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Research Article

Comparison of the Efficacy of Postoperative Pain Relief in Ultrasound Guided Fascia Illiaca Compartment Block versus Epidural Block on Quality of Recovery (QOR-15) in Patients Undergoing Femoral Surgery

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Abstract

Background: The occurrence of femoral fractures is quite high. The quality of life gets affected to a large extent due to pain and post-operative delirium. Various regional block techniques like Fascia illiaca compartment block, lumbar epidural analgesia, femoral nerve block, etc. have been described for femoral fractures. In this study, we compared the efficacy of post-operative pain relief FICB and Epidural block on quality of recovery (QOR-15) in patients undergoing femoral surgery.

Methods: This study included 40 patients wherein 20 patients were given FICB and 20 patients were given Epidural block. The patients were followed up for post-operative pain relief, Quality of Recovery, occurrence of delirium, disability and fraility.

Results: Quality of recovery QOR-15 was similar for both the groups preoperatively as well as at 24 hour and 48 hours post-operatively. Additionally, there was no difference in the time taken to administer the block, postoperative VAS score on movement and rest, requirement of additional analgesia and opioid consumption. Moreover, there were no significant differences in WHO disability assessment, modified frailty score, prevalence of delirium, mortality, morbidity and side effects of techniques. However, the total duration of hospital stay (in days) was found to be significantly more in the epidural group as compared with the FICB group (5.75±1.61 *vs* 4.75±1.16; P=0.38).

Conclusion: Ultrasound guided fascia iliaca compartment block is a tangible alternative to epidural block in patients undergoing femoral fracture repair.

Introduction

The incidence of femoral fractures ranges from of 9.5 to 18.9 per 100,000 annually [1]. These fractures are associated with prolonged impairment of independence and quality of life. Inadequate pain relief can further lead to several deleterious effects on the physique and the psyche of the patient. It can also lead to delirium, which is associated with delayed return of functional status, increased mortality, and poor functional outcomes at 3 months postoperatively [2]. Prolonged length of stay, morbidity, poor outcome leads to resource consumption of delivery care [3]. Different regional techniques have been described for preoperative and postoperative pain relief in patients with femoral fracture. These include epidural block, combined spinal epidural block, femoral nerve block, 3 in 1 block, sciatic nerve block, obturator nerve block and fascia iliaca compartment block [4].

Epidural analgesia remains the gold standard for postoperative pain relief in lower limb surgery [5]. Fascia Iliaca Compartment Block (FICB) is an alternative to central neuraxial block and can provide adequate unilateral analgesia with fewer adverse-effects when compared to epidural analgesia [6]. The impact of these regional techniques on postoperative outcome including quality of recovery and especially 30 day postoperative morbidity in patients undergoing femur fracture is sparsely studied [7].

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Measurement of quality of recovery is one of the important parameter of effective postoperative recovery. A patient's ability to resume normal activities after surgery and anesthesia is important indicator of successful perioperative outcome [8]. Pain, Disability, frailty, delirium and postoperative morbidity can be assessed by VAS, WHO Disability Assessment scores, Modified frailty score, Nursing Delirium Screening Scale (NuDesc) and Postoperative morbidity survey respectively [9-13].

In this study we planned to compare the effect of ultrasound guided fascia iliaca compartment block versus epidural block using PCA on effective postoperative outcome in patients undergoing femoral fracture repair. This includes especially outcome parameters like quality of recovery, pain relief, prevalence of delirium, disability, morbidity and mortality. Forty patients were included in this study with 20 patients in Group-1 (The FICB group) and 20 patients in Group-2 (The Epidural group).

Methods

This study was conducted in Department of Anaesthesia following institutional ethical committee approval and after obtaining written and informed consent from the patients enrolled. The inclusion criteria were - Patients undergoing femoral fracture repair, Patients with age 50 years to 80 years, ASA grade I-III patients and Patients able to use to Patient Controlled Analgesia (PCA) pump. The exclusion criteria included – Patients' refusal to participate in study, patients with any other fracture, patients suffering from concurrent comorbidities (cardiovascular, cerebrovascular, liver or renal), ASA IV - V patients, patients with known hypersensitivity to local anesthetics, patients with bleeding disorders or on anticoagulants, patients with sepsis, patients with cognitive impairment and patients with absolute/ relative contra-indications for spinal anesthesia.

Procedure for Group-1

Epidural catheter insertion was inserted in patients randomized to group "I". Under all aseptic conditions, 2ml of 2% lidocaine was infiltrated in skin and deeper planes of the best palpable space (L2-L3, L3-L4, L4-L5). The epidural anesthesia was performed using a 18 Gauge, 8cm Tuohy's needle of the epidural (18G) set at previously marked needle insertion site with predetermined depth of epidural space measured by ultrasound. The epidural space was confirmed by loss of resistance to air. The epidural catheter was inserted in epidural space and aspirated for blood or CSF. In case of negative aspiration, the epidural catheter was flushed with normal saline and fixed at depth equal to depth of epidural space plus 5cm. In case of positive aspiration, the catheter was repositioned or the procedure was performed again. The spinal anaesthesia was given by a 26-gauge Quincke spinal needle inserted at L3-L4 vertebral interspace. After confirmation of free flow of cerebrospinal fluid, 3ml (15mg) of hyperbaric bupivacaine 0.5% (w/v) was injected intrathecally. The epidural catheter was fixed and patient is turned to supine position.

Procedure for Group-2

In Group "II" patients, first spinal anesthesia using standard technique was given in the sitting position. After skin infiltration with lignocaine 2% (w/v), a 26-gauge Quincke spinal needle was inserted at L3- L4 vertebral interspace. After confirmation of free flow of cerebrospinal fluid, 3ml (15mg) of hyperbaric bupivacaine 0.5% (w/v) was injected intrathecally and then the patient was turned to supine position. In supine position, US-guided FICB was administered. The block was performed using a high-frequency 5-10 MHz linear transducer of ultrasound machine Titan. The probe was positioned on the thigh just inferior to the inguinal ligament in a transverse orientation and one-third of the distance between the pubic tubercle and the anterior superior iliac spine. The two fascial planes, the fascia lata and the fascia iliaca was visualized as two hyperechoic lines. An 8cm 18G Tuohy's needle was introduced percutaneously from lateral-to-medial and then was directed parallel to the transducer to allow continuous visualization of full needle length. The needle tip was visualized penetrating firstly the fascia lata and then the fascia iliaca. A 18G catheter was introduced for about 2-3cm past the needle tip and tunneling was done through the skin.

In both the groups, time taken for the block was noted. Time taken for the block in group 1 was taken from insertion of Tuohy's needle in the skin till the insertion of epidural catheter. Similarly, in group II, time was noted from insertion of needle till insertion of catheter. Fixation time of the catheters was not included. In the operation theatre, parameters were assessed every 5 minutes (min) till 20 min. Sensory and motor block was assessed in both the groups to verify successful. FICB and neuraxial blockade. Sensory block was assessed using pinprick over the sensory distribution of the femoral and lateral femoral cutaneous nerves (anterior and lateral aspect of the thigh respectively), and obturator nerve (medial and posterior aspect of the knee). Motor blockade was assessed using modified Bromage scale.

After completion of surgery, the patients were shifted to postoperative recovery unit. The patients were connected to PCA pump. This time point was noted at T0. Postoperative PCA was adjusted to deliver a continuous basal infusion of 5ml/h bupivacaine 0.125%+2 mcg/ml fentanyl and demand boluses of 4ml with a lockout interval of 20 min in both the groups. All the patients received injection paracetamol 1 gram IV 6 hourly and injection diclofenac 75mg IV 12 hourly unless contraindicated. Rescue analgesia of intravenous fentanyl 20 mcg was given to patients in both groups if VAS≥4 at rest, despite three consecutive PCA boluses.

The time point of connecting the epidural \FICB catheter to the PCA pump was noted to be T0. VAS score both on rest and movement was noted at T_0, T_1 (after 4 hour), T_2 (8 hour), T_3 (12 hour), T_4 (24 hour), T_5 (48 hour) and T_6 (72 hour). Number of boluses taken during the study period and any adverse effects were noted. Number of patients requiring additional analgesia and total 24-hour opioid consumption were also noted.

Postoperative delirium was also be assessed on postoperative day 0, 1, 2 and 7 by Nursing Delirium Screening Scale (NuDesc) [12]. If NuDesc score is more than 2, patient has postoperative delirium. Quality of Recovery QOR-15 score was observed after 24hours (QOR_1) and 48 hours (QOR_2). Poor quality of recovery is defined as $TQOR_1$ and $TQoR_2$ lower than mean score minus standard deviation [14]. Postoperative morbidity survey (nine domain system) prospectively identifies short term mortality after surgery [13]. It was measured postoperatively on postoperative day 1 till time of discharge.

The occurrence of any adverse events including nausea, vomiting, hypotension, shivering, pruritis or depression of respiration was recorded. At time of discharge, patient was also assessed in terms of disability and frailty by 12 item WHO disability assessment schedule and Modified Frailty score respectively. [10,11] Total hospital stay of the patients was noted. Disability was significant if WHO disability assessment score increased by

25%. Frailty score ranges 0-11 with a score 0 and 11 representing absence and highest degree of frailty respectively. Patient was followed for 30 days after the surgery. On 30th day, patient was again assessed for any disability, frailty, morbidity and mortality.

Primary outcome defined for the study was Quality of Recovery QOR-15 [14].

Secondary outcomes for the study include: Time taken to administer the block, Postoperative VAS score on movement and rest, number of patients requiring additional analgesia, total 24 hour opioid consumption, WHO disability assessment schedule, modified frailty score, prevalence of delirium, mortality, morbidity, total hospital stay and side effects of techniques, if any [9-13].

Statistical analysis: The statistical analysis was carried out using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, version 20.0 for Windows). For all quantitative variables mean, median and standard deviation was calculated. Means was compared using Student's t-test for independent groups if the data are normally distributed and Mann-Whitney U test if the data are not normally distributed (deviation from normal distribution of continuous data was first studied by applying Kolmogorov-Smirnov test). Mann-Whitney test was used for analysis of scores. Qualitative or categorical variables were described as frequencies and proportions. Proportions were compared using Chi square or Fisher's exact test whichever is applicable. Statistical tests were two-sided and was performed at a significance level of α=0.05.

Results

CONSORT diagram for patient intake is shown in figure 1. The patients enrolled in this study had similar demographic and morphometric parameters. The patients were predominantly male, mostly ASA physical status I in epidural group (68.8%) and ASA physical status II in FICB group (65.0%) (P=0.044) and had similar comorbidities. There were no considerably significant inter-group differences. Pre-operative investigations and vital parameters were comparable.

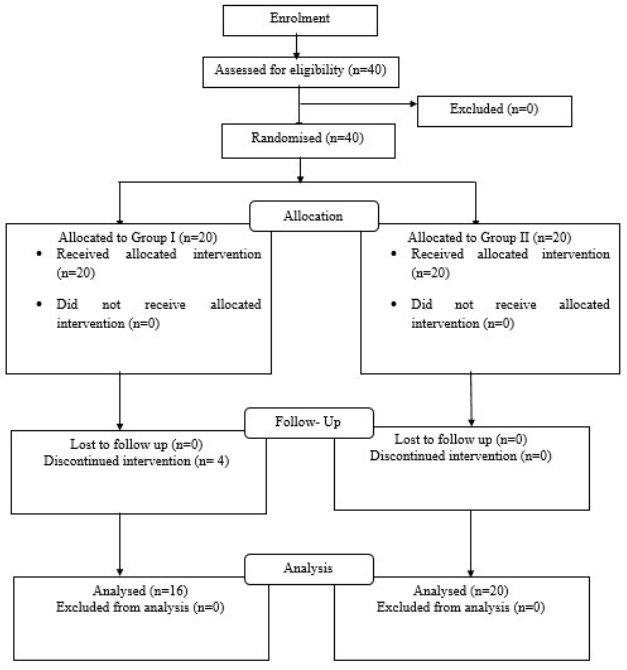

Figure 1: Consort diagram showing patient selection and randomization.

The primary outcome defined for the study i.e., Quality of recovery QOR-15 was similar for both the groups preoperatively (QOR A P=1.153; QOR B P=1.657) as well as at 24 hour (QOR A P=1.921; QOR B P=1.845) and 48 hours post-operatively (QOR A P = 1.961; QOR B P = 1.423) (Figure 2). Additionally, the time taken to administer the block (in min.) was similar for both epidural and FICB group (1.37±1.13 *vs* 1.26±0.91; P=0.730). There was no difference in the postoperative pain as assessed using VAS score on movement and rest at any point in time. The number of patients requiring additional analgesia was nil in both the group. Moreover, the total 24-hour opioid consumption (fentanyl in mcg) was similar between the epidural and FICB group (258.50±11.58 *vs* 252.80±9.85; P=0.120). There were no significant differences in WHO disability assessment, modified frailty score, prevalence of delirium, mortality, morbidity and side effects of techniques. However, the total duration of hospital stay (in days) was found to be significantly more in the epidural group as compared with the FICB group (5.75±1.61 *vs* 4.75±1.16; P=0.38) (Figure 3). The perioperative vitals were similar; except that, the variance in respiratory rate (in breaths per min) between the two groups at 0 min (15.81±1.64 for epidural group and 14.70±1.49 for FICB group) was statistically significant. (P=0.041).

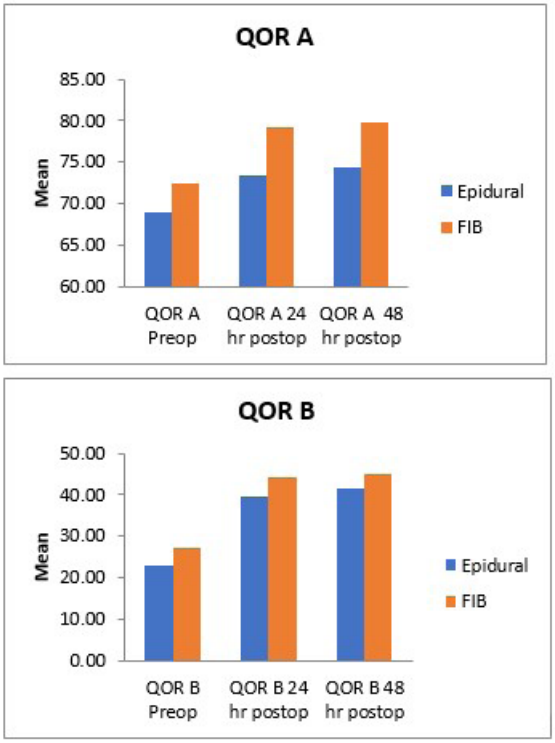

Figure 2: QOR comparison.

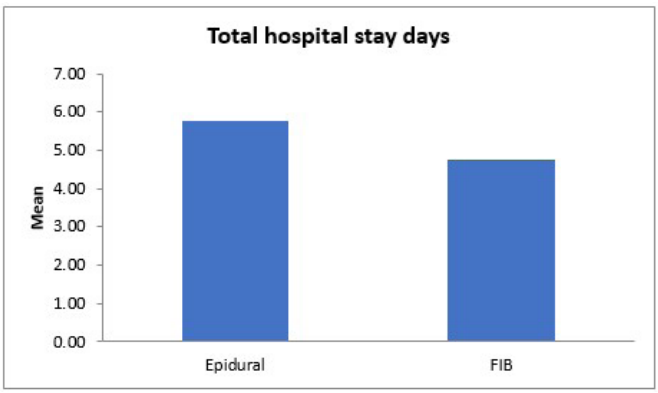

Figure 3: Duration of Hospital Stay.

Discussion

This study has elicited no meaningful difference in terms of pain relief and recovery while comparing between the patients who were administered epidural block and those who were administered ultrasound guided Fascia Iliaca Compartment Block (FICB) followed by respective infusion post-operatively. The only difference that could be revealed was in the total duration of hospital stay (in days) which was significantly less in the FICB group than in epidural group (5.75±1.61 *vs* 4.75±1.16; P=0.38). The FICB group had more ASA physical status II patients; however, the type of comorbidities was similar in both the groups.

To the best of our knowledge, no literature is present on comparison of postoperative quality of recovery in patients undergoing ultrasound guided fascia iliaca compartment block versus epidural analgesia using PCA for repair of femoral fracture to compare our results with.

In a study by Gao et al, the authors compared the effects of continuous FIB and continuous intra venous analgesia on Early Quality of Recovery After Total Hip Arthroplasty in Elderly Patients using the QOR-15 score. The authors concluded that FICB improved the quality of recovery at 24 h and reduced pain scores compared with PCIA. However, the time of first postoperative ambulation and length of hospital stay were not significantly affected [15].

In a study by Gallardo et al., the postoperative analgesia from a fascia iliaca compartment block was compared to continuous epidural analgesia following knee arthroplasty [16]. The fascia iliaca group had a combination of spinal anesthesia plus a fascia iliaca compartment block with 0.1% bupivacaine at a rate of 10mL/h, whereas the epidural group patients were administered a combined spinal-epidural anesthesia plus epidural infusion with 0.1% bupivacaine in continuous infusion at a rate of 8 mL/h. They found that opioid consumption, adverse effects, postoperative VAS scores were similar between the groups. However, hypotension was more frequent in the epidural group. So, it was concluded that the fascia iliaca compartment block is similar to continuous epidural infusion in providing postoperative analgesia for patients after total knee replacement. The findings of our study are in line with their findings. Hypotension was not observed in FICB group, but 12.5% patients in epidural group did have hypotension. Although, the difference was not significant (P=0.104).

In another study by Huang et al, the analgesic effect of preoperative fascia iliaca compartment block was evaluated for patients undergoing primary hip arthroscopic labral repair with osteochondroplasty [17]. Patients were randomized to receive preoperative fascia iliaca compartment block or control (no block). There were no significant demographic differences between the two groups but as in our study, there was a significant difference in distribution of American Society of Anesthesiologists classification (p=0.031). This study showed no significant differences in postoperative opioid consumption, VAS pain score and patient satisfaction between the two groups at any of the measured time points following surgery.

In a meta-analysis by Zhang et al, it was observed that as compared with the control group, FICB could significantly reduce the incidence of nausea and length of hospital stay [18]. There was no significant difference between the VAS score and risk of fall. The study inferred that FICB effectively reduced pain intensity up to 24h, opioid consumption and length of hospital stay in THA patients. Our study also noted that the length of hospital stay was reduced in patients who received FICB. (P=0.38).

A study by Rashwan showed that the severity of postoperative pain was statistically significantly less in the epidural group, number of patients required rescue analgesia in 24h were statistically significantly less in Epidural group, postoperative tramadol consumed was statistically significantly less in Epidural group than in the Fascia Illiaca group [19].

Our study suggests that ultrasound guided fascia iliaca compartment block is a tangible alternative to epidural block in terms of postoperative outcome in patients undergoing femoral fracture repair and quality of recovery. The advantages that ultrasound guided fascia iliaca compartment block offer is in the view of increased safety with ultrasonography in addition to easier visualization of the anatomy. Epidural block requires the patient to be made sitting or lateral to administer the block. This increases the problem since movement increases the pain, which can be severe, and support is often required to maintain the position- making the procedure a difficult experience for the patient. Ultrasound guided fascia iliaca compartment block circumvents this issue since it could be done in supine position which ensured better comfort and experience for both the patient as well as the anesthesiologist. The use of ultrasonography in conjugation with ability to administer the block in supine position makes the fascia iliaca compartment block suitable for frail, sick and elderly patients. Also the side effects of epidural, like hypotension are escaped in the FIB group. However, the incidence of nausea, vomiting, bradycardia remained insignificant within the two groups.

The strengths of this study include the design i.e., a prospective, randomized open label-controlled study. Inclusion and exclusion criteria were strictly followed. All of the patient enrolled was included in the analysis and there were only four dropouts or losses to follow up and hence, there was no apparent compromised power to detect true differences. There were some limitations. Firstly, the patients included were only ASA Grade I or II and therefore, the result of this study is not applicable to be extended to the patients of other ASA grades. Secondly, double blinding was unachievable in this study design because postoperatively, the machine settings were apparent to the data collector and needed necessary adjustments, troubleshooting and drugs to be filled/refilled. In future, further studies ought to involve a larger sample for confirming these results.

Conclusion

In conclusion, ultrasound guided fascia iliaca compartment block is a tangible alternative to epidural block in patients undergoing femoral fracture repair.

Author Statements

Acknowledgement

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