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## Postoperative analgesia for fracture femur using Ultrasound-Guided Fascia Iliaca block

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### ABSTRACT

**Background:** Fascia iliaca block using ultrasonography is one of the techniques to produce postoperative analgesia for surgery of fractured femur. Although this technique is not commonly used with spinal anesthesia in the elective fractured femur, Fascia iliaca block using ultrasonography will be a promising technique for postoperative analgesia in fracture femur.

**Aim of the study:** The current study compares between patients using fascia iliaca block using ultrasonography (FICB) as post-operative analgesia after spinal anesthesia and patients using spinal anesthesia only for elective surgery of fracture femur as (C) control group.

**Patient and Methods:** Sixty patients scheduled for fracture femur were join up the study. Patients were allocated to 2 groups. Group (FICB) patients underwent ultrasound-guided single-shot FICB postoperative after spinal anesthesia, while group (C) were handled with spinal anesthesia only. Post-operative blood pressure, visual analog scale (VAS) assessment of pain, number of postoperative morphine boluses, complications occurred, and patient satisfaction was recorded.

**Results:** In this study, the FICB group was less than the control group comparing visual analog scale values. Regarding the rescue analgesia, a decrease in the dosage of consumed morphine and more prolonged time up to the first rescue dose of morphine in the first postoperative day was recorded in the FICB related to the control group. Regarding Patients satisfaction measurement, more patients were highly satisfied in group FICB (75%) than the control group (16.7%).

**Conclusion:** Ultrasound- guided fascia iliaca block is a good method for pain relief in fracture femur postoperative as it prolongs analgesia time and decreases opioid consumption.

**Keywords:** Ultrasound-guided; fascia iliaca block; fracture femur; pain.

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### INTRODUCTION

Fractures femur is one of the commonest fractures met in orthopedics and also the most shocking injuries of the elderly. It may be affecting any part like the shaft, distal (supracondylar), or proximal femur.<sup>1</sup> Subarachnoid anesthesia is one of the commonly applied anesthetic procedures, it is a regional anesthetic technique involved by injection of a local anesthetic (LA) in the subarachnoid space commonly in orthopedic surgeries.<sup>2</sup> Analgesia should be supplied throughout the perioperative period from the pre-hospital setting with mobilization.<sup>3</sup> Fascia Iliaca block (FICB) was better in pain relief caused by fracture femur than opioids.<sup>4</sup> Ultrasound guidance becomes the capital golden method for regional anesthesia. It improved safety and efficacy by minimizing the blind methods of side effects.<sup>5</sup>

The study aimed to evaluate the Visual Analog Scale (VAS) of patients undergoing femur fracture surgeries as a primary outcome and the secondary outcomes

### PATIENT AND METHODS

This prospective randomized controlled clinical study was conducted on sixty patients, aged 30-50-year-old, with American Society of Anesthesiologists' (ASA) physical status I-II conducted for Femur fractures admitted to the orthopedic department, this study was done between July and December 2019 in Samir Abbas hospital in Saudi Arabia after agreement of the local ethical committee and written informed consent. Patients were randomized using computer-generated closed and opaque sealed envelopes, assigned into two groups 30 patients in each group; Group

(FICB) fascia iliaca block using ultrasonography (FICB) patients single shot with spinal anesthesia for fracture femur, while group (C) control group were handled with spinal anesthesia only.

Patient refusal, morbidly obese (BMI  $\geq 40$ ), Spine fractures, patient on anti coagulants, bleeding diathesis, and femoral grafts in the affected limb are excluded from this study. Once the patient in the operating room was connected to standard monitors; arterial blood pressure, electrocardiogram (ECG), and oxygen saturation (SpO<sub>2</sub>) (Drager, infinity delta XL, USA). Intravenous Access must be secured before lumbar puncture is performed; then taken 10-20 ml/kg Ringer lactate solution and Visual analog scale for pain assessment was explained to all patients.

After aseptic preparation, patients were placed in the left lateral decubitus position and the skin was infiltrated with 2% lidocaine at (the L4-5 interspace). Spinal anesthesia was performed using a 25-gauge spinal needle (pencil point, B-Braun AG, Germany). Cerebrospinal fluid free flow obtained then 15 mg 0.5% hyperbaric bupivacaine (aspen pharma, Ireland) was injected intrathecally over 20-30 sec, and this technique was done for the two groups.

In (FICB) group: After the end of the surgery, A sterile field is established with Betadine solution skin is disinfected and (Under aseptic condition). Palpation of a femoral artery may be a good landmark then the high frequency linear superficial probe was put transversely on the inguinal crease, moving slowly medially or laterally to find the iliacus muscle, fascia iliaca, and fascia lata. Using in the plane approached a 22 Gauge echogenic needle (sonolex Stim Pajunk) was inserted from the lateral side the two fascia clicks are perceived consecutively when the needle penetrating fascia lata and reach the plane between it and fascia iliaca. Negative aspiration: and then 1 to

2 mL of local anesthetic was injected to confirm the proper injection site between the fascia and the iliopsoas muscle. If local anesthetic spread takes place above the fascia or within the substance of the muscle itself, additional needle repositions, and injections were done. Complete the ultrasound fascia iliaca Block: by injected 30-mL of local anesthetic 0.5 % (Isobaric bupivacaine) (Bucaine 0.5% 5mg/ml, HIKMA Pharmaceutical, Amman-Jordan) .

A proper injection will result in the separation of the fascia Iliaca from the iliopsoas muscle by the local anesthetic which spreads lateral towards the anterior superior iliac spine and medially towards the femoral nerve as shown in (Figure 1).

The pain assessment postoperative was performed using (VAS) (0- no pain and 10 cm is the maximum agony).<sup>6</sup>

All our patients assessed for pain using (VAS). Pain assessment using VAS did postoperative after finishing the procedure at 0 points (the full recovery state), 2 hr, 6 hr, 12 hr, and 24 hr. Morphine sulfate 0.03mg/kg as rescue analgesia was given if needed, when VAS  $\geq 4$  in the post-operative 24 hours or on patient's demand (morphine sulfate 10mg/ml, Martindale pharmaceutical, UK). The total amount of morphine boluses in the first postoperative 24hours and the time of first analgesic dose of morphine received post-operative was calculated .

Mean arterial blood pressure (MABP) was assessed post-operatively at 0 points (immediately after the procedure), 2 hr, 6 hr, 12 hr, and at 24 hr. Complications occur postoperatively as nausea, vomiting, and pruritus were recorded. Patient satisfaction related to block performance, post-operative pain relief was evaluated by an 11- point satisfaction score (0=unsatisfied and 10 = most satisfied)<sup>7</sup>, and the score was divided as follows 0-3 (not satisfied), 4-6 (fair), and 7-10 (good).

Statistical analysis: Analysis was done using SPSS file software package for social science, quantitative data are expressed is frequencies, percentage, and the results carried out for analysis using descriptive t-tests and chi-square tests to compare continuous variables and categorical data respectively. A P-value of less than 0.05 was considered significant.

## RESULTS

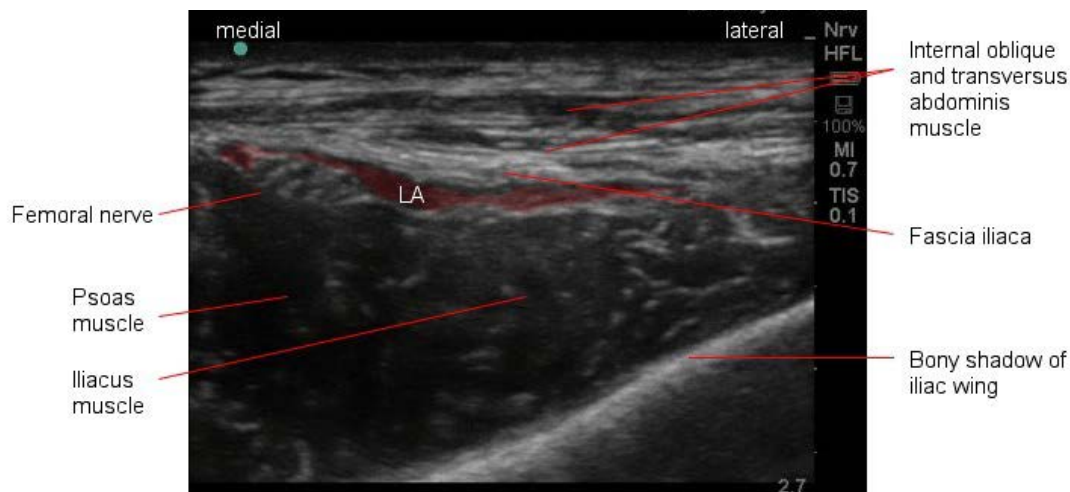
There was no significant difference between the two studied groups regarding patients' characteristics, ASA, site of the fracture, and baseline clinical status ( $P > 0.05$ ) as shown in (Table 1).

In this study, regarding the measurement of VAS, there was a highly significant difference with  $p < 0.001$  between the FICB group and the control group at 4h,6h,12h, and 24h postoperatively as shown in (Table 2). Regarding postoperative MAP measurement, there was no significant difference between the two studied groups ( $p$ -value  $> 0.05$ ) as shown in (Table 3).

Measurements of the first analgesic dose received post-operative showed that: Control group  $223.75 \pm 15.829$ min earlier than the FICB group  $480.833 \pm 41.222$ min and the total amount of morphine used with control group  $11.917 \pm 2.937$ mg higher than the total amount of morphine used with FICB group study group  $6.417 \pm 1.929$ mg see (Table 4).. There was a significantly longer time for the demand for the 1st dose of analgesia in FICB group compared to the control group. Also, the FICB group showed the most prolonged duration of analgesia and the least analgesia consumption (mg) during the first twenty-four hours postoperative as shown in (Table 4).

In this study, regarding complications, more complications occurred in the control group compared to FICB group with a significant difference between the two studied groups (p-value <0.001) as shown in (Table 5). In this study,

regarding Patients satisfaction measurement, more patients were highly satisfied in group FICB (73%) than the control group (16.7%) (P <0.001) as shown in (Table 6).



**Fig 1:** Ultrasound image showing local anesthetic extent within a left fascia iliaca and the femoral nerve.

	Group C (n=30)	Group FICB (n = 30)	P value
Age (years)	48.25 ± 13.96	43.83 ± 15.92	0.478
BMI	30.12 ± 3.34	28.27 ± 2.64	0.147
ASA			
I	17(56.7%)	21(70.0%)	0.422
II	13(43.3%)	9 (30.0%)	
Fracture site			
Distal	3 (10.0%)	7(23.3%)	0.381
Proximal	15 (50.0%)	13 (43.3%)	
Shaft	12 (40.0%)	10 (33.3%)	

**Table 1:** Demographic data, ASA, and fracture site (Mean ± SD, p value<0.05 significant).

VAS (IQR)	Control group No. = 30	FICB group No. = 30	P-value
VAS at 0 hr. post-op	2 (1-2)	1 (1-2)	0.224
VAS after 2 hr. post-op	2 (1-2)	2 (1-2)	<0.022*
VAS 4h post-op	4 (3-4)	2 (1-2)	< 0.001*
VAS 6h post-op	4 (3-4)	2 (1-2)	< 0.001*
VAS 12h post-op	4 (3-4)	2 (1-2)	< 0.001*
VAS 24h post-op	4 (3-4)	2 (1-2)	< 0.001*

**Table 2:** Visual Analog Score (VAS) among the two studied groups. (VAS: visual analog scale, IQR: interquartile range), (\*: Statistically significant (p-value <0.05).

Mean arterial blood pressure (mmHg)	Control Group (n = 30)	Group FICB (n = 30)	P-value
0	82.2±7.6	79.8±6.4	0.19
1 hr.	81.1±6.2	80.7±6.5	0.81
2 hr.	86.9±5.6	88.7±5.2	0.20
3 hr.	80.7±8.2	77.3±6.9	0.08
4 hr.	79.9±5.0	78.4±4.8	0.24
6 hr.	83.1±4.7	80.9±4.2	0.06
12 hr.	81.9±5.3	79.4±6.4	0.10
24 hr.	80.8±6.7	81.2±5.9	0.81

**Table 3:** Comparison between the two studied groups according to Mean arterial blood pressure (mmHg). (Mean ±SD, p value>0.05 non-significant).

	Control group No. = 30	FICB group No. =30	P-value
First analgesia received post op./minute	223.7 ± 15.8 195 – 250	480.8 ± 41.2 380 – 550	< 0.001*
Total amount of analgesia /mg	11.9 ± 2.9 8 – 16	6.4 ± 1.9 5 – 10	< 0.001*

**Table 4:** Time up to the 1st dose of rescue analgesia and total morphine consumption during the first 24 hrs. Mean ± SD, p value (< 0.05) significant.

Complications	Control group		FICB group		P-value
	No.	%	No.	%	
No complications	8	26.7%	22	73.3%	< 0.001*
Nausea and vomiting	17	56.7%	5	16.7%	0.001*
Pruritus	5	16.7%	3	10.0%	0.447

**Table 5:** complications that happened during the study. (Mean ±SD, p-value < 0.05 significant).

Patients satisfaction		Control group		FICB group		P-value
		No.	%	No.	%	
Patients satisfaction	7-10 (highly satisfied)	5	16.7%	22	73.3%	< 0.001*
	4-6 (partly satisfied)	18	60.0%	6	20.0%	0.002*
	0-3 (not satisfied)	7	23.3%	2	6.7%	0.071

**Table 6:** Patient satisfaction. (Mean ± SD, p value < 0.05 significant).

## DISCUSSION

This study aimed to identify the efficacy of ultrasound guided fascia iliaca block using bupivacaine for postoperative pain management and also, morphine consumption in the 1st 24 hours post-operative. The incidence of hip fracture decline and femur fracture increase to be about 60 % of all hip fractures.<sup>8</sup>

Femur fractures usually cause significant pain and annoying because a minimal over-riding of fracture is highly painful which can be difficult to manage safely.<sup>9</sup>

In current study, VAS scores during the postoperative time, it showed that there was a

significant difference between the two groups at the time of VAS after ultrasound-guided FICB group and (C) group, 4h, 6 h, 12h, and 24 h. as VAS scores were lower in FICB group and higher in control group which compared with the study of Wathen, et al. were a study FICB group versus morphine group in children with fracture femur and showed that FICB provided clinically superior pain management compared with IV morphine at 30 min from baseline and throughout the early 6 hours after the block.<sup>10</sup>

The Patients in FICB group less pain score than those in the patient control analgesia group though the changes in pain scores over time was comparable between the two groups as reported by Nie, et al. who compared the effect of continuous FICB with fentanyl (PCA) after hip surgeries, in this study, a

similar effect was achieved by a single shot of US FICB when added to spinal anesthesia for postoperative pain control and fewer complications.<sup>11</sup>

Regarding the rescue analgesic dose, it was found a decrease in dosage of consumed morphine and more prolonged time to the 1st rescue dose of morphine in the first postoperative day in FICB the group compared to the control group, which was reflected as less opioid side effects ultrasound guided FICB groups compared with the control group which comparable with Monzón, et al.<sup>4</sup> who carried out their study on elderly patients with traumatic hip fracture comparing pain control with FICB versus systemic analgesia, they discovered that measurements of VAS at fifteen min were  $6.24 \pm 0.17$  and  $2.9 \pm 0.16$  respectively and that pain scores were decreased at two hours in FICB group and Kumie, et al.<sup>12</sup> showed that a single injection of FICB could relieve pain during the first twenty-four hours in the postoperative period, decreasing the total postoperative analgesic consumption after 12 and 24 hours postoperatively, and a significantly prolonged time for 1st analgesic demand after femur fractures surgeries.

Bang, et al. study found that FICB in hemiarthroplasty has less opioid consumption at 4, 8, and 12 hours in the postoperative period, and the total fentanyl consumption during postoperative 24 hours was decreased in patients with the FICB which supported our results.<sup>13</sup>

Paut, et al. noticed the presence of minimal side effects among the FICB study group that was mainly nausea and vomiting.<sup>14</sup>

Nie, et al. compared the effect of continuous FICB with fentanyl patient control analgesia in patients after hip surgeries found that 2.6 %, suffered pruritus in FICB. Also, in this study noticed that a single shot of the US. FIB is leading to a decrease in the total amount of morphine used that reflected as a statistically significant decrease in the complications.<sup>11</sup>

In this study, the postoperative use of ultrasound-guided FICB is a safe method to decrease postoperative pain and reduced morphine consumption in femur surgeries, which can be one part of multimodal therapy with no side effects, which that supported the results by **Anaraki and Mirzaei (2014)** who investigated the effects of fascia iliaca block on pain score and systemic analgesic (morphine and gabapentin) consumption after femoral surgeries.<sup>15</sup>

In this study, ultrasound-guided FICB due to the safest method to reduce postoperative pain especially in twenty-four hours postoperative, reduced analgesic consumption in femur surgeries, and no side effects which confirmed by Haines, et al. who documented

that the ultrasound guidance assisted to confirm that we avoided vascular structures and allowed us to visualize the correct placement of local anesthetic and a significant advance in the success rate of the block when performed under ultrasound guidance ( $\approx 95\%$ ) and increase the reliability of sensory and motor blockade.<sup>16</sup>

Finally, patient satisfaction in the FICB group more than the control group which comparable with Yun, et al. who concluded that satisfaction of patients about the block was assessed after 24 hours: 45 patients (90%) were satisfied with the block and acceptance of the FIC block were found in 19 out of 20 cases.<sup>17</sup>

The limitation of this study may be that patients included were only ASA I–II and it would be better if higher risk ASA III and IV included.

## CONCLUSION

Single-shot ultrasound-guided FIC blocks able to quiet relieve the pain and to decrease the total analgesic consumption of morphine during the first twenty-four hours postoperatively after femur fracture surgery. Using ultrasound-guided FIC block after spinal anesthesia provides more satisfaction and less complications than spinal anesthesia only in patients undergoing surgery for femur fractures.

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