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# ULTRASOUND GUIDED FASCIA ILIACA COMPARTMENT BLOCK FOR PROXIMAL FEMORAL NAILING SURGERIES UNDER SPINAL ANAESTHESIA: COMPARISON OF SUPRAINGUINAL WITH INFRAINGUINAL APPROACH

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**Abstract**

**Background and aim:** Hip fractures are common in elderly and are usually managed by proximal femoral nailing (PFN) surgery. Fascia iliaca compartment block (FICB) is commonly administered to manage postoperative pain. The present study was aimed to compare duration of analgesia between suprainguinal and infrainguinal approach for FICB.

**Patients and methods:** 80 geriatric patients undergoing elective PFN surgery under spinal anaesthesia were included in the study. At the end of surgery ultrasound guided FICB was administered. Patients were divided in to two groups, group SIFICB received FICB using suprainguinal approach and group IIFICB received FICB using infrainguinal approach. 40 ml of 0.125% levobupivacaine was injected below fascia iliaca. Postoperative pain was assessed using visual analogue scale (VAS) score at 2,4,6,8,12,16,20, and 24 hours. When VAS score was 4 or more, rescue analgesia (inj.Tramadol 1 mg/kg IV) along with inj. Ondansetron 4mg IV was administered. Postoperatively haemodynamic parameters were assessed at 2,4,6,8,12,16,20, and 24 hours. Any adverse effects such as delirium, nausea and vomiting were noted.

**Results:** The duration of analgesia was significantly prolonged in group SIFICB when compared to group IIFICB (11.58±3.2 hrs vs 8.2±2.5 hrs, $p < 0.0001$). 24 hours tramadol requirement was significantly less in SIFICB group in comparison to IIFICB group (62.6±12.8 mg vs 87.4±14.6 mg, $p<0.0001$). VAS scores were significantly lower in SIFICB group at 12 and 16 hours postoperatively in comparison to IIFICB group ($p<0.0001$).

**Conclusion:** Suprainguinal FICB is preferred to infrainguinal FICB in geriatric patients undergoing PFN surgery as it provides longer duration of analgesia, decreases postoperative tramadol requirement, and decreases postoperative VAS score.

**Key words:** Proximal femoral nailing, fascia iliaca compartment block, analgesia

## Introduction

Hip fractures are a common cause of hospitalization in geriatric age group and they frequently require surgery. Proximal femur nailing (PFN) is a minimally invasive surgery for management of displaced hip fractures and is usually associated with moderate to severe pain. Inadequate treatment of postoperative pain delays mobilization of the patient, increases risk of postoperative delirium and deep vein thrombosis.[1] Polypharmacy, associated comorbidities and increased sensitivity to opioids narrow down the options available for pain management in elderly. Fascial compartment blocks are an attractive choice for pain management as they are devoid of side effects of epidural analgesia. Facia iliaca compartment block (FICB), first described by Dalens et al [2] is a popular technique for managing pain following PFN surgery. Till recently landmark guided FICB was widely used, however, the success rate is variable due to false facial pop up and deposition of local anaesthetic in false plane. With the advent of ultrasonography (USG), the success rate has improved as it allows real time needle visualization and deposition of drug in the proper plane. Conventionally FICB is administered using infrainguinal approach. In 2011, Hebbard et al [3] first described modified suprainguinal approach for FICB in a cadaver study. Our study hypothesis was that suprainguinal FICB may provide better postoperative analgesia than infrainguinal FICB in patients undergoing PFN surgery. The primary objective of the study was to compare duration of analgesia in both the groups. Secondary objectives included comparison of total rescue analgesia requirement in 24 hours, haemodynamic parameters, visual analogue scale (VAS) score and incidence of adverse effects like postoperative delirium, nausea, vomiting and wound infection.

**Patients and methods:**

The current investigation was carried out in a teaching hospital providing tertiary care after receiving approval from institutional ethical committee. Patients aged between 65-80 years, belonging to either sex and undergoing elective PFN surgery were included in the study. Patients having moderate/severe cardiorespiratory disease, allergy to study drugs, history of inguinal surgery and on anticoagulation therapy were excluded from the study. Patients were randomized in to two groups using computer generated random numbers. Group SIFICB – received FICB through suprainguinal approach and group IIFICB – received FICB through infrainguinal approach. The anaesthesiologist recording duration of analgesia, postoperative VAS score, haemodyanmic parameters and adverse effects was blinded to the group allocation. All patients underwent pre-anaesthetic evaluation (PAE), the procedure was informed and written, informed consent was obtained from all patients. Patients were shifted to operation theatre (OT) and baseline heart rate (HR), non-invasive blood pressure (NIBP) and pulse oximetry were recorded. Subarachnoid block (SAB) was performed under all aseptic and antiseptic precautions at L3-4 interspace with 25 G Quincke needle and 2.8 ml of 0.5% hyperbaric levobupivacaine was administered intrathecally. After completion of surgery, all patients received FICB as per the group allocation.

Group SIFICB received suprainguinal FICB, 40 ml of 0.125% levobupivacaine + 8 mg dexamethasone (2ml) (total volume – 42 ml) was administered

Group IIFICB received infrainguinal FICB, 40 ml of 0.125% levobupivacaine + 8 mg dexamethasone (2ml) (total volume – 42 ml) was administered

FICB was administered using USG (Sonosite edge II) with a high frequency linear probe 13-6 MHz. In suprainguinal approach, the transducer was placed in a sagittal plane medial to the anterior superior iliac spine (ASIS). The transducer was rotated clock wise (for block on right side) or counter clockwise (for block on left side) so that the probe lies along the spino umbilical line. Inguinal ligament, sartorius muscle, internal oblique muscle, fascia iliaca,

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iliacus muscle, anterior inferior iliac spine (AIIS) and deep circumflex iliac artery (DCIA) were identified (figure 1). The needle was inserted in a caudad to cranial direction using an in-plane approach. The target position of the needle was deep to DICA and fascia iliaca at a level cephalic to inguinal ligament and AIIS. After negative aspiration for blood, 40 ml of 0.125% levobupivacaine and 8 mg dexamethasone (2ml) was administered (total volume – 42 ml). Local anaesthetic should spread between fascia iliaca and iliacus muscle.

For infrainguinal approach, the transducer probe was placed below and parallel to the inguinal ligament. Femoral artery, nerve, iliacus muscle, sartorius muscle, fascia lata and fascia iliaca were identified (figure 2). The goal was to place the needle tip beneath the fascia iliaca approximately at lateral third of the line connecting the anterior superior iliac spine to the pubic tubercle. Following negative aspiration for blood, 40 ml of 0.125% levobupivacaine and 8 mg dexamethasone (2ml) was administered (total volume – 42 ml). The time of administration of FICB was counted as 0 hour.

Postoperative pain was assessed using visual analogue scale (VAS) score at 2,4,6,8,12,16,20, and 24 hours. When VAS score was 4 or more, rescue analgesia (inj.Tramadol 1 mg/kg IV) along with inj. Ondansetron 4mg IV was administered. Time duration between administration of FICB and administration of rescue analgesia was defined as duration of analgesia. Postoperatively haemodynamic parameters were assessed at 2,4,6,8,12,16,20, and 24 hours. Any adverse effects such as delirium, nausea and vomiting were noted.

Sample size calculation and statistical analysis:

Sample size was calculated based on the results of pilot study in which the duration of analgesia in infrainguinal FICB was 8.5±2.4 hrs. To detect 25% difference in duration of analgesia with 95% confidence interval and 90% power of the study, we needed 36 patients in each group. To compensate for possible dropout due to loss to follow-up, we included 40 patients in each group. Age, BMI, duration of surgery, duration of analgesia, VAS score, haemodynamic parameters and rescue analgesia consumption were expressed as mean and SD and were analysed using student's unpaired t test. Distribution of sex and adverse effects among the groups were expressed as fraction/percentage and analysed using fisher's exact test. P value less than 0.05 was considered as statistically significant and less than 0.001 was considered as statistically highly significant. Data was analysed using Medcalc software version 22.023.

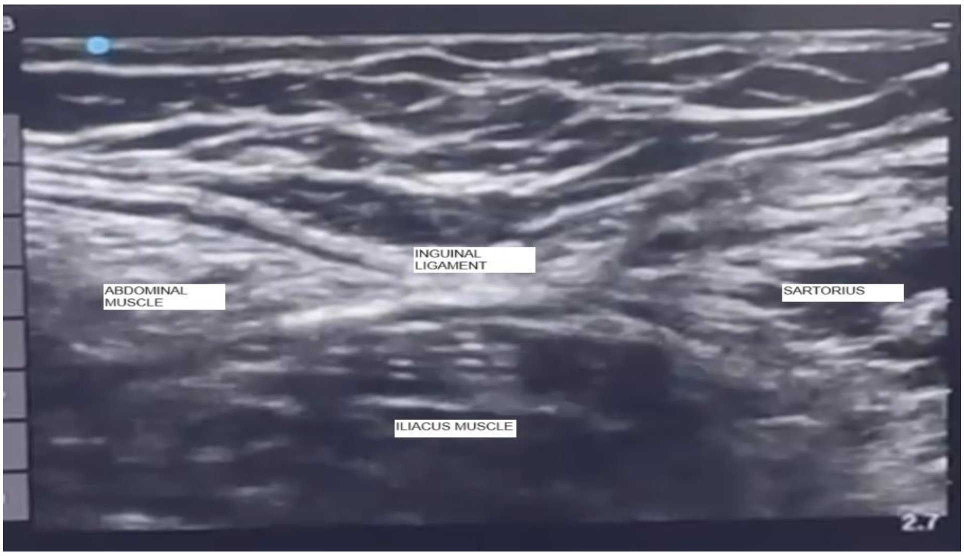


**Figure 1: Suprainguinal FICB**

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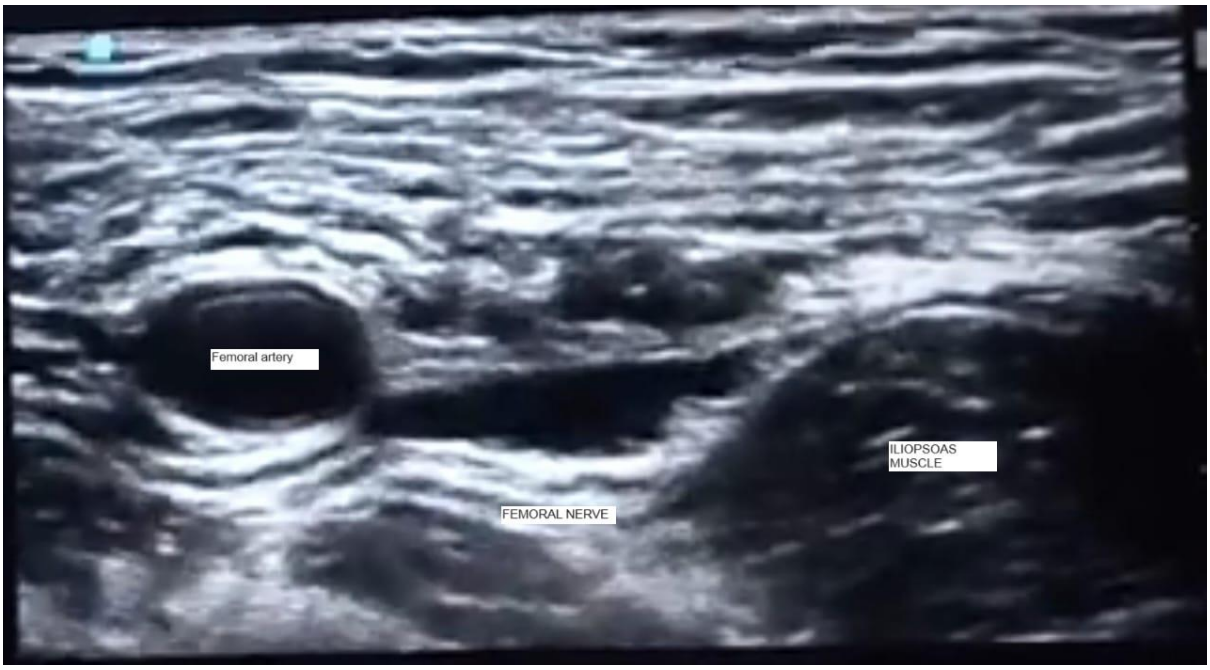


**Figure 2: Infrainguinal FICB**

**Results:**

Age, sex, body mass index and duration of surgery were comparable in both the groups (table 1).

Table 1: Demographic characteristics and duration of surgery

| | Group SIFICB n = 40 | Group IIFICB n = 40 | P value |
|---|---|---|---|
| Age (mean ± SD) | 70.6 ± 3.8 | 71.1 ± 4.2 | 0.5782 |
| Sex (M/F) | 17/23 | 16/24 | 1 |
| BMI (kg/m2) mean ± SD | 20.3 ± 2.5 | 20.9 ± 2.7 | 0.3056 |
| Duration of surgery (in minutes) mean ± SD | 102.6 ± 10.6 | 104.8±12.4 | 0.3963 |

Time for first rescue analgesia was significantly prolonged in SIFICB group (table 2). 24 hours tramadol requirement was significantly less in SIFICB group in comparison to IIFICB group (table 2).

Table 2: Duration of analgesia and tramadol consumption in first 24 hours postoperatively:

| Parameter | Group SIFICB n = 40 | Group IIFICB n = 40 | P value |
|---|---|---|---|
| Duration of analgesia in hrs Mean±SD | 11.58 ± 3.2 | 8.2 ± 2.5 | <0.0001 |
| Tramadol consumption in 24 hrs (in mg) mean ± SD | 62.6 ± 12.8 | 87.4 ± 14.6 | < 0.0001 |

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VAS scores were significantly lower in SIFICB group at 12 and 16 hours postoperatively (table 3). In comparison to IIFICB group, patients in SIFICB group had significantly lower heart rate and mean arterial pressure at 8,12 and 16 hours postoperatively (figure 3)

Table 3: Comparison of VAS score

| Time interval of VAS score (in hours) | Group SIFICB Mean ± SD | Group IIFICB Mean ± SD | P value |
|---|---|---|---|
| 2 | 0 | 0 | - |
| 4 | 0 | 0 | - |
| 6 | 1.28±0.8 | 1.31±0.7 | 0.5938 |
| 8 | 1.81±0.9 | 1.78±0.8 | 0.8752 |
| 12 | 1.9±1.1 | 3.8±1.2 | <0.0001 |
| 16 | 2.2±1.9 | 4.6±2.1 | <0.0001 |
| 20 | 2.8±1.6 | 3.2±1.5 | 0.2552 |
| 24 | 2.9±1.4 | 3.1±1.3 | 0.5099 |

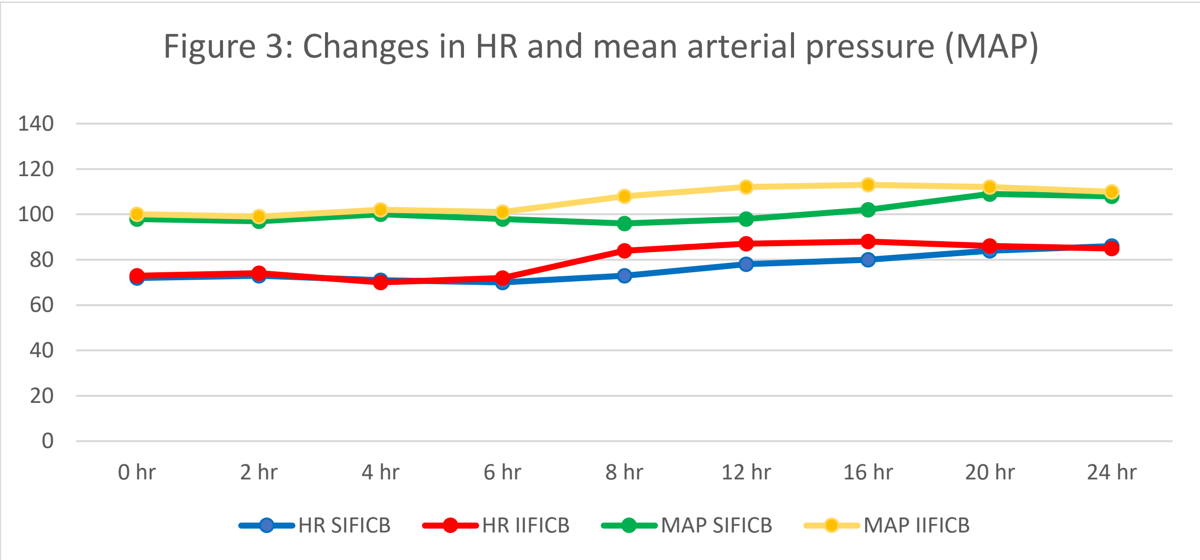


**Figure 3: Changes in HR and MAP**

None of the patients had postoperative delirium, nausea, vomiting or skin infection at the surgical/FICB block site.

**Discussion:**

FICB is commonly administered for managing postoperative pain following hip arthroplasty and PFN surgery. Deniz et al [4], Thompson et al [5], Mostafa et al [6], Bang et al [7] observed significant opioid sparing effect of FICB in patients undergoing hip arthroplasty and femur surgery. Azizoglu et al [8] compared single shot suprainguinal FICB and epidural analgesia in patients undergoing hip surgeries and concluded that both suprainguinal FICB and epidural analgesia are equally effective in providing adequate postoperative analgesia in early postoperative period (till 18 hours).

In our study, the duration of analgesia was significantly prolonged in SIFICB group in comparison to IIFICB group (table 2). Kumar K et al [9] observed significant prolongation of time for first PCA (patient controlled analgesia) morphine demand in modified suprainguinal FICB group in comparison to conventional infrainguinal FICB group. Hebbard et al [10] conducted a cadaveric study to observe the spread of injection after suprainguinal FICB and found extensive spread of dye throughout the iliac fossa, around femoral nerve (FN) and lateral femoral cutaneous nerve (LFCN). Vermeylen et al [11] conducted a study in human volunteers and observed that in suprainguinal FICB, local anaesthetic spreads more reliably to the three target nerves (FN, LFCN and obturator nerve) as observed on magnetic resonance imaging (MRI) in comparison to infrainguinal FICB. This can explain better analgesia with suprainguinal FICB than infrainguinal FICB in the current study. Though Bansal K et al [12] observed that the duration of analgesia in suprainguinal and infrainguinal groups was comparable, the quality of analgesia in terms of patient satisfaction score was significantly better in suprainguinal group. The duration of analgesia was 2 to 3 times more in the current study when compared to Kumar et al [9] and Bansal K et al [12]. This may probably be due to the addition of adjuvant (dexamethasone) in the current study

Tramadol consumption in 24 hours after surgery was significantly less in SIFICB group in comparison to IIFICB group (table 2). Similar findings were observed by Bansal K et al [12]. Kumar et al [9] observed significantly less morphine consumption in suprainguinal FICB group when compared to infrainguinal FICB group. As the duration of analgesia was significantly prolonged, the need and dose of rescue analgesia was significantly less in SIFICB group.

VAS score was significantly less at 12 and 16 hours postoperatively in SIFICB group when compared to IIFICB group (table 3). Kumar et al [9] and Bansal K et al [12] also observed lower VAS scores in suprainguinal FICB in comparison to infrainguinal FICB group. More reliable spread of drug with suprainguinal FICB can explain lower VAS score in SIFICB group.

Heart rate and MAP were significantly less in SIFICB group at 8,12 and 16 hours (figure 3). This was due to lower VAS score and longer duration of analgesia in SIFICB group in comparison to IIFICB group.

There were no side effects like nausea and vomiting in both the groups. This can be explained as all patients received antiemetic prophylaxis and dexamethasone itself prevents postoperative nausea and vomiting. None of the patients had infection at the surgical site or at the site of injection.

Our study had few limitations. FICB was administered after completion of surgery. Preoperative administration of FICB helps in better positioning for spinal anaesthesia and improves patient satisfaction. Continuous FICB using a catheter would have been more beneficial to the patient.

To conclude, suprainguinal FICB is preferred to infrainguinal FICB in geriatric patients undergoing PFN surgery as it provides longer duration of analgesia, decreases postoperative tramadol requirement, and decreases postoperative VAS score.

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**Conflict of interest:** Nil

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