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Comparative Evaluation of FasciaIliaca Compartment Block and Intravenous Fentanyl for Positioning During Spinal Anesthesia in Fracture Femur Surgeries - A Randomized Controlled Study

Dr. S Arun Sathish[1], Dr. Gokul S[2], Dr. Rakesh Choudhary[3], Dr. Surya Prakash Chittora[4]

[1]PG Resident, Department of Anesthesia, Jhalawar Medical College and Associated Hospitals, Jhalawar (Raj.)

[2]PG Resident, Department of Anesthesia, Jhalawar Medical College and Associated Hospitals, Jhalawar (Raj.)

[3]Medical Officer, Department of Anesthesia, Jhalawar Medical College and Associated Hospitals, Jhalawar (Raj.)

[4]Senior Professor and HOD, Department of Anesthesia, Jhalawar Medical College and Associated Hospitals, Jhalawar (Raj.)

Abstract: ***Background: Spinal anaesthesia is the commonly used anaesthetic technique for surgery of fracture femur. Severe pain during patient positioning for spinal anaesthesia is a major concern. Opioids and other systemic analgesics have been in use to provide pain relief and improve positioning while the peripheral nerve blocks have now come up as a safe and an effective alternative. Methods: After the hospital ethics committee approval, 60(ASAI–II) adult patients scheduled for Femur fracture surgeries were included in this study. The Group FICB (n=30) received 30ml of 0.25% bupivacaine under landmark technique fifteen minutes before positioning. Group FENT (n=30) received titrated doses of Inj.Fentanyl 0.5mcg/kg I.V. repeated to 3 doses (1.5 mcg/kg totally) with an interval of 5 minutes between doses, the first dose given 15 minutes before positioning. Visual Analogue Scale score, quality of patient positioning, patient satisfaction, time to perform spinal anaesthesia and requirement of first rescue analgesic post op were compared between the two groups. Results: VAS score during positioning in group FICB: 1.59 ± 1.31 versus FENT: 2.80± 1.64 (P=0.0025).Quality of patient positioning in groupFICB: 2.40±0.85versusFENT:1.68±0.60(P=0.0004). Time taken to perform spinal anesthesia in group FICB: 4.86±0.49 Versus FENT: 5.66 ±0.89 (P<0.0001). Conclusion: It is concluded that comparing with Intravenous Fentanyl, FICB provides better quality during positioning of femur fracture patients, better quality of patient positioning, greater patient satisfaction.***

Keywords: Spinal anaesthesia, fracture femur, positioning, FasciaIliaca Compartment Block, intravenous fentanyl

1. Introduction

The fascia iliaca compartment block (FICB) was first described by Dalens and colleagues in 1989[(1)].It remains a popular regional anaesthetic technique for surgical procedures involving the hip joint and femur. The FICB may be thought of as an anterior approach to the lumbar plexus where local anaesthetic (LA) is injected proximally beneath the fascia iliaca [(2)] with the aim of blocking the femoral nerve (FN), obturator nerve (ON), and lateral cutaneous nerve of thigh (LCNT) simultaneously (FIG 1).

The hip joint consists of a ball (femoral head) and socket (acetabulum) with the femoral head, neck, and greater and lesser trochanters comprising the proximal end of the femur. The psoas major muscle originates from the vertebral bodies of T12–L4 and costal processes of the L1–L5 vertebrae and merges with the iliacus muscle (which originates from the inner surface of the iliac bone) before inserting into the lesser trochanter. The greater trochanter provides the insertion for gluteus medius and gluteus minimus muscles [(3)].

The sensory nerve supply to the hip joint includes the FN, ON, articular branches of the sciatic nerve, nerves supplying quadratis femoris, and superior gluteal nerve. Sensory innervations of the skin on the lateral thigh is supplied by the LCNT and by the lateral cutaneous branch of the subcostal nerve. Sensation to the upper anterior portion of the thigh is supplied by the ilioinguinal and genitofemoral nerves.

2. Landmark Technique

Anatomical landmarks are the inguinal ligament, anterior superior iliac spine (ASIS), and pubic tubercle. The patient is positioned supine, and a line connecting the ASIS and the pubic tubercle is divided into thirds. The injection is performed at a point 1 cm caudad to the junction of the lateral third and medial two thirds. The ipsilateral femoral pulse is palpated approximately 1.5 cm medial to the point of injection. A blunt, short-bevel needle is inserted perpendicular to the skin and the needle angle adjusted to approximately 60° and directed cranially. A ‘give’ or ‘pop’ may be felt as the needle passes through fascia lata, and a second ‘give’ as it passes through the fascia iliaca. The needle angle is adjusted to approximately 30° and advanced a further 1–2 mm. LA should be injected without experiencing resistance. If resistance occurs, the needle should be withdrawn slightly and injection reattempted after further aspiration [(4)].

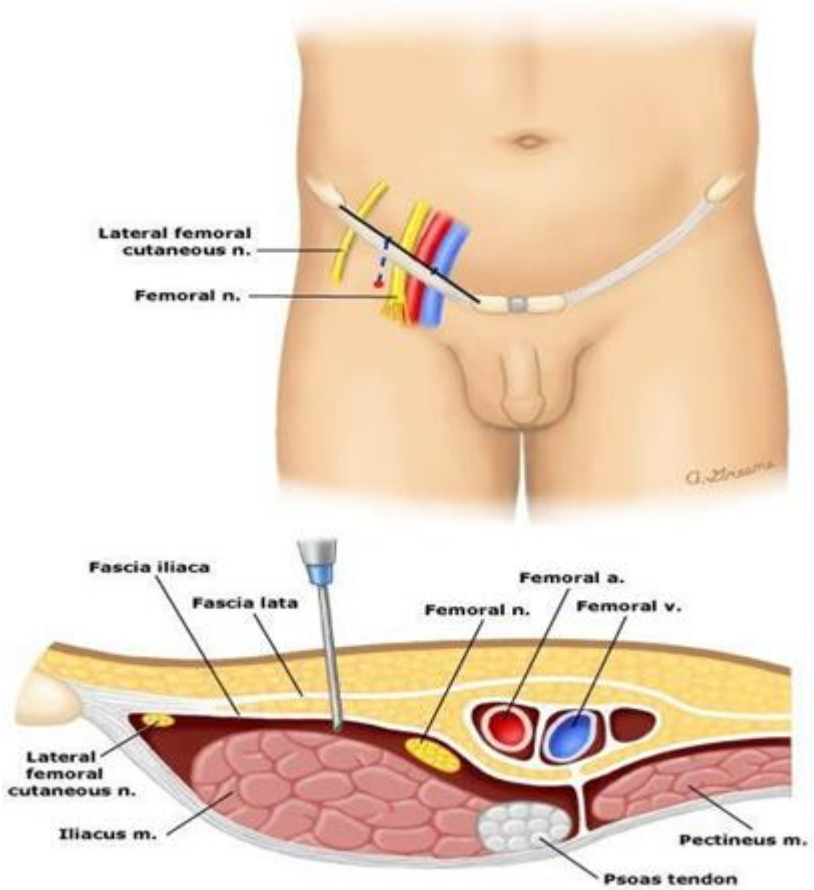


Figure 1: Anatomy and Land mark procedure

FICB is seen as a simple method which is easy to learn and use. It's performed via the landmark method. FICB is also well described for acute pain management of femur fractures and was shown to decrease opioid requirements in high-risk patients [(5)]. FICB decreases the discomfort and was also shown to improve positioning for spinal anesthesia. Correct positioning during spinal anaesthesia is also crucial for a successful procedure.

3. Materials and Methods

After the hospital ethics committee approval, 60 American Society of Anesthesiologists (ASA) physical statuses I–II patients, aged between 18–75 years scheduled for Femur fracture surgeries were included in this clinical trial.

Exclusion criteria included age <18 years, ASA class III-IV, known allergy to Opioids, chronic hepatic or renal failure, any contraindications to regional techniques (allergy to amide local anesthetics, infection around the site of the block, and coagulation disorder), history of analgesics dependence and patients with body mass index(BMI) >35 kg/m^2. The study was performed between September 2021and January2022.

Patients were distributed in two groups through computer generated random numbers table: Fascia Iliaca block (FICB) and Intravenous fentanyl group (FENT).

In group FICB, patients received 30mL of 0.25% Bupivacaine incrementally after a negative aspiration test via FICB guided by peripheral nerve stimulator 5 minutes prior to positioning and Group FENT patients received titrated doses of Inj.Fentanyl 0.5mcg/kg I.V. repeated to 3 doses (1.5 mcg totally) with an interval of 5minutes between doses.

Hemodynamic variables like heart rate, non-invasive blood pressure, saturation of oxygen, respiratory rate was recorded after the block/iv fentanyl and at five minutes intervals till positioning. The analgesia provided by either of the modes was assessed by using Visual analogue scale scores at 15minutes (during positioning) after the block/ I.V.Fentanyl.

Sub arachnoid block was performed in the sitting posture under strict aseptic precautions in the L3-L4 space using 25G Quincke needle with 3ml of 0.5% Bupivacaine (hyperbaric). The quality of patient positioning for administering spinal anesthesia was recorded by another anesthesiologist blinded to the mode of analgesia with scores of 0-3. Time to perform spinal anesthesia will be recorded (time from beginning of positioning to end of spinal). The collected data were recorded for further statistical analysis.

4. Result

Demographic variables and operative characteristics were similar between the groups. (Table 1) There were no statistically significant differences in age (years), BMI (kg/ m2).

Table 1: Demographic and Clinical Characteristics

Variable	FICB (n=30)	FENT (n=30)	P- value
Age (years)	43.5+12.9	42.3+14.5	P=0.736
Sex (F/M), number	7/23	5/25	P=0.208
ASA (1/2), number	16/14	16/14	P=1.0
BMI (Kg/m^2)	25.8±4.4	24.6±4.8	P=0.317

Demographic data and base line values for HRs, MAPs and Spo2 were comparable in both the groups. There was no significant change noticed in HRs between two groups (P = 0.75); however, MAP was significantly lower in FENT group (P = 0.005).However, no patient in both the groups had SpO_2 <90% during the procedure (Table 2).

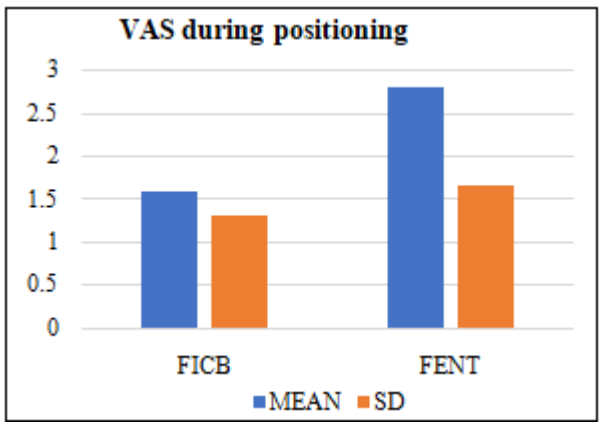
Table 2: Vital Clinical Parameter before Analgesia and During Position

	FICB	FENT	P value
MAP at T0	88.41±6.54	86.8±8.94	0.429
MAP at position	88.36±6.87	84.6±8.21	0.005
HR at T0	78.73±9.68	79.8±11.02	0.90
HR at position	79.36±8.86	78.66±9.26	0.75
Spo2 at T0	98.12±8.76	98.6±1.82	1
Spo2 at position	98.0±0.11	98.03±0.40	0.69

VAS score during positioning in group FICB: 1.59 ± 1.31 versus FENT: 2.80± 1.64 (P=0.0025). Quality of patient positioning in group FICB: 2.40±0.85 versus FENT:1.68±0.60(P=0.0004). Time taken to perform spinal anesthesia in group FICB: 4.86±0.49 Versus FENT: 5.66 ±0.89 (P<0.0001) (Table 3)

Table 3: VAS Scores, Performance Time, Quality of Position and Time to Perform SAB

	FICB	FENT	P value
No of days since fracture	4.53±1.50	4.67±1.54	0.7354
VAS at T0	7.83±1.51	8.4±1.22	0.12
VAS during position	1.59±1.31	2.80±1.64	0.0025
Quality of positioning	2.40±0.85	1.68±0.60	0.0004
Time to perform SAB	4.86±0.49	5.66 ±0.89	0.001



5. Discussion

Spinal anesthesia is the most commonly used anesthetic technique of choice in orthopedics for lower limb fractures. While regional anesthesia has been shown to be more beneficial compared to general anesthesia, patient positioning for neuraxial blockade may cause severe pain in patients with femur fractures [6]. Various systemic analgesics are being used to provide pain relief during positioning in these patients. Among the systemic analgesics, opioids are widely used but they are known to be associated with side effects like cognitive impairment, vomiting, urinary retention, respiratory depression especially in the elderly. Nerve blocks like the 3 in 1 block, femoral nerve block, fasciailiaca compartment block [7] have all come up as an alternative approach to provide pain relief and improve positioning in these patients [8]

The most important finding of our study was that fascia iliaca compartment blockade offered superior analgesia compared to IV fentanyl during position for spinal anesthesia in cases of fracture femur. The Visual Analogue Scale score during positioning was significantly lower in FICB group (1.59±1.31) compared to FENT group (2.80±1.64)and it was statistically significant with a P value of 0.0025. Ashok J et al [9] compared FNB with Fentanyl similar to our study and found that FNB patients had low VAS score compared to Fentanyl group.

FICB was associated with greater patient satisfaction. Iamaroon et al [10] used 0.5 µg/kg fentanyl as the initial dose and average additional dose of fentanyl in FENT group was 17.1 ± 18.4. The total doses required by IV fentanyl group are similar to our study. In our study, initial doses of FENT 1.0 µg/kg were given. We planned to give the additional dose with a 5 min interval because titration of the dose of fentanyl may reduce any serious side-effects, such as hypoventilation or apnea.

The quality of patient positioning was higher in FICB group with a mean of 2.40±0.85 when compared to FENT group which had a mean of1.68±0.60. It was statistically significant with a P value of 0.0004. It means that fasciailiaca compartment block provides better quality of patient positioning for spinal anesthesia compared to i.v. fentanyl. Patient satisfaction was also significantly better in FICB group. Durran et al [11] compared FNB with opioid – Nalbuphine and concluded that nerve block provides a better patient positioning and satisfaction

6. Conclusion

It is concluded that Fascia Iliaca Compartment Block is more efficacious than intravenous fentanyl for positioning during spinal anesthesia 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 anesthesia in sitting position compared to i.v. fentanyl in fracture femur surgery.

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