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Research Article

Duration of post-operative analgesia with Fascia iliaca compartment block (ficb) using Bupivacaine with Dexmedetomidine and Bupivacaine with Dexamethasone in patients with proximal fracture femur

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ABSTRACT:

Introduction: Fracture of proximal femur is a common occurrence following road traffic accidents and falls (in relatively older age group). These fractures are associated with considerable pain before surgery and in postoperative period. Effective pain management during positioning and in postoperative period is crucial and fascia Iliaca compartment block can be used effectively for this purpose in these patients. Many adjuvants like epinephrine, clonidine, Opioids, ketamine, dexamethasone and dexmedetomidine were combined with local anaesthetics to prolong the post-operative analgesia. We conducted this prospective study to know duration of post-operative analgesia with Fascia iliaca compartment block (ficb) using Bupivacaine with Dexmedetomidine and Bupivacaine with Dexamethasone in patients with proximal fracture femur.

Materials and methods: This was a randomized, prospective, double blinded and controlled study done in the department of anesthesiology of a medical college situated in an urban area. 90 patients of either gender , ASA grade I & II ,the age of whom was between 18-80 years and who were undergoing surgery for proximal fracture femur under spinal anesthesia were enrolled in this study . All these patients received FICB by landmark technique before spinal anesthesia. The patients were divided in 3 groups. Group I - Patient in this group received 0.25% Bupivacaine plus normal saline 0.9%. Group II Patient in this group received 0.25% Bupivacaine plus dexamethasone. Group III Patient in this group received 0.25% Bupivacaine plus dexmedetomidine. Level of analgesia during positioning and in post operative period along with other parameters like sedation scores, VAS scores, hemodynamics and complications in these 3 groups were compared.

Results: The study comprised of 90 patients out of which 45 (50%) were males and 45 (50%) were females with a M: F ratio of 1:1. ASA Grades and Mean duration of surgeries in these groups were comparable. For preoperative Pulse Rate, SBP, SpO2 the test used was One-Way ANOVA. $p > 0.05$ for all three parameters. There was no significant difference in onset of FICB and time required for giving spinal anesthesia in three groups ($p>0.05$). 27(90%) patients in group I, 25(83%) patients in group II and 26(87%) patients in group III had no sensation to pinprick thirty minutes after FICB. Preoperative pulse rate and pulse rate thirty minutes after FICB were compared .There was significant reduction in pulse rate ($p<0.05$) in group III 30 minutes after FICB. The analysis of changes in mean pulse rates showed that there was no significant difference in mean pulse rate intraoperatively ($p>0.05$). the study of postoperative duration of analgesia showed that There was highly significant difference in post-operative duration of analgesia between group I&II ,group I&III and group II&III .

Conclusion: Addition of dexamethasone or dexmedetomidine to Bupivacaine for fascia iliaca compartment block in patients with proximal femur fracture further prolongs post-operative analgesia compared to plain Bupivacaine. Addition of dexmedetomidine to Bupivacaine provides better postoperative analgesia than Bupivacaine with dexamethasone.

Key words : Fascia Iliaca Compartment Block, dexamethasone, dexmedetomidine, Analgesia.

Introduction:

Due to increased mechanization and motorization there is a spectacular increase in the cases of road traffic accidents leading to various fractures like fracture pelvis, femur and tibia or fibula. Fracture of the femur is one of the common fractures seen following high velocity impacts after road traffic accidents[1]. Femur can also be fractured in relatively old

age patients following less severe trauma such as fall. Irrespective of the type of trauma or the age of the patient common features of fracture include swelling, severe pain and restricted movements[2]. The patient presents with various signs and symptoms depending upon the severity and type of fracture. While patients with displaced and compound fracture have inability to walk patients with undisplaced fractures may be ambulatory[3].

Various surgical procedures required for proximal femur fractures may include closed reduction, open reduction and internal fixation, dynamic hip screw fixation and Austin Moore arthroplasty[4]. Optimum analgesia during positioning and in postoperative period is crucial for the management of these patients. Various options available for postoperative analgesia in these patients include nonsteroidal anti-inflammatory drugs, Opioid analgesics and epidural analgesia. While NSAIDs and Opioid analgesics may be used they may be associated with suboptimal analgesia while epidural analgesia may be contraindicated in some patients owing to coagulopathy or refusal by patients etc[5]. In such cases Fascia iliaca compartment block (FICB) can be used for the purpose of positioning and postoperative analgesia. Many adjuvants like epinephrine, clonidine, Opioids, ketamine, dexamethasone and dexmedetomidine were combined with local anaesthetics to prolong the post-operative analgesia[6]. Dexamethasone has been shown to be effective in few clinical studies. The decrease in pain intensity and the prolonged analgesia attained with the use of perineural dexamethasone may be the result of local or systemic action[7]. Dexamethasone may act locally on glucocorticosteroid receptors to induce vasoconstriction, thereby slowing down systemic absorption of local anaesthetics. One theory tells that dexamethasone potentiates the activity of inhibitory potassium channels on nociceptive C-fibers (via glucocorticoids receptors) thereby decreasing their activity[8]. Dexamethasone may act systemically by reducing the inflammatory response caused by surgical tissue injury. Dexmedetomidine is a potent selective alpha-2 agonist of which alpha 2 selectivity is 8 times greater than clonidine. Its use with Bupivacaine either epidurally or intrathecally is associated with prolongation of local anesthetic effect[9]. In human dexmedetomidine has also shown to prolong the duration of block and post-operative analgesia when added to local anesthetic in various regional block. It acts by blocking the hyperpolarisation-activated cation which prevents the nerve from returning from a hyperpolarized state to resting membrane potential for subsequent firing[10].

Till date there are few studies of dexmedetomidine and dexamethasone in respect of post-operative analgesia in FICB. The present study was designed to determine efficacy and success of FICB to provide analgesia for positioning for spinal anesthesia and to determine and compare post-operative analgesia with Bupivacaine plus dexmedetomidine and Bupivacaine plus dexamethasone.

Materials And Methods:

This randomized, prospective, double blinded and controlled study was undertaken after obtaining Institutional ethical committee approval and informed written consent from the patients. The study population included 90 patients of either gender , ASA grade I & II ,the age of whom was between 18-80 years and who were undergoing surgery for proximal fracture femur under spinal anesthesia . All these patients received FICB by landmark technique before spinal anesthesia. Patients were divided into 3 groups. Group I - Patient in this group received 0.25% Bupivacaine (38 ml) plus normal saline 0.9% (2ml) making total up to 40 ml, Group II Patient in this group received 0.25%bupivacaine (38 ml) plus dexamethasone 8mg (2ml) making total up to 40 ml and Group III Patient in this group received 0.25% Bupivacaine (38 ml) plus dexmedetomidine (1 microgram/kg diluted to 2ml) making total up to 40 ml. In each patient detail history was elicited. Patient was clinically examined in detail and All patients underwent investigations like Complete haemogram, Blood sugar level, Renal function test, Liver function test and Electrocardiogram. On arrival of patient in operation room all patients were monitored with Pulse oximeter (Spo2), NIBP, Heart rate, VAS score Prior to FICB and throughout the procedure. Intravenous line was set up and an infusion of Ringer lactate solution was started and continued throughout the procedure. The block was carried out as described by Dalens et al[11] after thorough explanation of the procedure to patient. The following parameters were studied (a) Hemodynamic variables pulse rate and blood pressure (NIBP) were recorded at 30 minutes. (b) Visual Analogue Scale score was noted at 30 minutes while positioning for spinal anesthesia. VAS score was recorded on 100 mm line marked from 0 to 100 in which 0 indicated no pain and 100 indicated severe pain. Patients were explained about VAS score. (c) Pinprick sensation was noted in anterior and lateral aspect of thigh at 30 minutes. (d) Sedation score was assessed using Ramsay Sedation Score at interval of fifteen minutes up to 2 hours and also later at 4, 8, 12, 16 hours after block. (e) Quality of pain relief during positioning for spinal anesthesia was assessed subjectively: satisfactory /not satisfactory. (f) Time to perform spinal anaesthesia was recorded (time from beginning of patient positioning to end of performance of spinal anaesthesia) (g) Haemodynamic variables were monitored every 5 minutes for initial 20 minutes and then every 30 minutes intraoperatively and later at 4hours, 8 hours, 12 hours ,16 hours after the FICB. (h) Time to perform surgery was recorded. (i) Post operatively patients were assesed for analgesia by VAS score. VAS score was recorded till patient requested for 1st rescue analgesia that was duration of post-operative analgesia. Rescue analgesia was given in form of inj diclofenac 1.5mg/kg. (j) Possible side effects : All patients were observed for side effects like nausea, vomiting, bradycardia, hypotension and local anesthetic toxicity. Management of inadequate block: In case of inadequate block that was presence of sharp pinprick sensation grade 0 in anterior and lateral aspect of thigh at 30 minutes such patients were given injection midazolam 1 mg and injection ketamine 0.2 - 0.8 mg / kg for positioning for spinal anesthesia and such cases were excluded from our study.

Inclusion criteria:

1. Age 18-80 years of both sex.
2. ASA grade I & II Patient posted for proximal fracture femur under spinal anaesthesia

Exclusion criteria:

1. Patient who refused consent.
2. Uncorrectable Bleeding disorders.
3. Allergy to local anaesthetics.
4. Infection at local site of block.
5. Patients in psychoses.

The study of effectiveness of analgesia with FICB for positioning during spinal anaesthesia and to compare the duration of post-operative analgesia using Bupivacaine with dexmedetomidine and Bupivacaine with dexamethasone in patients with proximal fracture femur was conducted in 90 patients of proximal femur fracture undergoing surgery under spinal anesthesia in tertiary health care centre. There were equal numbers of Males and Females enrolled in this study (1:1). The study comprised of 45 males and equal number of females. P value was more than 0.05 hence the study groups were found to be comparable with respect to gender.

Results:

Groups	Sex		Total (n)	X^2 Test	P Value	Decision (Based on P Value)
	Male	Females				
Group I	15 (50%)	15 (50%)	30	0.2679	0.8747	Non-Significant (P > 0.05)
Group II	13 (43%)	17 (57%)	30			
Group III	14 (47%)	16 (53%)	30			
Total	45	45	90			

Table 1: Gender Distribution in the studied cases.

The analysis of ASA grades of the patients revealed that 49 patients belonged to ASA I and 41 patients belonged to ASA II. P value was more than 0.05 and hence the difference was not found to be statistically significant

Groups	ASA		Total (n)	X^2 Test	P Value	Decision (Based on P Value)
	I	II				
Group I	16 (53%)	14 (47%)	30	0.8731	0.2715	Non-Significant (P > 0.05)
Group II	18 (60 %)	12 (40 %)	30			
Group III	17 (57%)	13 (43%)	30			
Total	49	41	90			

Table 2: ASA Grades in the studied cases.

The duration of surgery was found to be 2.05 +/- 0.37 in group I while in group II and Group III this was 2.08 ± 0.42 and 2.06 ± 0.37. P value was 0.930 and hence the difference was statistically 'Not significant'

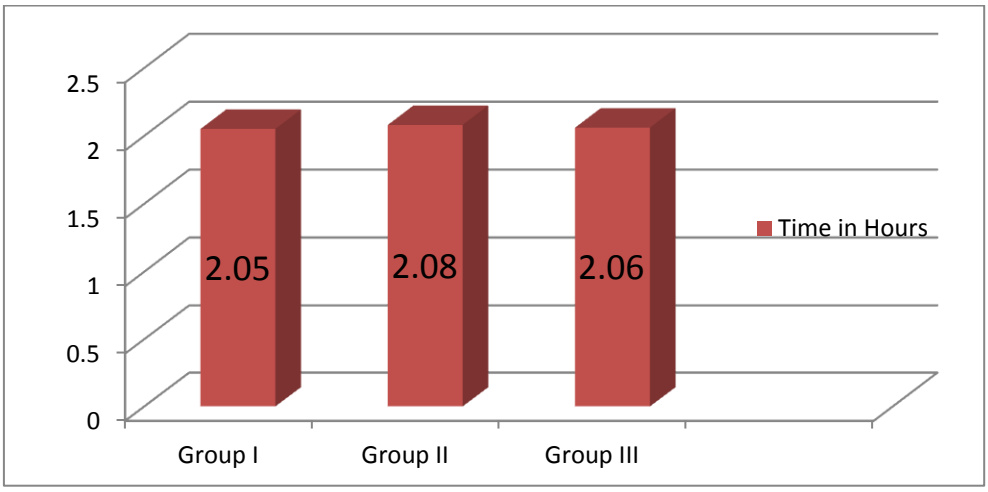

Figure 1: Mean Duration of surgery in studied cases.

For preoperative Pulse Rate, SBP, SpO2 the test used is One-Way ANOVA. p > 0.05 for all three parameters. Hence the three

groups were found to be comparable preoperatively. For preoperative VAS score the test used is Kruskal-Wallis Test p = 0.650. Hence there was no significant difference between the groups preoperatively.

Preoperative Parameters	Statistic	Group I (n=30)	Group II (n=30)	Group III (n=30)
Pulse Rate (in beats/minute)	Mean ± S.D.	81.13 ±12.5	80.6 ± 12.6	79.53 ± 10.3
	Maximum	100	99	101
	Minimum	60	56	60
	C.I. (95 %) Lower Limit - UpperLimit	76.46 – 85.80	75.89 –85.31	75.67 – 83.40
	P Value	0.8685		
SBP (mmHg)	Mean ± S.D.	125.2 ± 8.04	124.8 ±6.4	123.4 ± 6.45
	Maximum	142	140	138
	Minimum	110	112	110
	C.I. (95 %)Lower Limit – Upper Limit	122.2 – 128.2	122.4-127.2	121.0-125.8
	p value	***0.5810****		
SPO2 %	Mean ± S.D.	99.23 ± 0.63	99.20 ± 0.85	99.3 ± 0.92
	Maximum	100	100	100
	Minimum	98	97	97
	C.I. (95 %) Lower Limit – Upper Limit	99.0 – 99.47	98.88 – 99.52	97 – 100
	P value	***0.802****		
VAS	Median	90	90	90
	Maximum	100	100	100
	Minimum	70	80	80
	P Value	0.650		

Table 3: Preoperative pulse rates, systolic Blood pressure, SPO2 and VAS in studied cases.

There was no significant difference in onset of FICB and time required for giving spinal anesthesia in three groups (p>0.05).

Preoperative Parameters	Statistic	Group I (n=30)	Group II (n=30)	Group III (n=30)
Onset of FICB (In minutes)	Mean ± S.D.	27.83 ± 3.39	28.83 ± 3.64	28.33 ±3.56
	Maximum	35	35	35
	Minimum	25	25	25
	C.I. (95 %) Lower Limit – Upper Limit	26.57 – 29.10	27.47 – 30.19	27.01 – 29.66
	P Value	***0.550****		
Time required for giving Spinal Anesthesia (In Seconds)	Mean ± S.D.	140.8 ± 14.85	139.4 ± 14.86	141.9 ±18.08
	Maximum	167.0	167.0	179
	Minimum	100	100	110
	C.I. (95 %)Lower Limit – Upper Limit	135.2 – 146.3	133.9 – 145.0	135.1 – 148.7
	p value	***0.8368****		

Table 4: Onset of FIAB and Time required for giving spinal anesthesia In studied cases.

27(90%) patients in group I, 25(83%) patients in group II and 26(87%) patients in group III had no sensation to pinprick thirty minutes after FICB. And 3(10%) in group I, 5(17%) patients in group II and 4 (13%) patients in group III had dull sensation to pinprick. P value was found to be more than 0.05 hence there was no significant difference in pinprick sensation at 30 minutes after FICB in three groups.

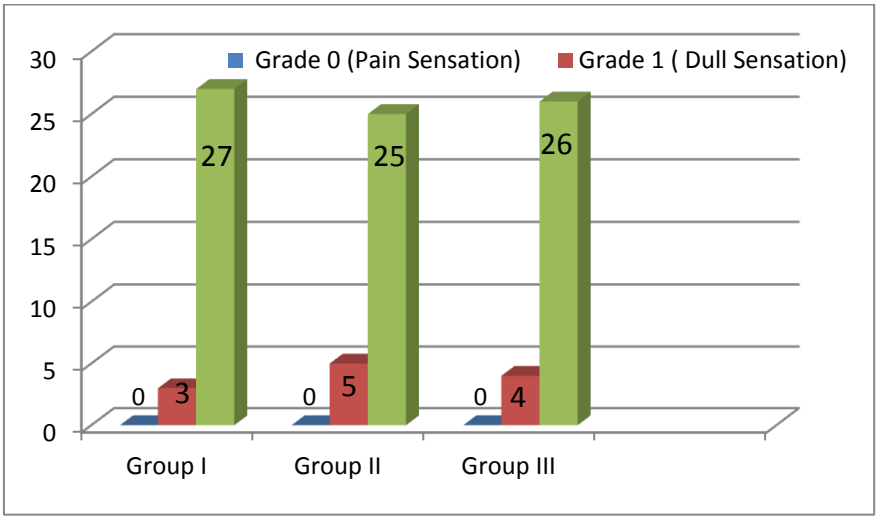

Figure 2: Analgesia by pinprick sensation.

After 30 minutes of FICB 28 (93%) patients in group I, 26(87%) patients in group II and 27 (90%) patients in group III had mild pain. And 2 (7%) patients in group I, 4(13%) patients in group II and 3 (10%) patients in group III had moderate pain. But the difference was statistically non-significant (p=0.74).

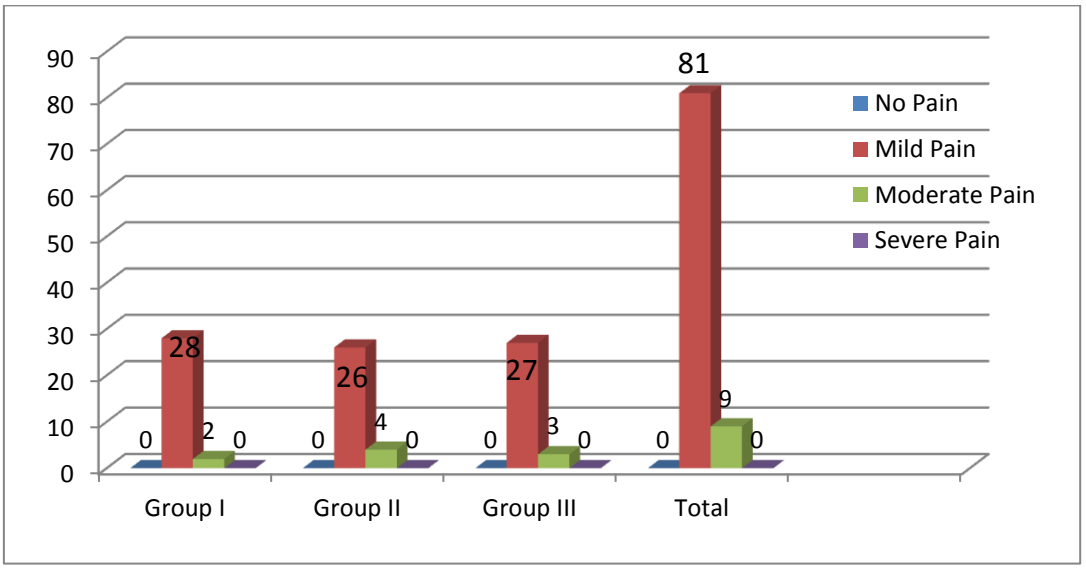

Figure 3: Grade of Analgesia for spinal positioning at 30 minutes.

In all three groups similar percentage of patients (97%) had satisfactory quality of pain relief during positioning for spinal anesthesia.

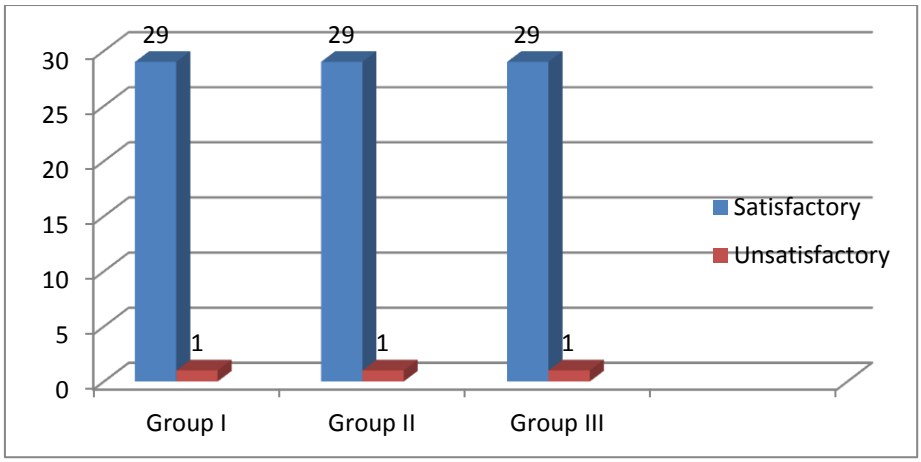

Figure 4: **Pain relief during patient positioning for spinal anesthesia after FICB**

Preoperative pulse rate and pulse rate thirty minutes after FICB were compared .We did not find any significant change in this

comparison in pulse rate ($p>0.05$) in group I & group II. However there was significant reduction in pulse rate ($p<0.05$) in group III 30 minutes after FICB.

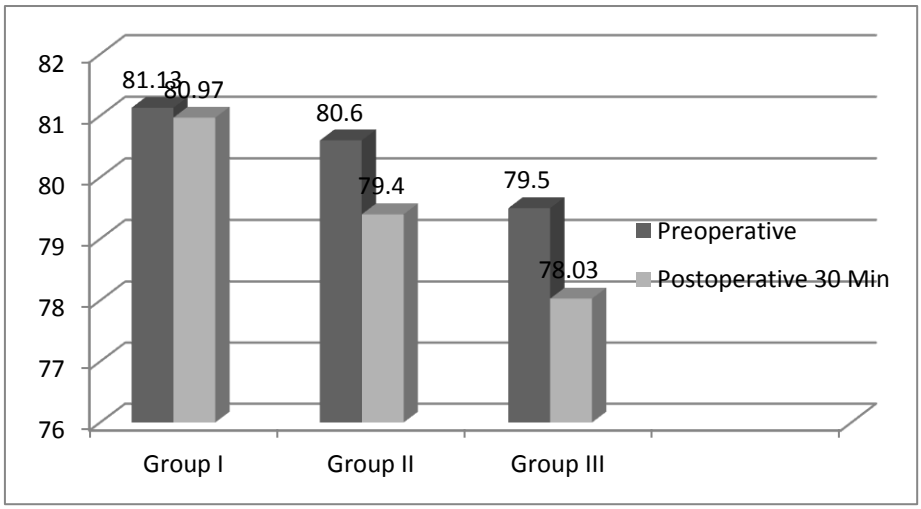

Figure 5: Mean Pulse Rate/ Min During onset of FICB

Here we compared within the group between preoperative blood pressure and blood pressure thirty minutes after FICB .We did not find any significant change in this comparison in blood pressure in group I & group II ($p>0.05$). However there was significant reduction in blood pressure in group III after 30 minutes of FICB ($p<0.05$).

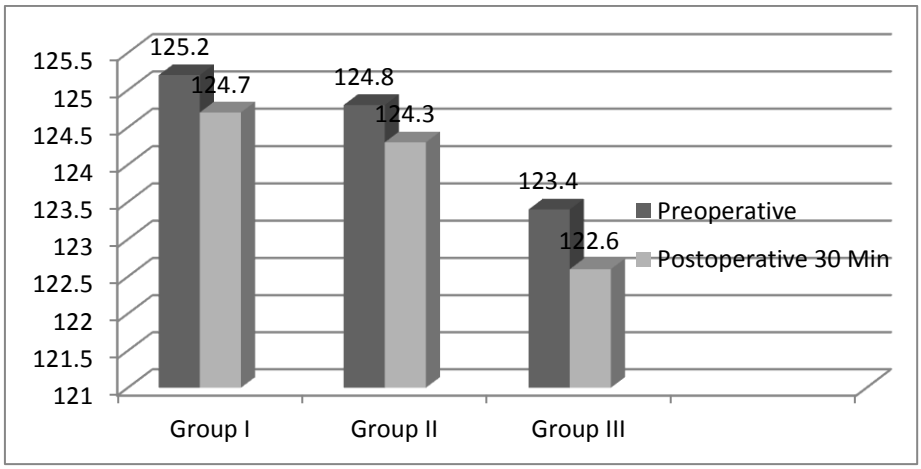

Figure 6: Mean Systolic Blood Pressure (in mm of Hg) During onset of FICB

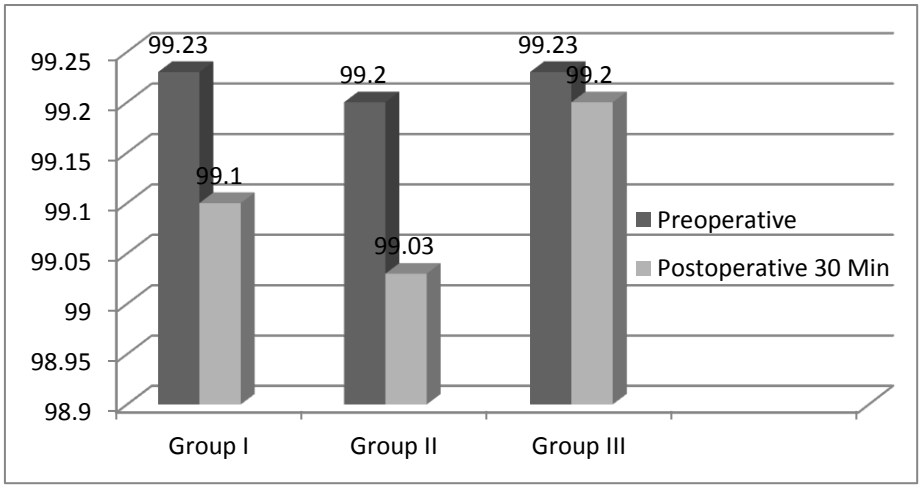

Figure 7: Mean SPO2 During onset of FICB

we compared within the group between preoperative Spo2 and thirty minutes after FICB .We did not find any significant change in this comparison in SpO2 $p>0.05$ in all groups

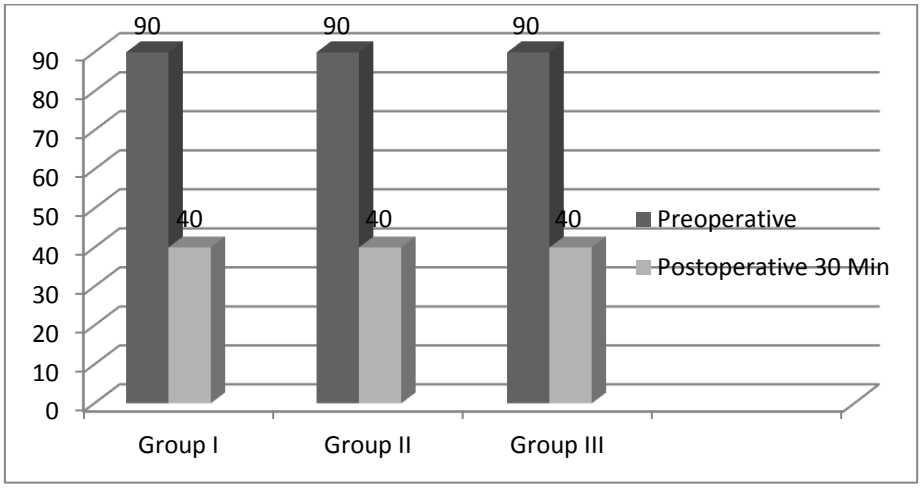

Figure 8 : Mean VAS scores During onset of FICB

The analysis of changes in mean pulse rates showed that there was no significant difference in mean pulse rate intraoperatively (p>0.05).

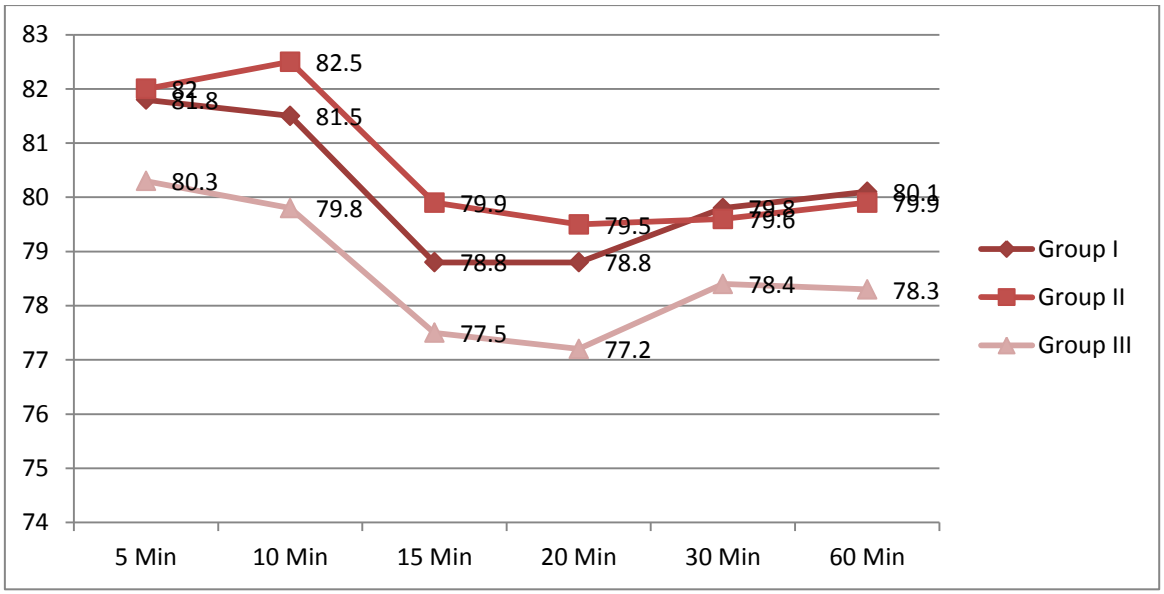

Figure 9: Changes in mean Pulse Rate after spinal anesthesia.

The analysis of changes in mean systolic blood pressure showed that there was no significant difference in mean systolic blood pressure intraoperatively (p>0.05).

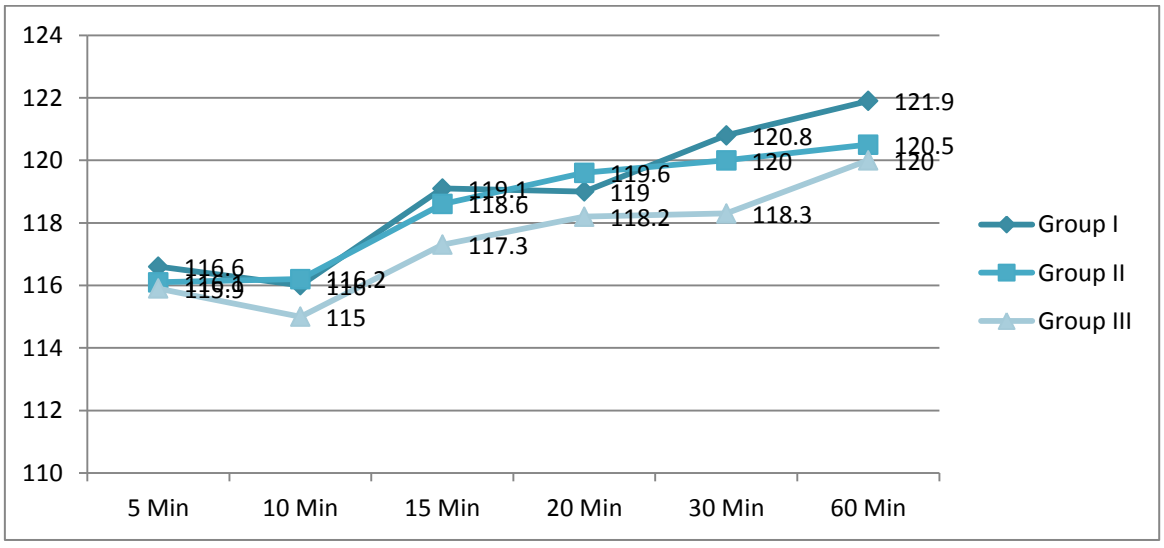

Figure 10 : Mean Systolic Blood Pressure changes after spinal anesthesia.

The analysis of sedation score revealed that 2 patients had sedation score of 3. But they were responding to commands .None of patient had sedation score >3.

Figure 11: **Graph of sedation score at various intervals after FICB.**

The analysis of return of pinprick sensation revealed that the mean time in hours in group I, GroupII and Group III was 3.96+/- 0.76, 3.76 +/- 0.43 and 3.87 +/- 0.34 respectively. The test used was One-Way ANOVA test. There was no significant difference while comparing 3 groups p>0.05. The analysis of change in pulse rates, systolic blood pressures and SPO2 between 3 groups at various intervals postoperatively showed no significant difference (P > 0.05).

Post Operative VAS was found to be statistically significantly different in at 8 and12 hours . There was significant difference in VAS in group I & II and group I &III at 8th hour (p<0.05). But there was no significant difference in VAS between group II & III.

VAS (8 hours)	
Pair of Groups	Decision Based on P Value
Group I And Group II	Significant (P < 0.05)
Group I And Group III	Significant (P < 0.05)
Group II and Group III	Non-Significant (P > 0.05)

Table 5 : VAS in studied groups at 8 hours .

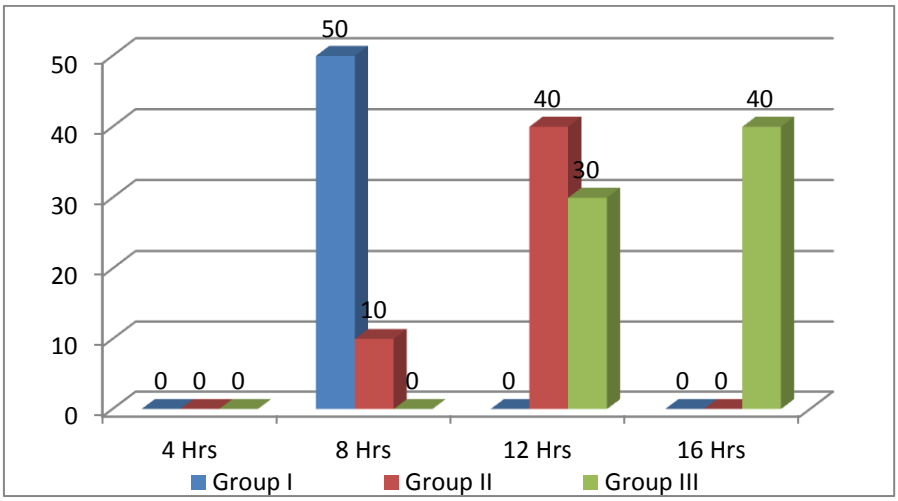

Figure 12: Postoperative changes in VAS in studied Groups.

Lastly the study of postoperative duration of analgesia showed that There was highly significant difference in post-operative duration of analgesia between group I&II ,group I&III and group II&III p<0.001.

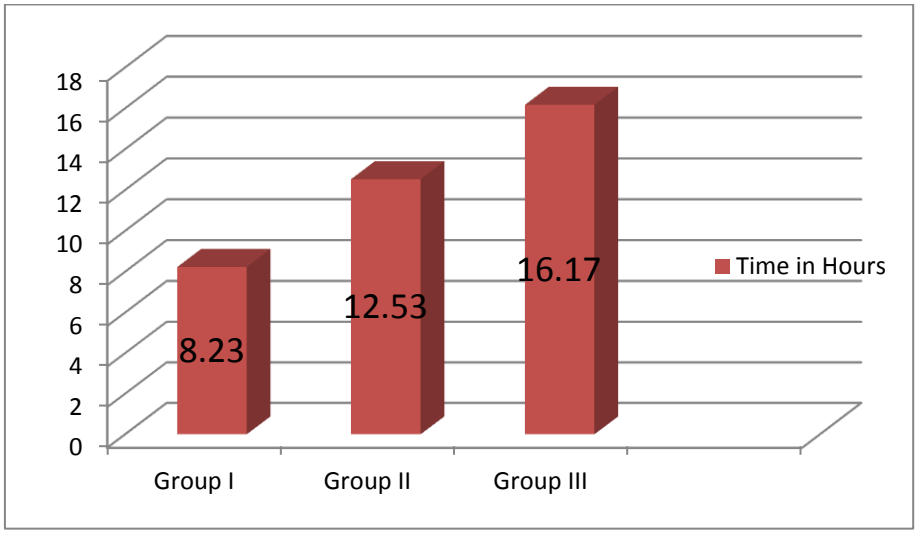

Figure 13 : Postoperative Duration Of Analgesia in studied groups .

Post Operative duration of analgesia of FICB	
Pair of Groups	Decision Based on P Value
Group I And Group II	Highly Significant (P < 0.001)
Group I And Group III	Highly Significant (P < 0.001)
Group II and Group III	Highly Significant (P < 0.001)

Figure 12: Postoperative changes in VAS in studied Groups.

Discussion:

FICB was first performed in 1989 in children and later on adults. It was mainly used to provide analgesia following surgical procedures in hip, femur, knee, treatment of burns on thigh and in prehospital treatment of fracture femur[12,13]. Single shot fascia iliaca block provides effective analgesia for positioning of the patient with proximal femur fracture during spinal anesthesia and also provides postoperative analgesia. It blocks two main lumbar plexus nerve femoral and lateral cutaneous nerve of thigh by central spread of local anesthetic (volume dependent block)[14]. A fractured proximal femur is subjected to major muscle forces that can deform the thigh and angulate bone fragments. Therefore complete paralysis of all muscles acting on femur is mandatory for intraoperative realignment of fracture. Spinal anesthesia is widely used anesthetic technique for intertrochanteric nailing, or replacement of head by Austin moore prosthesis or putting proximal femur nail. The positioning of these patients to perform spinal anesthesia is often problematic because even slight overriding of fracture is intensely painful. When considering the technique used to aid positioning for spinal block, Sandby-Thomas et al reported that the most frequently used agents were midazolam, ketamine, and propofol. Alternative agents were fentanyl, remifentanil, morphine, nitrous oxide, and sevoflurane, whereas nerve blocks were used infrequently[15].

The beneficial effect of FICB in patients with radiologically confirmed hip fractures is well known with several studies reporting a good outcome[16,17]when compared to NSAIDS[18], alfentanil. FICB provided good pain relief for patients with femoral shaft fractures when used in prehospital care FICB is simple, easy to perform and requires less skill. Unlike FNB, FICB does not require the use of nerve stimulator which could cause additional pain to the patient due to quadriceps muscle contraction. Ghimire A, concluded that Fascia iliaca compartment block provides better analgesia than femoral nerve block in terms of facilitating optimal positioning for subarachnoid block in patients undergoing proximal femoral fracture fixation procedure[19].

Comparison of mean age and ASA grades of the studied cases showed that t there was no difference between three groups p> 0.05. There was statistically insignificant difference in onset of FICB between three groups (p = 0.550). In our study the onset time of FICB was 27.8 ± 3.39 minutes in group I, 28.83± 3.64 minutes in group II and 28.33 ± 3.56 minutes in group III. Studies using nerve stimulation for three-in-one blocks with 20 mL of bupivacaine 0.5% have reported sensory onset times of 27 ± 7 minutes82, 32 ± 10 minutes83, and 27 ± 16 minutes84 which is similar with our study. Rest of our results ware also similar to studies conducted by other authors. Among three groups two patients (7%) in group III had bradycardia which was treated with injection intravenous atropine. Among three groups two patients (7%) had sedation in group III but was maintaining Spo2>94% and were responding to commands. Hypotension was not noted in any patient. There was no incidence of nausea or vomiting. There was no symptom or sign of local anesthetic agent toxicity observed in any patient. Hence FICB provides preoperative analgesia for positioning for spinal anesthesia in patients of proximal fracture femur. Fascia iliaca blocks can also provide

significant benefit in the pre-operative period and allow patients to sit up more comfortably while they await surgery. Addition of dexamethasone and dexmedetomidine to local anesthetic further prolongs postoperative analgesia of FICB[20].

Conclusion:

Use of FICB in patients of fracture neck of femur provides analgesia for positioning during spinal anesthesia. Dexamethasone, Dexmedetomidine as adjuvant to bupivacaine can be used safely to prolong post-operative analgesia in FICB. Addition of dexamethasone or dexmedetomidine to Bupivacaine further prolongs post-operative analgesia compared to plain Bupivacaine. Addition of dexmedetomidine to Bupivacaine provides better postoperative analgesia than Bupivacaine with dexamethasone.

Conflict Of Interest: None

References:

1. Jain AK. Proximal Femoral Fractures. Indian Journal of Orthopaedics. 2013;47(3):322.
2. Mittal R, Banerjee S. Proximal femoral fractures: Principles of management and review of literature. Journal of Clinical Orthopaedics and Trauma. 2012;3(1):15-23.
3. Bonnaire F, Zenker H, Lill C, Weber AT, Linke B. Treatment strategies for proximal femur fractures in osteoporotic patients. Osteoporos Int. 2005 Mar;16 Suppl 2:S93-S102. Epub 2004 Oct 16.
4. Bhosale P, Suryawanshi A, Mittal A. Total hip arthroplasty for failed aseptic Austin Moore prosthesis. Indian Journal of Orthopaedics. 2012;46(3):297-303.
5. Nagara M, Uchimura K, Nagara H, Furuya Y. [Epidural anesthesia for the repair of the femoral neck fracture in elderly patients]. Masui. 1995 Mar 3;44(3):419-22.
6. Kirksey MA, Haskins SC, Cheng J, Liu SS. Local Anesthetic Peripheral Nerve Block Adjuvants for Prolongation of Analgesia: A Systematic Qualitative Review. Schwentner C, ed. PLoS ONE. 2015;10(9):e0137312.
7. Chong MA, Berbenetz NM, Lin C, Singh S. Perineural Versus Intravenous Dexamethasone as an Adjuvant for Peripheral Nerve Blocks: A Systematic Review and Meta-Analysis. Reg Anesth Pain Med. 2017 May/Jun;42(3):319-326.
8. Yaghoobi S, Seddighi M, Yazdi Z, Ghafouri R, Khezri MB. Comparison of Postoperative Analgesic Effect of Dexamethasone and Fentanyl Added to Lidocaine through Axillary Block in Forearm Fracture. Pain Research and Treatment. 2013;2013:761583.
9. Selim MF, Elnabtity AMA, Hasan AMA. Comparative evaluation of epidural bupivacaine – dexmedetomidine and bupivacaine –fentanyl on Doppler velocimetry of uterine and umbilical arteries during labor. Journal of Prenatal Medicine. 2012;6(3):47-54.
10. Brummett CM, Hong EK, Janda AM, Amodeo FS, Lydic R. Perineural dexmedetomidine added to ropivacaine for sciatic nerve block in rats prolongs the duration of analgesia by blocking the hyperpolarization- activated cation current. Anesthesiology. 2011 Oct;115(4):836–43.
11. Dalens B, Vanneuville G, Tanguy A. Erratum: A comparison of the fascia iliaca compartment block with the 3-in-1 block in children (Anesth Analg, Vol. 69, No. 6, December 1989, p. 709). Vol.70, Anesthesia and Analgesia. 1990. p. 474.
12. Cuignet O, Mbuyamba J, Pirson J. The long-term analgesic efficacy of a single - shot fascia iliaca compartment block in burn patients undergoing skin-grafting procedures. J Burn Care Rehabil. 2005; 26 (5): 409–15.
13. Lopez S, Gros T, Bernard N, Plasse C, Capdevila X, Ph D. Fascia Iliaca Compartment Block for Femoral Bone Fractures in Prehospital Care. 2003;28(3):203–7.
14. Capdevila X, Biboulet P, Bouregba M, Barthelet Y, Rubenovitch J, d' A this F. Comparison of the three-in-one and fascia iliaca compartment blocks in adults: clinical and radiographic analysis. Anesth Analg. 1998;86(5):1039–44.
15. Sandby-Thomas M, Sullivan G, Hall JE. A national survey into the peri- operative anaesthetic management of patients presenting for surgical correction of a fractured neck of femur. In: Anaesthesia. 2008. p.250-8.
16. Bundgaard M, Bak M, Foss NB, Kristensen BB, Randomized A, Trial P, . Fascia Iliaca Compartment Blockade for Acute Pain Control in Hip Fracture Patients. 2007; (4):773–8.
17. Yun MJ, Kim YH, Han MK, Kim JH, Hwang JW, Do SH. Analgesia before a spinal block for femoral neck fracture: Fascia iliaca compartment block. Acta Anaesthesiol Scand. 2009;53(10):1282–7.
18. Monzon DG, Iserson K V., Vazquez JA. Single Fascia Iliaca Compartment Block for Post-Hip Fracture Pain Relief. J Emerg Med. 2007;32(3):257–62.
19. Ghimire A, Bhattarai B, Koirala S, Subedi A. Analgesia before Performing Subarachnoid Block in the Sitting Position in Patients with Proximal Femoral Fracture: A Comparison between Fascia Iliaca Block and Femoral Nerve Block. Kathmandu Univ Med J 2015;50(2):152-5.
20. Gandhi R, Shah A,Patel I. Use of dexmedetomidine along with bupivacaine for brachial plexus block.National J Med Res (2012)