e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(4); 197-208

Original Research Article

Evaluating Efficacy of Fascia Iliaca Compartment Block Preoperatively for Alleviating Pain of Positioning for Subarachnoid Block in Patients with Proximal Femur Fracture: A Prospective Randomized Clinical Study

Sandip Kumar S. Prajapati[1], Kumud Ganvit[2], Pinal Raj Bumiya[3], Nidhi Maru[4], Urviben Pravinbhai Patel[5]

[1]Resident Doctor, Medical College and SSG Hospital, Vadodara, Gujarat, India
[2]Associate Professor, Medical College and SSG Hospital, Vadodara, Gujarat, India
[3]Assistant Professor, Medical College and SSG Hospital, Vadodara, Gujarat, India
[4]Resident Doctor, Medical College and SSG Hospital, Vadodara, Gujarat, India
[5]Senior Resident, Medical College and SSG Hospital, Vadodara, Gujarat, India

Received: 16-01-2023 / Revised: 15-02-2023 / Accepted: 20-03-2023
Corresponding author: Dr Sandipkumar S. Prajapati
Conflict of interest: Nil

Abstract

Background: Femur fracture exhibits extreme pain doesn't allow ideal positioning for subarachnoid block. Adequate analgesia before administrating subarachnoid block will increase patient's cooperation. The aim of our study was to assess analgesic efficacy of fascia iliaca compartment block (FICB) for positioning for subarachnoid block in patients with proximal femur fracture.

Material and Methods: A Prospective randomized clinical study was carried out in 60 patients of 18-70 years of age, with ASA I - III surgery for proximal femur fracture and randomized into 2 groups of 30 patients each using sealed envelope method. Group FICB received the block with 40ml (15ml 0.5% Bupivacaine+ 15ml 2% Lignocaine with adrenaline (1:200,000) + 8ml sterile water+ 2ml Dexamethasone) using classical landmark technique, 20 minutes before positioning. Group IVP received injection paracetamol 1 gm IV 20 minutes before positioning. We observed visual analogue scale score (VAS) during positioning, time to perform spinal and postoperatively patient satisfaction, Time to first rescue analgesia, total number of rescue analgesics doses required in 1st 24 hrs post-operatively.

Results: VAS during positioning in group FICB: 2.1 ± 0.60 versus IVP 3.53 ± 0.57 (P<0.0001) resulting in lesser time to perform spinal anaesthesia & patient satisfaction was better in group FICB. Total number of rescue analgesics required in 1st 24 hrs in group FICB ;1.66±0.66 compared to group IVP; 2.56± 0.50(P<0.0001).

Conclusion: Fascia iliaca compartment block alleviates pain of positioning for subarachnoid block in patients with proximal femur surgeries. It also provides adequate analgesia in postoperative period with lesser requirement of rescue analgesics.

Keywords: Fascia Iliaca Compartment Block, Proximal Femur Fracture, Pain of Positioning, Subarachnoid Block.

Introduction

Fracture of the proximal femur causes severe pain, usually after trauma or a minor fall, and most commonly affects the neck, intertrochanteric, and subtrochanteric areas of the femur, resulting in significant morbidity [1]. Most fractures require surgical intervention, which can be performed under regional or general anaesthesia. In comparison to general anaesthesia, regional anaesthesia has been linked to lower morbidity and mortality [2]. Furthermore, regional anaesthesia has several advantages over general anaesthesia, including a lower incidence of sedation, nausea, vomiting, and post-operative respiratory events [3]. As a result, proximal femur fracture surgeries are carefully performed under regional anaesthesia. Positioning patients with fractured femurs for subarachnoid block is difficult because even the slightest overriding of the fracture ends is excruciatingly painful [1,4]. A painful stimulus emerges from the periosteum [1,5,6], resulting in an incorrect position for spinal anaesthesia and making it difficult even in patients with normal spines. Analgesia administered prior to positioning not only improves patient comfort but also facilitates positioning and successful spinal block [1]. Failure to adequately manage pain prior to surgical intervention increases sympathetic stimulation, which can lead to cardiovascular events during surgery, particularly in geriatric patients [6]. To provide analgesia as a technique to ease positioning before spinal anaesthesia, various drugs such as intravenous nonsteroidal anti-inflammatory drugs (NSAIDs) and opioids [1,4,5,7] or peripheral nerve blocks such as the classical femoral nerve block [5,7,8], 3-in-1 block [8,9], fascia iliaca block [1,4,10,11]. can be given. Even if opioids have been widely used, they can help with static pain relief but may be insufficient for dynamic pain [12]. Opioids can also cause respiratory depression, hypotension, dizziness, mental confusion, constipation, itching, urine retention, and nausea [13]. NSAIDs can cause epigastric pain, GI bleeding, and kidney damage [14].

Fascia iliaca compartment block is a superficial, simple, and less risky method of positioning patients prior to subarachnoid blockade, even in patients with impaired renal and respiratory function for whom opioids are not preferred [15]. Not only periosteum but also adductor muscle spasm cause pain in femur fractures, necessitating adequate blockage of the femoral nerve, obturator nerve, and lateral femoral cutaneous nerves [1,16]. As a result, we chose the fascia iliaca compartment block because it efficiently blocks all three essential lumbar plexus nerves [1]. As a result, we conducted this study to assess the analgesic efficacy of fascia iliaca compartment block in relieving pain associated with positioning for subarachnoid block in patients undergoing surgery for proximal femur fracture.

Material and Method

This prospective randomized clinical study was conducted between April and October 2022, after receiving ethical committee approval (Institutional Ethics Committee for Biomedical and Health Research, (IECBHR). No. IECBHR/12-2022 approved on January 11, 2022). CTRI/2022/04/041916 is the CTRI number. The sample size required in each group to achieve a power of 80% and a confidence interval of 95% was 28, which was close to 30. It was calculated using earlier studies and a 15% reduction in VAS score after giving block as the primary outcome variable (med calc software-Version 20.113) [4]. Criteria for inclusion in Patients ranged in age from 18 to 70 years old and had various types of proximal femur fractures. Patients with multiple fractures, bleeding diathesis, neuropsychiatric complaints, or who had received analgesics within the previous 8 hours were also

excluded from the study. All patients scheduled for elective or emergency proximal femur fracture surgery had a thorough pre-anesthetic evaluation that included a thorough history, general and systemic examinations, and airway and spine assessment. Routine and specific investigations (as indicated) were conducted. All of the patients who were chosen were thoroughly informed about the study's purpose, procedure, visual analogue scale, and potential side effects. We obtained written and informed consent. After confirming NBM, an 18 G intravenous cannula was inserted.

Glycopyrrolate 0.2mg injection and Ondansetron 4 mg injection Before surgery, patients were preloaded with Ringer lactate intravenously @ 10ml/kg over a 20-minute period before receiving SAB. The operating room was prepared with all necessary equipment, including an anesthesia machine with a multipara monitor and drugs. Baseline vital parameters were recorded, including pulse rate (PR), systolic blood pressure (SBP), diastolic blood pressure (DBP), oxygen saturation (SpO2), and electrocardiogram (ECG). The patients were divided into two groups of 30 using the opaque sealed envelope method.

Group FICB: Patients who received a fascia iliaca compartment block 20 minutes before SAB positioning. [Total drug volume of 40 ml given 15 ml (lignocaine 2%) +l5 ml (bupivacaine 0.5%) +2ml (8mg) dexamethasone+ adrenaline (1:200000) +8ml sterile water] IVP-: (control group) Patients who received a 1gm I.V injection of paracetamol 20 minutes before SAB positioning. FICB was performed supine, with all aseptic and antiseptic precautions taken. A three-part line connects the ASIS (anterior superior iliac spine) and the pubic tubercle. The block is performed 1cm caudad to the junction of a lateral third and a medial two-third [17]. Palpate to make sure it's lateral to the femoral pulse. A blunt 23/24G hypodermic needle is selected and inserted perpendicular to the skin at the point of needle insertion. (Image1)

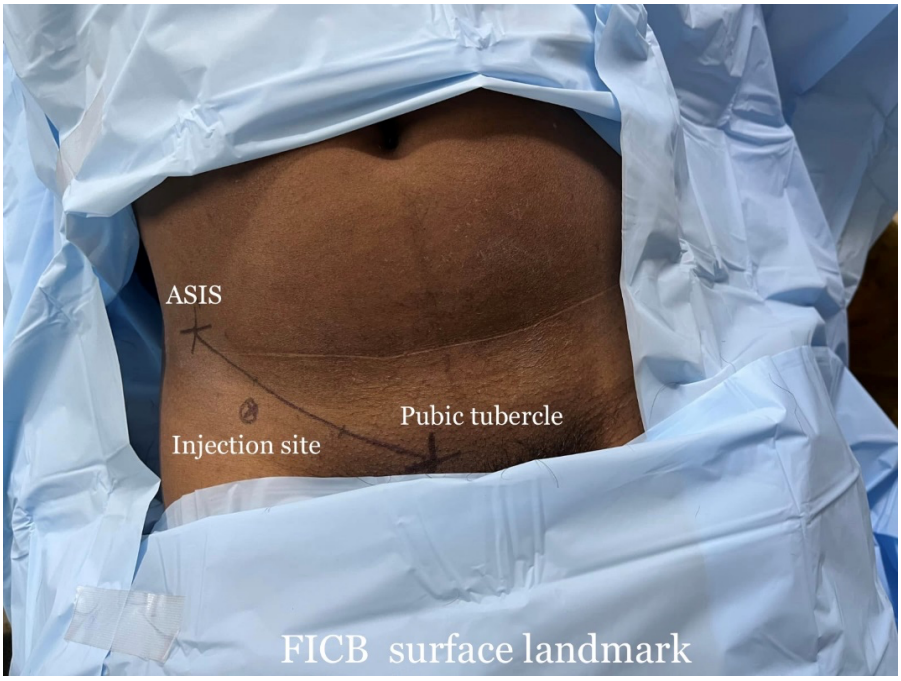


Image 1: FICB surface landmark

Image 2

Pops are felt as a needle penetrates the two Fascia (of a fascia Lata and fascia iliaca). Fix the needle after a second pop and inject the entire 40ml volume, aspirating every few mls. (image-2) If there is resistance or swelling, the needle is most likely superficial; stop injecting and continue as before. After 20 minutes of intervention, a sitting subarachnoid block was performed. The primary outcome investigated was analgesia as measured by the VAS score during positioning. The VAS (visual analogue scale) score was recorded before and after 20 minutes of fascia iliaca block, as well as during spinal anesthesia positioning. Time taken to achieve SAB (measured from the start of the positioning maneuver to spinal needle removal(18)) was a secondary outcome measure.

Patient acceptance for intervention was evaluated After completion of surgery by asking if you are comfortable with the pain management done before positioning "yes or no." We measured the total duration of analgesia in the postoperative period (i.e., from the time of onset of analgesic effect of FICB to the first use of rescue analgesic when VAS >4 [19] and the total used doses of analgesics (i.e., injection tramadol 2mg/kg) given in the first 24 hours after surgery. Hemodynamic were recorded before analgesia, 20 minutes after analgesia, during positioning and throughout the surgery at 1,3,5,10,15,30,45,60,75 and 90 minutes. If any complications arose, they were also noted.

Observations and Results

The study included 60 patients between the ages of 18 and 70 with ASA I-III who were undergoing proximal femur fracture. In terms of age, gender, weight, ASAPS, type of surgery, duration of surgery, and mean pre-operative vital parameters, both groups were comparable. (TABLE 1). VAS score before giving analgesia in group FICB was 7.47±0.57 and in group IVP was 7.50±0.68 (P=0.84) which was comparable. VAS score found to be lesser in group FICB 20 minutes after analgesia and during positioning (2.13±0.62) compared to group IVP (3.53±0.57) with 'p' Value < 0.0001.(TABLE 2)

Time taken to achieve spinal was less in group FICB (158.96±8.42 sec) compared to group IVP (194.03±7.87 sec) with 'p' Value <0.0001. (TABLE 3) Out of 30 patients in group FICB, In comparison to group IVP, where 21 patients were satisfied with the pain relief method, 28 patients were satisfied (liked). (P = 0.042) which was statistically significant. (TABLE 3) Patients in group FICB required their first rescue analgesia dose at 13.73± 1.83 hours after FICB block, while patients in group IVP required their first rescue analgesia dose at 8.33± 1.37 hours.

As a result, there was a highly significant difference and a longer duration of analgesia in group FICB versus group IVP. (P<0.0001). (TABLE 4) In our study, the total number of rescue analgesics required in the first 24 hours was 1.66 ±0.66 in group FICB and 2.56± 0.50 in group IVP, which was highly significant (P<0.0001). (TABLE 5) Both groups' vital parameter means were comparable, with no statistically significant difference. ('p' >0.05) None of the patients in group FICB as well as group IVP experienced any complications.

Table 1: Demographic Data

Parameter	Group FICB	Group IVP	Intergroup p value
Sex (male; female)	23:7	24:6	1
Age (years) (Mean ± SD)	40.53±16.02	40.43±14.75	0.98
Weight (kg) (Mean ± SD)	57.50±5.69	57.17±7.62	0.85
ASA Grading			
ASAPS I	16	17	0.88
ASAPS II	6	6	
EASAPS II	5	3	
EASAPS III	3	4	

Table 2: Comparison of Vas Score

VAS Score	Group FICB	Group IVP	'p' Value
Before analgesia	7.47±0.57	7.50±0.68	0.84
20 min after analgesia	2.13±0.62	3.53±0.57	<0.0001
During positioning	2.13±0.62	3.53±0.57	<0.0001
Intra group 'p' Value	<0.0001	<0.0001	

Table 3: Comparison of Other Parameters

Parameter	Group Ficb	Group Ivp	'P' Value
Time taken to achieve SAB (sec)	158.96±8.42	194.03±7.87	<0.0001
Patient satisfaction (like; dislike)	28/2	21/9	0.042

Table 4: Time To First Rascue Analgesia (in Hours) (Mean±Sd)

Group Ficb	Group Ivp	'P' Value
13.73±1.83	8.33±1.37	P<0.0001 (Highly significant)

Table 5: Total Number of Rescue Analgesic Required In First 24 Hour Postoperatively.

Group Ficb	Group Ivp	'P' Value
1.66±0.66	2.56± 0.50	<0.0001 (Highly significant)

Discussion

Because of the excruciating pain, positioning patients for spinal anaesthesia with a fractured femur is challenging [1]. Analgesia before giving positioning can be offered by traditional method such as intravenous nonsteroidal anti-inflammatory drugs(NSAIDs) and opioids. However, as previously discussed, opioids may be insufficient for dynamic pain and have numerous side effects [13]. Beside that NSAIDs may cause epigastric pain, GI bleeding and alter renal function [14]. Peripheral nerve blocks, such as the classical femoral nerve block [5,7,8], 3-in-1 block [8,9], and fascia iliaca block [1,4,10,11], can be used to provide analgesia and ease positioning prior to spinal anaesthesia. Peripheral nerve blocks are commonly used to relieve pain following fractures and surgical procedures. [12] However, there have been few studies in which peripheral nerve blocks have been used to relieve pain and improve positioning. The femoral nerve is the primary source of supply to the periosteum, which is the source of nociception. Not only periosteum but also adductor muscle spasm cause pain in femur fractures, necessitating adequate blockage of the femoral nerve, obturator nerve, and lateral femoral cutaneous nerves. [1,16] Marhofer et al. [20,21] demonstrated that there is consistent lateral, caudal, and slightly medial spread of local anaesthetic after a "3-in-1 block," but no cephalad spread was observed, implying that only the femoral and lateral cutaneous nerves can be reliably blocked, while the obturator nerve is frequently spared. According to Praveenkumar Shekhrajka et al. [3], FICB is superior to femoral nerve block because there is no need for a nerve stimulator, it is simple and safe to perform, and the insertion point is away from the femoral nerve and vessels. As a result, we chose the fascia iliaca compartment block because it is less risky, easier to perform, and effectively blocks all three essential nerves of the lumbar plexus, including the femoral, obturator, and lateral cutaneous nerve of the thigh. We did not use an ultrasound method for block performance, which some studies suggest would improve efficacy. [10]

Although a USG machine is not always readily available, especially in emergency situations, we chose to study this technique because we have achieved a high success rate with landmark-based FICB in our practise. (Kacha et al. 2018; R. Madabushi et al. 2016; Maria Diakomi et al. 2014). [1,10,19] The success of a fascial plane block is discussed. First, volume is critical because large amounts of LA are required to achieve the necessary spread to block the targeted nerves. [20,22] 30-40 ml of LA is recommended for the landmark and USG infrainguinal approaches, and at least 40 ml of LA is required for the USG suprainguinal approach to consistently block the FN, ON, and LFCN. [20,22] We used bupivacaine as a long-acting LA to extend analgesia, which is widely used and available but has a long onset time. Because lignocaine acts faster[23] (within 2-5 minutes of injection), it was used to achieve a quick onset time. The volume of local anaesthetics used in both subarachnoid block and FICB raises the possibility of toxicity. On the other hand, because both of these sites absorb the drug more slowly and the volume of the drug chosen was well within the allowable limit, we had no cases of local anaesthesia systemic toxicity. [1] Several adjuvants, including opioids, epinephrine, clonidine, midazolam, and ketamine, have been combined with local anaesthetics to extend the duration of analgesia from nerve blocks, but with little success. [14] Despite this, dexamethasone (glucocorticoid) has been shown to be effective in small-scale pretherapeutic[24,25] and therapeutic trials. [26,27] Also dexamethasone doesn't cause

any sedation and reduces absorption of local anaesthetics by initiate some extend of vasoconstriction. Dexamethasone inhibits nociceptive C-fibers by increasing the action of inhibitory potassium channels via glucocorticoid receptors. [14]

Many studies have found that when dexamethasone was added as an additive to local anaesthetics in fascia iliaca block, the duration of the block was prolonged. [14,28] Kacha et al. 2018[19] used 0.25% ropivacaine for fascia iliaca compartment block and waited 30 minutes for the analgesic effect to take effect. R. Madabushi et al. [1] used 0.375% ropivacaine for fascia iliaca compartment block and waited 15 minutes for analgesic effect.

We sat there for 20 minutes. To maximise the analgesic effect of FICB and paracetamol, a 20-minute interval between FICB/IV paracetamol and spinal anaesthesia was chosen. We have selected to use sitting position for subarachnoid block, as it was unremittingly implemented in our institute. We hypothesised two additional benefits of this position: it would be easier for patients to sit by themselves and would provide a better position for subarachnoid block. Furthermore, in lateral positioning, more support and assistance to the patient is required to counter the lumbar lordosis.[1] The two groups were comparable to each other with respect to age, weight, sex ratio and ASAPS, type and duration of surgery. Our findings were consistent with the findings of Kacha et al 2018, Maria Diakomi et al 2014, R. Madabushi et al 2016, Ashok Jadon et al 2021, and Priyanka Kulkarni et al 2021. [1,10,19,29,30].

In the present study before analgesia VAS scorei.e., whether patient had pain while changing position, was comparable in both the groups. 20 minutes after giving FICB reported significantly low pain score compared to conventional IV paracetamol. Our results corelates with Yuan-Pin Hsu et al 2018, Maria Diakomi et al 2014, Kacha et al 2018, Hao-yang Wan et al 2020, Groot et al 2015, Ashok Jadon et al. 2021.)[6,10,12,19,29,31] The central analgesic effect of paracetamol is mediated by activation of the descending serotonergic pathway, whereas local anaesthetics inhibit nerve membrane depolarization by interfering with NA+ and K+ currents. As a result, it prevents electrical impulses from propagating. [23]

In our study, Time taken to achieve SAB: defined as Time in seconds measured from the start of positioning manoeuvre to the spinal needle removal.[18] Time taken to achieve SAB was also found to be high in patients who had taken intravenous paracetamol (194.03±7.87) seconds compared to patients who was given FICB (158.96±8.42) seconds which was statistically very highly significant with ‘p’ Value <0.0001.

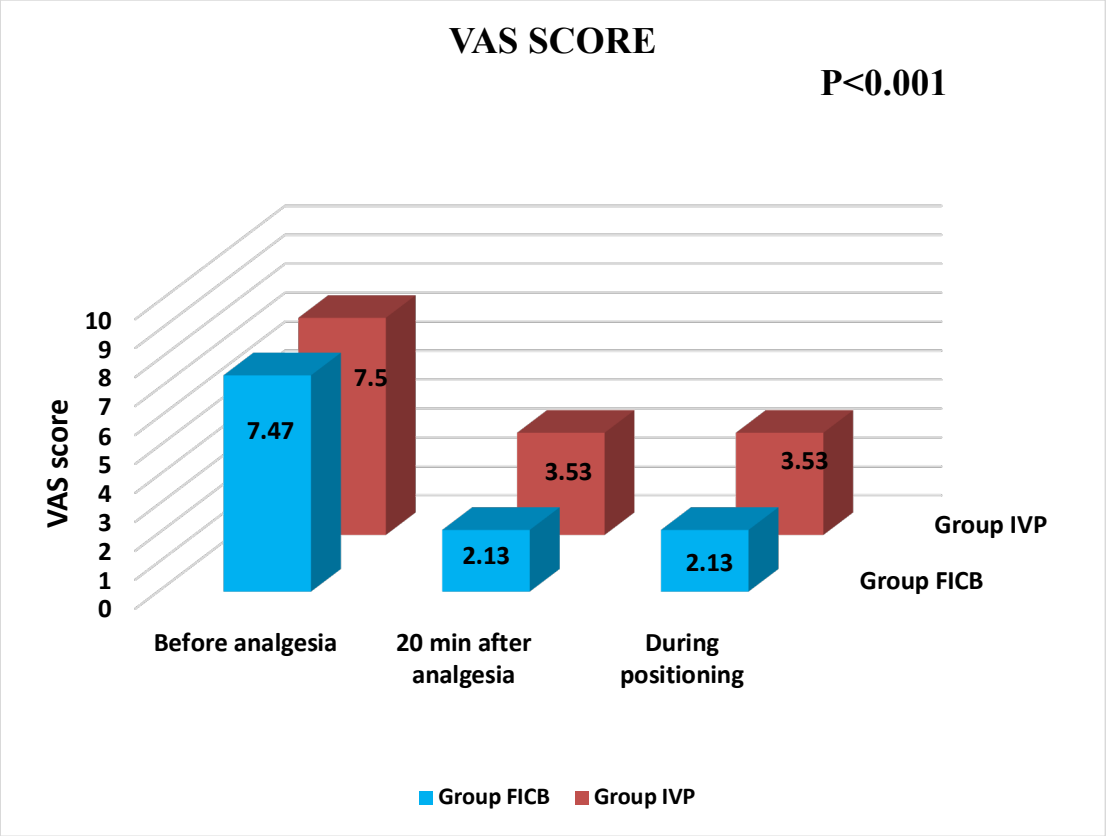
Our results were consonance with Maria Diakomi et al.[10] Madabushi R. et al.[1]. Yun M et al.[4] Patient satisfaction noted as “like or dislike”. 93.3% patients in FICB group were satisfied with the technique of analgesia as compared to 70% in IVP group, which was statistically significant with ‘P’ value <0.05. These results were in consonance with Yadav et al. 2021, Diakomi et al.2014 and Yun et al. 2009. [4,10,18] The mean pulse rate, systolic blood pressure, diastolic blood pressure and oxygen saturation were comparable in both the groups. It continued to be same after giving after fascia iliaca block or intravenous paracetamol and during positioning. (‘p’ >0.05). Our study results were in consonance with Kacha et al.[19]

But, pulse rate, SBP and DBP found to decrease gradually followed by SAB administration in both the groups. SAB produces sensory, motor and sympathetic

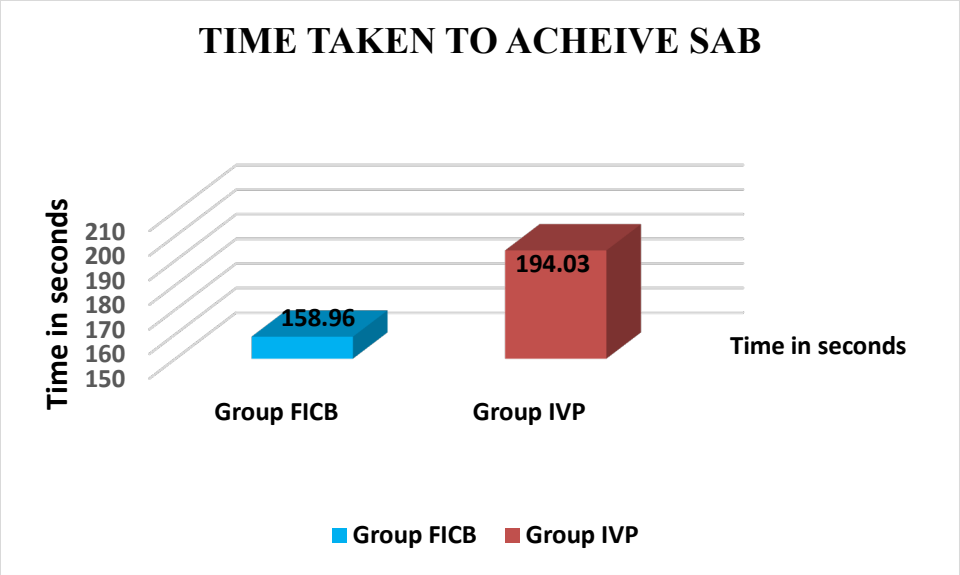
blockade. Sympathetic blockade may produce hypotension and change in pulse rate. To prevent severe hypotension, preloading with Ringer lactate is usually a routine and in our study, also we followed the same protocol. Duration of analgesia was defined as "From time of onset of analgesic effect of FICB till the first use of rescue analgesic.[19]

Group FICB had prolonged duration of analgesia compared to group IVP which was 13.73±1.83 hrs and 8.33±1.37 hrs, respectively. (p<0.0001) Our results are in consonance with Kacha et al. 2018(19), Shekhrajka et al. 2020[3], Diakomi et al. 2014 and Yun et al. 2009[4,10] who observed that time to first rescue analgesia was significantly longer in group FICB compared to group IVA (intravenous analgesia).

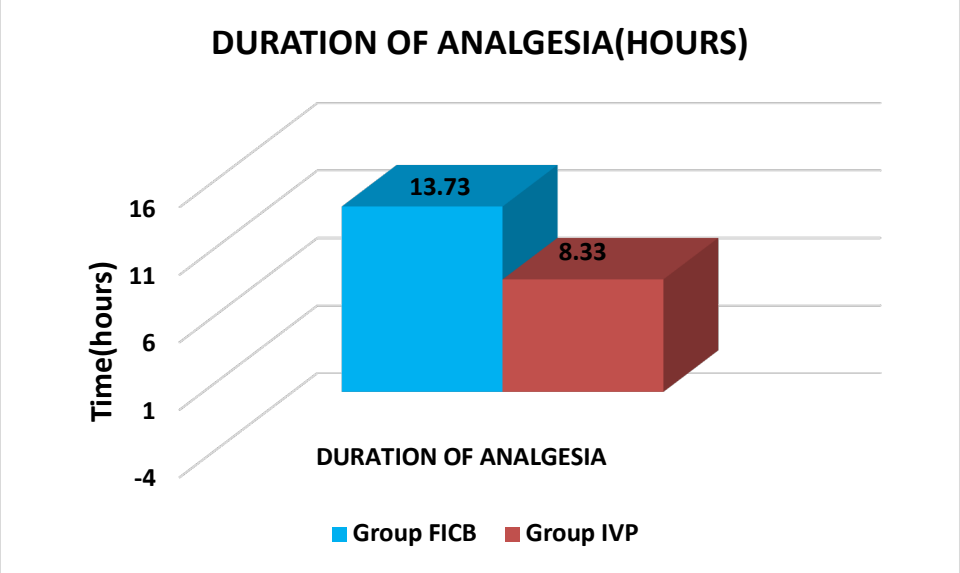
Total number of rescue analgesics(Rescue analgesia was given in the form of injection tramadol 2mg/kg, VAS>4) required in first 24 hours in Group FICB was 1.66±0.66 and in group IVP was 2.56±0.50 which was highly significant statistically. ("p" <0.0001) Kacha et al. 2018, Shekhrajka et al. 2020, also found the similar results (3,19) We did not observe any serious complications in both the groups. R. Madabushi et al. 2016[1] and Kacha et al. 2018 [19] who has also found no serious peri and post-operative complications.



Graph 1: VAS Score



Graph 2: Time taken to achieve SAB



Graph 3: Duration of analgesia (hours)

Conclusion

Facia iliaca compartment block is a simple, safe procedure that relieves the pain of positioning for subarachnoid block in patients with proximal femur fractures. When compared to intravenous paracetamol, it also prolongs analgesia and reduces the need for rescue analgesics in the post-operative period.

Acknowledgements: We want to thank DR. J. C. Vasava Sir and Dr. Swati Bhatt Madam for their clinical help.

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