca compartment.

2.1.2 FNB: The ultrasound probe was placed below the inguinal ligament to identify the femoral vessels and nerve in cross-section. A 22G needle was introduced at a 45 degrees angle in plane to the US probe and 20ml of the local anaesthetic solution (10ml of 2% lignocaine adrenaline and 10ml of 0.25% bupivacaine) was injected along the nerve sheath through this needle. The needle was directly visualized by ultrasonography throughout the procedure to ensure that the spread of the study drug was in the correct fascial plane. Immediately after the injection, manual pressure was held for 5 min, 1cm below the injection site.

Fifteen minutes after the intervention, the patients were helped into the sitting position. The anaesthesiologist who gave the spinal anaesthesia was unaware of the group allocation. This was done to ensure double blinding.

The quality of patient position maintained for spinal anaesthetic block placement was recorded (0-not satisfactory, 1-satisfactory, 2-good,-optimum). The NRS scores before and during patient positioning and the quality of patient position was recorded by the anaesthesiologist who performed the spinal block. It was planned to give Inj. Fentanyl 2 mcg/kg IV as rescue analgesia and the number of patients demanding rescue analgesia was also recorded.

Post-intervention, the patient was monitored for heart rate, blood pressure, oxygen saturation and electrocardiogram as per ASA monitoring standards till patient was shifted to the ward from recovery.

3. Results

Sixty patients were enrolled in our study. Spinal anaesthesia could be administered to all the patients successfully. None of the patients required a rescue analgesic for positioning for spinal anaesthesia.

Data were expressed in terms of mean ± SD or median. Comparison between groups was done using Students t-test for continuous variables and Chi-square test for categorical variables. For NRS scores, comparison between two groups was done by the Mann-Whitney U test. Results were considered statistically significant for p values <0.05. Data were analysed using software Epi info v 7.0 and Primer of Biostatistics.

Demographic profile of the two groups was comparable. (Table 1)

Table 1: Demographic characteristics of patients in the two groups

Demographics	Group FICB (n = 30)	Group FNB (n= 30)	P; significance
Age (in Years)	59.23 ± 14.29	60± 13.45	0.831;NS
Sex Ratio (%)			0.542;NS
Male	24(80)	22(73.33)	
Female	06(20)	08(26.7)	
Weight (in kg)	63.33 ± 9.44	64.40 ± 9.40	0.663;NS
ASA (%)			0.781;NS
Grade-I	21(70)	20(66.7)	
Grade-II	9(30)	10(33.3)	

Table 2 shows comparison of NRS pain scores at three stages
1. Before intervention.
2. Just before positioning for spinal anaesthesia.
3. While positioning for spinal anaesthesia.

Table 2: Comparison of NRS between the two groups

NRS at	Group (N=30)	NRS											P Value
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
Before intervention	FNB	0	0	0	0	1	5	14	9	1	0	0	NS
	FICB	0	0	0	0	1	8	10	11	0	0	0	
Just before positioning	FNB	0	0	0	0	0	4	15	11	0	0	0	0.559 (NS)
	FICB	0	0	0	0	1	7	11	11	0	0	0	
While positioning	FNB	0	0	4	8	9	7	2	0	0	0	0	0.030 (Significant)
	FICB	0	0	10	8	10	1	1	0	0	0	0	

Table No. 2 shows that the median NRS was comparable in both the groups before intervention. There was no statistical difference in NRS just before positioning (p 0.559). However, the difference in NRS while positioning was statistically significant (p 0.030). While positioning, the patients in the FICB group were more pain free as compared to the patients in the FNB group.
The third parameter that we studied was the anaesthetist's satisfaction with the quality of patient positioning for spinal anaesthesia.
Anaesthetist's Satisfaction for quality of patient positioning was calculated in the form of score
Not satisfactory-0 Good -- 2
Just satisfactory-1 Optimum -- 3

Any score more than or equal to 2 was considered as optimal positioning and any score below 2 was considered suboptimal.

Table 3: Comparison of Anaesthetist's satisfaction with patient positioning

Group	Position		Total	P - value
	Optimal	**Suboptimal**		
FNB	18	12	30	0.0449
FICB	25	5	30	

Table 3 shows that there was statistically significant difference between the two groups. A higher number of patients could be positioned optimally in the FICB group as compared to the FNB group (p value 0.0449).
There was no statistically significant difference among the two groups with respect to the heart rate, MAP, SpO2 or adverse effects related to the blocks.

4. Discussion

Hip fracture is a common and serious injury in the elderly osteoporotic population with huge financial and social impact. These patients are often in severe pain. Transportation to the hospital and movements inside the hospital from casualty to radiology to ward, then to OT, all add to the pain. The pain is often underestimated and undertreated. This is because the patient may be confused or may have dementia, making communication difficult. Also, there is a tendency amongst practitioners to withhold adequate analgesia because of their concern about the possible side-effects of drugs in these frail patients.
As a result of unmitigated pain, patients may become delirious, hypoglycaemic and dehydrated, become hypertensive or develop cardiac ischaemia and arrhythmias.
Amongst the drugs used to provide analgesia to such patients, the non-steroidal anti-inflammatory drugs NSAIDs have undesirable effects on platelet function, kidneys and gastric mucosa [1]. Parenteral opioids have remained the mainstay for mitigating hip pain from fractures or after hip arthroplasty for long time now [3]. Intravenous Fentanyl has been extensively studied for facilitating positioning for spinal anesthesia in hip fractures with varied results [9]. Iamaroon *et al.*, using only bupivacaine, were unable to show any benefit of FNB over IV Fentanyl at 15 minutes [5]. Opioids, however tend to cause drowsiness, respiratory depression and nausea and vomiting. All these adverse effects can be avoided by using peripheral nerve blocks [3, 6, 7]. Sia *et al.* concluded FNB to be better for spinal anesthesia positioning as compared to fentanyl in femoral shaft fractures. We restricted our study only to include hip fractures and therefore decided to study and compare FNB versus FICB. The intense pain arising from proximal femur fractures like intracapsular neck fracture or intertrochanteric fracture involves the three main nerves namely the femoral nerve, the lateral femoral cutaneous nerve and the obturator nerve. Therefore a plain femoral nerve block, although easy, may not provide adequate analgesia.
The above mentioned three nerves run a considerable part of their course close to the inner aspect of the fascia iliaca[2]. Below the inguinal ligament, this space is continuous with the lacuna musculorum, covered by the fascia iliaca, the fascia lata and then the skin covering the femoral triangle. Injecting a sufficient amount of a solution in the lacuna musculorum and favouring its upward migration towards the iliacus muscle should result in a spread of the solution within the entire fascia iliaca compartment, thus allowing all the structures (especially the nerves) traversing this space to be contacted by the solution. Hence, by giving FICB, multiple nerves supplying the hip joint can be blocked with a single injection [6, 7, 9]. We gave USG guided blocks in order to increase the accuracy and decrease the complications in both the groups. Comparison of FICB and FNB has been extensively studied for comparing perioperative analgesia in total hip replacement surgeries (THR) with inconsistent results [4, 11, 12].
Many studies which have established the efficacy of the FICB for hip fracture patients in emergency department as well as before positioning for spinal anaesthesia using mainly plain bupivacaine [13, 14]. In our study, for both the types of blocks, we used a mixture of 2% lignocaine with adrenaline and 0.25% bupivacaine. Lignocaine has a faster onset of action as compared to bupivacaine. On the other hand, Bupivacaine has a longer duration of effect. In the OT, with a long list of cases, a faster onset is desirable. Therefore, we used the mixture, hoping to combine both the

benefits of faster onset and achieving minimum volume sufficient to spread proximally to block the target nerves. This agrees with our results as we got the onset within 15 minutes. Lignocaine gave faster onset of action and addition of 0.25% bupivacaine made up the sufficient volume. No such study with combination of drugs in this volume has been conducted in the past. This can explain the discrepancy in results in the study conducted by Neena Jain *et al.* comparing FICB and FNB in positioning.

There are certain limitations to our study. Firstly, we used only the sitting position for spinal anaesthesia, which can be given by the lateral approach also. From recent studies on FICB and various cadaveric studies it is now clear that obturator nerve is spared with FICB for most of the times, however the results are always better than FNB [16, 17, 18]. Suprainguinal approach to FICB is believed to target the hip articular fibers and provides a near total analgesia of the hip joint presumably [19]. This may be of more relevance in studying analgesia for total hip arthroplasty patients. We therefore studied the classical approach to FICB in our study for its safety and simplicity.

In our patients from both the groups, none exceeded NRS pain score of 7 post intervention, hence no rescue analgesia was needed. Those patients in whom NRS pain score did not reduce below 7 were considered as 'failed block'. Strikingly, in our study, we did not face any failed block as all the blocks were given under real time visualization using USG.

Thus, in our study, we found fascia iliaca compartment block to have significant advantages over the femoral nerve block. It is a relatively easy block and gives a definite approach for nerves supplying the hip. The distribution of analgesia was significantly better with this block. FICB provides an excellent mechanism to relieve pain of hip fractures thereby improving the quality of positioning for spinal anesthesia and simultaneously increasing the anesthetist comfort.

5. Conclusion: The Fascia iliaca compartment block (FICB) is more effective in relieving pain than the femoral nerve block (FNB). The anaesthetist's satisfaction regarding the quality of patient positioning is more with FICB. Thus, FICB can be used as a routine procedure for pain relief in hip fracture patients for positioning for spinal anaesthesia.

6. References

1. Lawrence, Valerie A *et al*. Medical complications and outcomes after hip fracture repair. Archives of Internal Medicine. 2002; 162(18):2053.
2. Guay J, Parker MJ, Griffiths R *et al*. Peripheral nerve blocks for hip fractures. Cochrane Database Syst Rev 2017; 5:CD001-159. [PMC free article] [PubMed] [Google Scholar]
3. Lindestrand AG, Christiansenml, Jantzen C, Van Der Mark S, Andersen SE. Opioids in hip fracture patients: an analysis of mortality and post hospital opioid use. Injury. 2015; 46(7):1341-1345. doi:10.1016/j.injury.2015.04.016. [PubMed] [CrossRef] [Google Scholar]
4. Fei D, Ma LP, Yuan HP, Zhao DX. Comparison of femoral nerve block and fascia iliaca block for pain management in total hip arthroplasty: a meta-analysis. Int J] Surg. 2017; 46:11-13. Doi: 10.1016/j.ijsu.2017.08.008. [PubMed] [CrossRef] [Google Scholar]
5. Iamaroon *et al*. Femoral nerve block versus Fentanyl: Analgesia for positioning patients with fractured femur. Local and Regional Anaesthesia, 2010, 21.
6. Madabushi R, Rajappa GC, Thammanna PP *et al*. Fascia iliaca block vs intravenous fentanyl as an analgesic technique before positioning for spinal anesthesia in patients undergoing surgery for femur fractures-a randomized trial. J Clin Anesth. 2016; 35:398-403. [PubMed] [Google Scholar]
7. Yun M, Han M, Park S *et al*. Analgesia prior to spinal block in the lateral position in elderly patients with a femoral neck fracture: A comparison of fascia iliaca compartment block and intravenous alfentanil. Eur J Anaesthesiol. 2009; 26:111. [Google Scholar]
8. Dolan J, Williams A, Murney E *et al*. Ultrasound guided fascia iliaca block: a comparison with the loss of resistance technique. Reg Anesth Pain Med. 2008; 33:526-31. [PubMed] [Google Scholar]
9. Mosaffa F, Esmaelijah A, Khoshnevis H. Analgesia before performing a spinal block in the lateral decubitus position in patients with femoral neck fracture: a comparison between fascia iliaca block and IV fentanyl. Reg Anesth Pain Med. 2005; 30:61-161. [Google Scholar]
10. Mostafa SF, Eid GM, Elkalla RS. Patient-controlled fascia iliaca compartment block versus fentanyl patient-controlled intravenous analgesia in patients undergoing femur fracture surgery ☆ Egypt J Anal Chem. 2018; 34(1):9-13. [Google Scholar]
11. Badica IC, Pavelescu D, Badica L, Barbilian R, Grintescu I. The efficacy of fascia iliaca compartment block (FICB) for postoperative analgesia after hip arthroplasty (HA) Reg Anes Pain Med. 2010; 35(5):E80. [Google Scholar]
12. Deniz S, Atim A, Kurklu M, Cayci T, Kurt E. Comparison of the postoperative analgesic efficacy of an ultrasound-guided fascia iliaca compartment block versus 3 in 1 block in hip prosthesis surgery. Agri. 2014; 26(4):151-157. Doi: 10.5505/agri.2014.76993. [PubMed] [CrossRef] [Google Scholar]
13. Steenberg J, Moller AM. Systematic review of the effects of fascia iliaca compartment block on hip fracture patients before operation. Br J Anaesth. 2018; 120(6):1368-1380. Doi: 10.1016/j.bja.2017.12.042. [PubMed] [CrossRef] [Google Scholar]
14. Diakomi M, Papaioannou M, Mela A *et al*. Preoperative fascia iliaca compartment block for positioning patients with hip fractures for central nervous blockade: A randomized trial. Reg Anesth Pain Med 2014; 39:394-8. [PubMed] [Google Scholar]
15. Jain N, Mathur PR, Patodi V, Singh S. A comparative study of ultra-sound guided femoral nerve block versus fascia iliaca compartment block in patients with fracture femur for reducing pain associated with positioning for subarachnoid block. Indian J Pain 2018; 32:150-4.
16. Eyi YE, Arziman I, Kaldirim U, Tuncer SK. Fascia iliaca compartment block in the reduction of dislocation of total hip arthroplasty. Am J Emerg Med. 2014; 32(9):1139. Doi: 10.1016/j.ajem.2014.06.007. [PubMed]

[CrossRef] [Google Scholar]
17. Shariat AN, Hadzic A, Xu D, Shastri U, Kwofie K, Gandhi K *et al*. Fascia lliaca block for analgesia after hip arthroplasty: a randomized double-blind, placebo-controlled trial. Reg Anesth Pain Med. 2013; 38(3):201-205. Doi: 10.1097/AAP.0b013e31828a3c7c. [PubMed] [CrossRef] [Google Scholar]
18. Bang S, Chung J, Jeong J, Bak H, Kim D. Efficacy of ultrasound-guided fascia iliaca compartment block after hip hemiarthroplasty: a prospective, randomized trial. Medicine. 2016; 95(39):e5018. Doi: 10.1097/MD.0000000000005018. [PMC free article] [PubMed] [CrossRef] [Google Scholar]
19. Stevens M, Harrison G, McGrail M. A modified fascia iliaca compartment block has significant morphine-sparing effect after total hip arthroplasty. Anaesth Intensive Care. 2007; 35(6):949-952. [PubMed] [Google Scholar].