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Comparative study of intravenous fentanyl versus *Fascia iliaca* compartment block in reducing pain for better position in fracture femur patients for sub arachnoid block

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Abstract

Background: For performing successful Sub Arachnoid Block, proper positioning of patient is needed, which is affected in patients with fracture femur due to pain and immobility of joint.

Aim/Objective – Aim is to reduce pain and to get better positioning for Sub Arachnoid Block in these patients by comparing Intravenous Fentanyl and *Fascia iliaca* Compartment Block.

Material & Method: Six patients of fracture femur of age 30 to 60 years and of ASA Grade I and II were divided into 2 groups. 30 patients were given Intravenous Fentanyl @ 1mcg/kg and 30 patients were given *Fascia iliaca* Compartment Block with 20 ml of 0.25% Ropivacaine using Peripheral Nerve Stimulator (PNS) 30 mins before giving Sub Arachnoid Block.

Adequacy of position and VAS for pain was noted at the time of sitting position for Sub Arachnoid Block along with hemodynamics and other side effects.

Results: Pain reduction in *Fascia iliaca* Compartment Block group was better than Intravenous Fentanyl group (p value <0.05) and positioning for Sub Arachnoid Block was better in *Fascia iliaca* Compartment Block group as compared to Intravenous Fentanyl group (p value <0.05).

Patients in FICB group were found to be more hemodynamically stable and experienced no side effects as compared to patients in Intravenous Fentanyl Group.

Conclusion: Patient with *Fascia iliaca* Compartment Block were found to have lower pain/VAS and better positioning during Sub Arachnoid Block procedure.

Keywords: *Fascia iliaca* compartment block, fentanyl, fracture femur, sub arachnoid block, pain, positioning

Introduction

The incidence of femur fracture is among the most common traumatic injury in elderly patients. The number of hip fracture worldwide is expected to increase from 1.7 million in 1990 to 8.2 million in 2050 [1] due to ageing of population and urbanization.

Owing to elderly patients, these patients found to have multiple co morbidities which increases peri-operative complications hence these patients are usually operated under Sub Arachnoid Block because of multiple advantages over General anesthesia. In these patients anaesthesiologist faces the common problem of improper positioning for Sub Arachnoid Block due to extreme pain and immobile joint [2]. Secondly, because of pain in sitting position neuro-hormonal stress predisposes these patients to cardiovascular adverse events.

[3]. to make anaesthesia safe and smooth, pain free and better position of patients is needed for Sub Arachnoid Block. Various modalities have been tried to achieve this in different institutes which are counseling, systemic analgesics and now a days nerve block (Femoral Nerve, Compartment block) [4].

Among these, *Fascia iliaca* Compartment Block is safe and easy to administer block, well described for acute pain management in fracture femur patients [5].

In this study, we compared *Fascia iliaca* Compartment Block and Intravenous Fentanyl to reduce pain and get better position for Sub Arachnoid Block in fracture femur patients.

Material and Method

This study was conducted at Index Medical College Hospital and Research Centre, Indore

from February 2019 to June 2020, after approval from the institutional ethics committee. Written and informed consent was obtained from all subjects before study. After institutional ethical committee approval 90 patients of age group between 30 to 70 years of either sex belonging to ASA I/ASA II undergoing surgical intervention under spinal anaesthesia for fracture neck of femur. detailed history, complete physical examination and investigation done for all patients.

Inclusion Criteria

Sixty patients of ASA grade I and II belonging to age group 30-70 years of either sex with fracture femur undergoing surgeries planned under Sub Arachnoid Block.

Exclusion Criteria

Patient refusal, Local infection at site of block, allergy to local anaesthetic, drug abuse, addiction to alcohol or tobacco, concomitant fracture.

Patients were divided into two groups by computer generated random series in numbered envelope which were allocated to patients in order of recruitment.

In group B: Patients were given *Fascia iliaca* Compartment Block with 20ml of 0.25% Ropivacaine.

In group F: Patients were given Intravenous Fentanyl @ 1mcg/kg.

All patients who were coming for fracture femur surgeries under Sub Arachnoid Block from inclusion criteria were pre-operatively assessed as per protocol. VAS for pain and procedure for SAB, it's position were explained preoperatively.

One night before, all patients were given Tab. Alprazolam 0.25mg. On the day of operation, in pre-op room haemodynamics and pain were assessed.

Patients were taken on operating table, monitor was attached. Intra venous fluid started, and patient was assessed for haemodynamics and pain score at 0 minute.

Patients were kept in the operation theatre and in Group B, PNS guided *Fascia iliaca* compartment block by using 20 ml of 0.25% Ropivacaine were given under all aseptic precautions and in Group F, IV Fentanyl @1mcg/kg was given.

VAS score for pain and hemodynamic variables were recorded for 0, 10, 20 and 30 minutes.

At 30 minutes, all patients were given sitting position for sub arachnoid block and different anaesthesiologists performed this procedure without knowing the group and noted down adequacy of sitting position for sub arachnoid block and VAS for pain.

Patients were managed under Sub Arachnoid Block as per protocol. Side effects like nausea, vomiting were noted down.

Primary outcome of the study to compare the analgesic efficacy offered by both the techniques in terms of reduction of pain and better positioning achieved for subarachnoid block.

Secondary outcomes included assessment of drug used and block given for haemodynamic parameter following study.

Statistical Analysis

Statistical analysis was done with Sigmaplot version-10 computer software. Student t-test was applied to compare the means and P < 0.05 was taken as significant.

Results

This study was conducted with aim to reduce pain during sitting position while giving sub arachnoid block in fracture femur patients.

Two groups of 30 patients were taken to compare VAS for pain and adequacy of sitting position.

Demographic data in terms of Age, Gender, and ASA Grade were comparable in both groups which was statistically insignificant. (Table - 1)

Table 1: Showing patients characteristics between groups

Characteristics	Group		P value	
	Fentanyl	FICB		
Age (mean ± SD)	41.60±10.64	46.17±10.73	0.103	
Sex	Female	10 (33.3)	11 (36.7)	0.787
	Male	20 (66.7)	19 (63.3)	
ASA grade	I	23 (76.7)	19 (63.3)	0.260
	II	7 (23.3)	11 (36.7)	

FICB: *Fascia iliaca* Compartment Block, SD: Standard Deviation

P value < 0.05 is considered insignificant

Visual analogue scale score for pain were compared at 0, 10, 20, 30 and 40 minutes.

VAS for pain at 0 minute when patient was taken on table are statistically same (p > 0.05)

VAS for pain was found lower in Group B (FICB Group) after 20 minutes as well as 30 minutes as compared to group F (Fentanyl group) which is statistically significant (p value <0.001) (Table – 2)

Table 2: Comparing VAS for pain

Group		Baseline	10 min	20 Min	30 min	40 min
Fentanyl	Mean	5.40	5.33	5.30	5.33	.40
	Std. Deviation	.968	.994	.988	.994	1.070
FICB	Mean	5.80	5.33	3.90	2.70	.03
	Std. Deviation	.761	.711	.662	1.236	.183
P value		0.081	1.000	<0.001	<0.001	0.069

VAS: Visual analogue scale, FICB : *Fascia iliaca* Compartment Block

P value <0.05 is considered significant, < 0.01 is considered highly significant

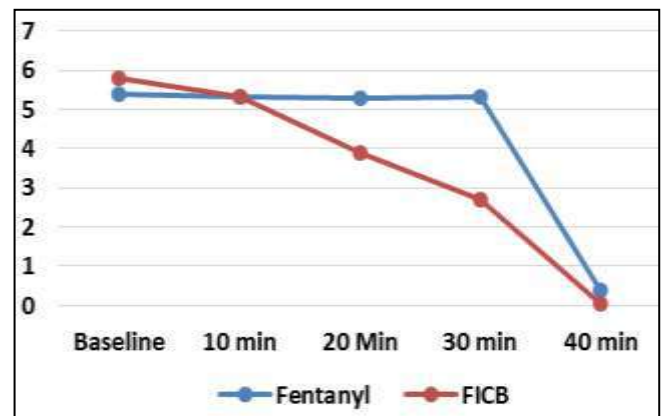


Fig 1: Comparing VAS for pain

Patient were given sitting position at 30 minutes of intervention. 20 patients out of 30 in Group B as compared to 4 out of 30 patients in Group F found to give adequate sitting position which was statistically significant. (Table – 3)

Table 3: Comparison of Adequacy of Position

Adequacy of position				
	Having poor position	Having fair position	Having good/adequate position	Total
Group B (FICB)	4	6	20	30
Group F (Fentanyl)	6	20	4	30

FICB: *Fascia iliaca* Compartment Block

Patient were monitored for Systolic Blood Pressure which was found statistically significantly lower in Group B at the

time of sitting position, i.e. at 30 minutes and at 40 minutes, as compared to group F (Table – 4 (a))

Table 4(a): Comparing Systolic Blood Pressure

Report						
Group		Baseline	10 min	20 Min	30 min	40 min
Fentanyl	Mean	145.77	147.07	147.53	147.43	113.23
	Std. Deviation	8.097	8.630	8.033	8.097	8.504
FICB	Mean	147.73	145.03	144.80	124.80	100.37
	Std. Deviation	8.534	9.309	9.084	6.754	7.703
P value		0.364	0.384	0.222	<0.001	<0.001

FICB: *Fascia iliaca* Compartment Block

P Value < 0.05 is considered significant, < 0.01 is considered highly significant

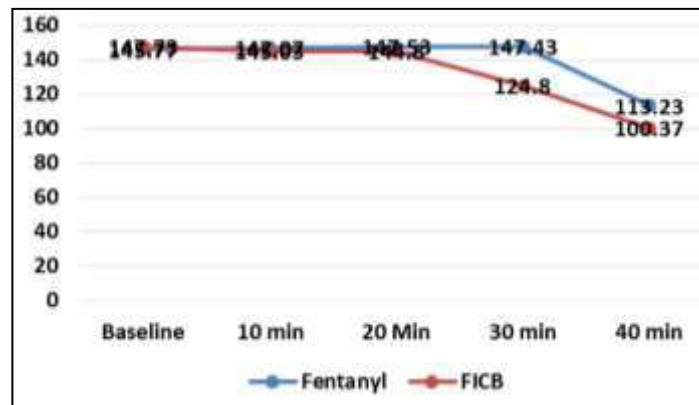


Fig 2: Comparing Systolic Blood Pressure

However, diastolic Blood pressure were found similar in both groups and p value is >0.05 (Table – 4 (b))

Table 4(b): Comparing Diastolic Blood Pressure

Group		Baseline	10 min	20 Min	30 min	40 min
Fentanyl	Mean	88.60	89.50	89.23	89.43	89.17
	Std. Deviation	4.375	4.024	4.248	4.032	4.379
FICB	Mean	89.80	85.30	85.60	88.17	71.23
	Std. Deviation	6.397	5.018	5.379	6.103	9.409
P value		0.400	0.001	0.005	0.375	<0.001

FICB: *Fascia iliaca* Compartment Block

P value < 0.05 is considered significant, < 0.01 is considered highly significant.

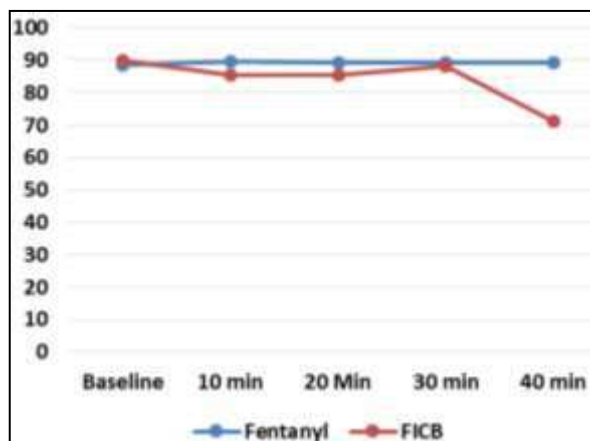


Fig 3: Comparing Diastolic Blood Pressure

Heart rate was found lower in sitting position i.e. at 30 minutes in Group B which was statically significant. (Table – 5)

Table 5(a): Comparing Heart Rate

Group		Baseline	10 min	20 Min	30 min	40 min
Fentanyl	Mean	83.97	81.90	82.10	81.70	81.70
	Std. Deviation	5.672	5.088	5.287	5.120	5.120
FICB	Mean	84.30	81.00	80.83	80.17	80.83
	Std. Deviation	5.572	5.669	5.590	5.896	5.590
P value		0.819	0.520	0.371	0.287	0.534

FICB: *Fascia iliaca* Compartment Block
P value > 0.05 is considered insignificant

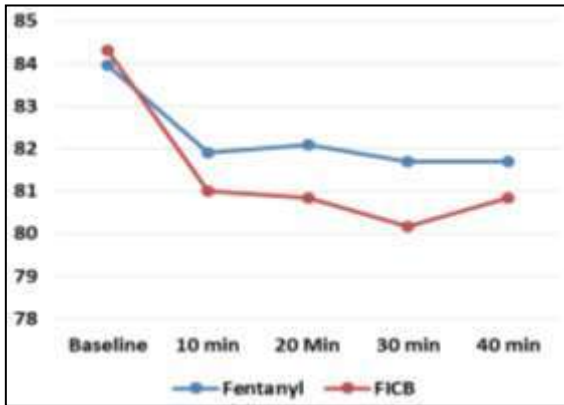


Fig 4: Comparing Heart Rate

The mean value of Heart rate in group FIC block was less as compared to iv fentanyl block and placebo group, in every 10 min the mean value of heart rate is decreasing in FIC block, while in IV Fentanyl group and Placebo group there is no significant change in heart rate.

Table 5(b): Comparison of Heart Rate at different time intervals

Minutes	Treatments pair	Tukey HSD p-value	Tukey HSD inference
0 Minutes	Fentanyl vs. Placebo	0.001	Significant
	Placebo vs. Ficb	0.001	Significant
	Ficb vs. Fentanyl	0.001	Significant
10 Minutes	Fentanyl vs. Placebo	0.02	Significant
	Placebo vs. Ficb	0.001	Significant
	Ficb vs. Fentanyl	0.003	Significant
20 Minutes	Fentanyl vs. Placebo	0.001	Significant
	Placebo vs. Ficb	0.001	Significant
	Ficb vs. Fentanyl	0.001	Significant
30 Minutes	Fentanyl vs. Placebo	0.001	Significant
	Placebo vs. Ficb	0.001	Significant
	Ficb vs. Fentanyl	0.001	Significant
40 Minutes	Fentanyl vs. Placebo	0.001	Significant
	Placebo vs. Ficb	0.001	Significant
	Ficb vs. Fentanyl	0.001	Significant

04 patients of Group F had nausea (Table 6(a)) and vomiting (Table 6 (b)) which was statically non-significant. No other side effects were noted in either groups.

Table 6(a): Comparing Nausea

		Group		Total	P value
		Fentanyl	FICB		
Nausea	None	Count	26	30	0.038
		% within Group	86.7%	100.0%	
	Present	Count	4	0	
		% within Group	13.3%	0.0%	

FICB: *Fascia iliaca* Compartment Block
P value <0.05 is considered significant

Table 6(b): Comparing Vomiting

		Group		Total	P value
		Fentanyl	FICB		
Vomiting	None	Count	26	30	0.038
		% within Group	86.7%	100.0%	
	Present	Count	4	0	
		% within Group	13.3%	0.0%	

FICB: *Fascia iliaca* Compartment Block
P value < 0.05 is considered significant

Discussion

Patients with femur fracture requires a continuum of pain management from the time of prehospital admission till final rehabilitation. Optimal perioperative analgesia is an issue to be addressed. A good postoperative analgesic regimen is critically important to attenuate stress response in the postsurgical period to improve postoperative outcomes. Inadequate pain control may lead to serious medical issues such as tachycardia, myocardial, ischemia, venous thromboembolism. Adequate postoperative analgesia facilitates earlier patient mobilisation and satisfaction.

Fracture femur is among the common surgeries comes in orthopedics department, which is preferably taken under Sub Arachnoid Block, so as to avoid intubation, mechanical ventilation and use of multiple medication which increases morbidity. Sub Arachnoid Block gives good relaxation, decrease blood loss, provide post operative analgesia, decrease incidence of deep vein thrombosis and found economical than General anesthesia.

Femur Fracture are considered painful bony injury. Patients may be found comfortable or pain relieved with systemic analgesic on lying down position, but during giving sitting position for sub arachnoid block their pain increases four folds in intensity in almost 2/3rd of patients [6].

Relieving pain in sitting position for sub arachnoid block not only provided adequate position for procedure but also reduces time, and multiple prick and also decrease untoward hemodynamic responses.

Previously, patients were used to console and explain for this procedure, but nowadays, various strategies were used to reduce pain and make them comfortable. Out of them, systemic medication and nerve block (Femoral Nerve Block, Compartment Block) are under use. Systemic medication has its own side effects and limitations [7].

This study was done to find out better approach for pain control by using *Fascia iliaca* Compartment Block as compared to Intravenous Fentanyl.

We took 30 patients in each group and compared about VAS for pain and adequacy of sitting position at the time of Sub Arachnoid Block. Data were collected from patient and anaesthesiologist performing Sub Arachnoid Block.

VAS for pain on sitting position, i.e., at 30 minutes after intervention was found to be statistically significantly lower (p value <0.001) in group B.

In a study conducted by Dureja *et al.* in 2006 [8], comparison between Inj. Diclofenac and FICB with 0.5% bupivacaine was done.

In a study by Kumar D *et al.* in 2006 [9], 0.5% ropivacaine was used in FICB, prolonged analgesia with significant decrease in VAS after 20 minutes of block was obtained, which was also obtained in our findings.

In a comparative study between FICB and IV Fentanyl using 0.5% ropivacaine for FICB and 0.5 mcg/kg IV Fentanyl conducted by Singh AP *et al.* [10] it was concluded that VAS was better in FICB group along with satisfactory

analgesia and better comfort of patient during SAB in FICB patients, which is supporting our findings.

Studies conducted by Lamaroon A *et al.* (2009) ^[11] MJ Yun *et al.* (2010) ^[12], Jadon *et al.* (2013) ^[13] also support our findings of better efficacy of FICB for significant decrease of VAS and better positioning during SAB with no adverse effects.

In a study done by Melaku Bantie *et al.* (2020) ^[14] comparing analgesic effect of IV Fentanyl, Femoral Nerve Block and FICB during SAB positioning was found to be significantly better in FICB and FNB groups as compared to IV Fentanyl group.

Yuan Pin HSU *et al.* (2018) ^[15] conducted a study of FICB versus IV analgesics for positioning of femur fracture patients before a spinal block, which concluded that FICB provide significantly better quality during positioning of femur fracture patients for a spinal block and a shorter time for spinal anaesthesia as compared to IV analgesics.

K. Deepa *et al.* (2017) ^[16] conducted a study for comparative evaluation of *Fascia iliaca* compartment block and IV fentanyl for positioning during spinal anaesthesia in fracture femur surgeries which concluded that FICB is more efficacious than IV fentanyl for positioning during SAB in surgery for fracture femur. It showed that FICB provides superior analgesia, better quality of patient positioning and greater patient satisfaction thereby reducing time taken to perform spinal anaesthesia in sitting position compared to IV fentanyl which is same as our study.

In a study conducted by Madabushi *et al.* (2016) ^[17] it was reported that IV fentanyl group had significantly reduced mean heart rate as compared to patients of FICB group, but in our study mean heart rate was reduced in Group B.

In a comparative study between IV Fentanyl and FICB by Raksha Keitisak M *et al.* ^[18] the results support our findings that there is no significant p value study where the hemodynamic stability is more in group B or group F.

In the study by Jadon *et al.* (2013) ^[13] it was said that there was no significant side effects seen in FICB group, which supports the findings in our study. A study by Kumar *et al.* (2006) ^[9] also supports the same finding.

In a study performed by Diakomi *et al.* (2014) ^[19] which was same as ours, no adverse effects in both groups (FICB and IV Fentanyl) were noted.

A study by Lamaroon *et al.* (2009) ^[11] also shows no complications in FICB, same as our study.

Summary

Patients with *Fascia iliaca* Compartment Block gave better sitting position for Sub Arachnoid Block owing to reduce VAS for Pain as compared to Intravenous Fentanyl group patients. They were also more hemodynamically stable.

Conclusion

It is concluded that *Fascia iliaca* Compartment Block is more efficacious than intravenous fentanyl for positioning during spinal anaesthesia in surgery for fracture femur. *Fascia iliaca* Compartment Block provides superior analgesia, better quality of patient positioning, greater patient satisfaction thereby reducing the time taken to perform spinal anaesthesia in sitting position compared to i.v. fentanyl in fracture femur surgery.

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