European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 09, Issue 06, 2022

Original Research Article

Dexamethasone as adjuvant to ropivacaine in pre- operative ultrasound guided fascia iliaca compartment block for positioning patients with femoral fracture for central nervous blockade: A double blinded randomized comparative clinical study

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Abstract

Background: Positioning for neuraxial blocks in proximal femur fracture is challenging, even slight overriding of the fracture end is intensely painful, Prior to neuraxial blockade, analgesia is provided by conventional modes of pain relief like NSAIDs, opioids and peripheral nerve blocks such as femoral nerve block, 3 in 1 block and Fascia iliaca compartment block, In this study we gave ultrasound guided Fascia iliaca compartment block and compared efficacy of block for positioning for spinal anesthesia with dexamethasone as adjuvant to ropivacaine in one group and only ropivacaine in another.

Methodology: In this double blind prospective, randomized comparative trial, 51 patients were randomly allocated to receive ultrasound guided fascia iliaca compartment block (FICB) with 38cc of 0.25% ropivacaine with 2cc saline in group A and 8mg(2cc) of dexamethasone with 38cc 0.25% ropivacaine in group B. Block was given 30 min before giving spinal anesthesia, oxygen saturation, systolic and diastolic blood pressure, Visual analogue scale (VAS) score for first 30 min and at the time of positioning was noted. Post-operatively monitoring was done half hourly till 6th hour, rescue analgesia time was noted (VAS>3)

Results: No significant difference was observed in both group in term of oxygen saturation, SBP, DBP, pulse rate and VAS scores in first 30 min and till 6th hour of post-operative period. While positioning for spinal anaesthesia pain scores were comparable in both the group with no significant difference observed ($p>0.05$). Mean rescue analgesia time for group A was 556.40±68.184 SD while for group B it was 616.15±71.447 SD min which was significantly higher ($P=0.004$).

Conclusion: USG guided FICB is easy to perform block and give excellent analgesia for positioning and mobilisation of femur fracture patients pre and post operatively both, and dexamethasone as adjuvant to 0.25% ropivavaine prolong its local anaesthetic effect significantly.

Keywords: Fascia iliaca compartment block, ultrasound, dexamethasone, ropivacaine

ISSN 2515-8260 Volume 09, Issue 06, 2022

Introduction

The techniques of peripheral nerve blocks were developed early in the history of anaesthesia. American surgeons, Halsted and Hall demonstrated injection of cocaine in peripheral sites including the ulnar, musculo-cutaneous, supra-trochlear and infra-orbital nerves for minor surgical procedures in 1880s.

Peripheral nerve block techniques plays an important role in modern anaesthesia. Skilful application of peripheral neural blockade widens the anesthesiologist‟s range of options in providing optimal anesthetic care. Upper limb surgeries are mostly performed under peripheral blocks such as the brachial plexus block [1].

Brachial plexus blocks provide a useful alternative to general anesthesia for upper limb surgeries. They achieve near ideal operating conditions by producing complete muscular relaxation, maintaining stable intra-operative haemodynamic condition and sympathetic block which reduces postoperative pain, vasospasm and edema. Various approaches of brachial plexus block have been used for upper limb surgeries namely inter-scalene approach, supra-clavicular approach, infra-clavicular approach and axillary approach.

Lower limb surgeries are mainly performed under subarachnoid block or epidural block which provides excellent anesthesia and analgesia not only intra- operatively but post-operatively as well.

For performing such neuraxial blocks sitting position [2, 3, 4, 5] of patient is more comfortable for person performing these blocks since it provide wider inter-vertebral space, especially in femur fracture cases where most of patients are of older age group with calcified ligaments and more difficult lumbar puncture.

Hip fracture is a very common injury and is associated with significant morbidity and mortality. Patients with fractured hips tend to be older with multiple medical co-morbidities, placing them at higher risk for complications, especially chest infection and heart failure. Over 95% of hip fractures are related to fall. Falls are the leading cause of death in adults more than 64 years of age, with hip fracture as the most serious and expensive injury resulting from a fall [6].

Pain intensity from fractured hip can be moderate to severe, and because of their peripheral location, are well suited for regional techniques. Fractures may involve the femoral neck, trochanter, or shaft femur. These surgeries are more often managed with regional anesthesia techniques.

Positioning for neuraxial blocks is always challenging because even slight overriding of the fracture end is intensely painful [7]. Hence, prior to neuraxial blockade, analgesia is provided by conventional modes of pain relief like NSAIDs, opioids and also by peripheral nerve blocks such as femoral nerve block, 3 in 1 block and Fascia iliaca compartment block (FICB). FICB is not a nerve block but a single shot compartment block where large volume of local anesthetic agent is deposited beneath fascia iliaca which cover femoral nerve on medial side, lateral femoral coetaneous nerves on lateral side, and short course of obturator nerve in the deeper plane.

Conventional pain treatment (NSAIDs, paracetamol and IV morphine) has undesirable side-effects, many of those being particularly undesirable in patients with high co-morbidity. The most common approach to pain management in trauma patients is IV opioids. While opioids are excellent analgesics, work quickly, and are a rational choice when patients have multiple injuries, they carry a significant burden of potential adverse effects, which include; respiratory depression, vasodilation and hypotension (especially in hypovolemia), delirium, nausea and vomiting, constipation, pruritus, immunosuppression, increased staffing requirement to monitor patient (due primarily to respiratory depression), Increased length of stay in emergency department or recovery room [8].

Methodology

ISSN 2515-8260 Volume 09, Issue 06, 2022

Inclusion criteria for study were patients aged between 18 to 80 yrs. of ASA grade I and II with proximal femur fracture and willing for surgery. Exclusion criteria were patient with bleeding disorders, allergy to local anesthetics, peripheral neuropathy, hepatic or renal insufficiency, previous femoral bypass surgery, inguinal hernia, inflammation or Infection over injection site, morbid obesity, patients on previous opioid therapy, psychiatric disorders and poly-trauma.
In this study 51 patients were divided randomly into two groups; Group A and group B. Allocation to two groups was done using computer generated random number table by resident (anesthesia department) who was not a part of the study and was kept confidential until end of the study and was revealed after statistical analysis.
Materials used in study were 0.25% ropivacaine, 22-gauge 100 mm needle (Stimuplex ®, B. Braun, Melsungen, Germany), Sonosite Micromaxx ® (Sonosite ®, Bothell, WA, USA) US machine, and 8 mg dexamethasone.
Written informed consent was taken from 51 Patients of ASA class-I and II, who were posted for proximal femur fracture surgery in HSK hospital.

- Group A (40ml of 0.25% ROPIVACAINE + 2 ml saline) and
- Group B (40ml of 0.25%ROPIVACAINE + 8 mg dexamethasone).

Each Patients were monitored using electrocardiography, pulse-oximetry and non- invasive blood pressure every 2 minutes till 30 minutes and were explained about VAS system of pain scoring before giving block which was noted every 2 min until 30 min. Comfort while positioning for spinal anesthesia was noted 30 minutes after FICB using VAS score.
Patients were blind about their group and drugs they were receiving. Drug loading and allocation of group was done by resident (Anesthesia department) and was documented in confidentiality and was revealed only after the end of study.
USG guided FICB and postoperative monitoring was done by chief investigator who was unaware of group allotted and drug administered.
In Surgical ICU. Postoperative monitoring included oxygen saturation, non-invasive blood pressure, pulse rate, VAS score every 15min for first half hour every 30 min following that until 6th post-operative hours. Patients reporting pain scores 4 and above were given IV tramadol (100 mg) as rescue analgesia.
Sample size was calculated using OPEN-EPI version 2.3.1 software. Sample size was calculated based on the time of requirement of first rescue analgesia in a study conducted by Suresh kumar N46, Kiran N, Ravi M, Don Sebastian, Punith Gowda RM.

Two-sided significance level (1-alpha): 95

Power (1-beta, % chance of detecting): 80

Ratio of sample size, Unexposed/Exposed: 1

Percent of patients who needs 1st rescue analgesia in group I (A): 17
Percent of patients who needs 1st rescue analgesia in group II (B): 57

Sample Size for Group (A)

23 Sample Size-For Group (B): 23

Total sample size

46, sample size rounded off to 51, 25 in group A and 26 in group B to compensate for drop-

out.

Statistical analysis was done using SPSS software 11.0. Data obtained is tabulated in the Excel sheet and analysed. All values are expressed as mean + standard deviation. Chi-square test for proportions in qualitative data. Student's unpaired t – test for Quantitative data. $p< 0.05$ was considered statistically significant.

Results

Visual analogue scale score was use to assess pain. There was gradual improvement of pain score from mean 7.69 in group A and 7.52 in group B at 0min to score of 2 at the end of 30 min in both the group. This improvement was achieved earlier in group B compare to group A, although difference was not significant **(***p*>0.05)

Table 1: Pre-operative pain score comparison of the study groups for 1st 30 minutes

Time of Assessment	Mean (VAS)		t*Value	P Value	Significance
	A group	B group			
0 min	7.40	7.35	.302	*p*>0.05	NS
2 min	5.88	4.92	11.290	*p*>0.05	NS
4 min	4.88	4.12	8.305	*p*>0.05	NS
6 min	4.80	4.08	6.451	*p*>0.05	NS
8 min	4.68	4.08	4.946	*p*>0.05	NS
10 min	3.76	3.15	5.374	*p*>0.05	NS
15 min	3.00	3.00	-	*p*>0.05	NS
20 min	3.00	3.00	-	*p*>0.05	NS
25 min	2.00	2.00	-	*p*>0.05	NS
30 min	2.00	2.00	-	*p*>0.05	NS

Mean pain score in both the group were between 0 and 1 to start with at zero post- operative minutes, and in both groups pain score variations were not significant and remain below VAS score 2 at the end of 6 hours post-operatively. (*p*>0.05)

Table 2: VAS score post-operatively

VAS Time of Assessment	Mean		t*Value	P Value	Significance
	A group	B group			
0 min	.44	.50	-.421	*p*>0.05	NS
15 min	.60	.73	-.711	*p*>0.05	NS
30 min	.68	.85	-.957	*p*>0.05	NS
60 min	.84	.96	-.752	*p*>0.05	NS
90 min	1.24	1.23	.064	*p*>0.05	NS
120min	1.32	1.27	.358	*p*>0.05	NS
150 min	1.32	1.31	.085	*p*>0.05	NS
180min	1.32	1.31	.085	*p*>0.05	NS
210 min	1.32	1.38	-.438	*p*>0.05	NS
240 min	1.44	1.38	.394	*p*>0.05	NS
270 min	1.44	1.38	.394	*p*>0.05	NS
300 min	1.44	1.38	.394	*p*>0.05	NS
360 min	1.48	1.42	.401	*p*>0.05	NS

Post-operative rescue analgesia time

Time of rescue analgesia administration was kept as visual analogue score of 4 or more. 100mg of tramadol IV was kept for rescue analgesia as protocol, subsequently multi- modal analgesia was administered to all patients.

ISSN 2515-8260 Volume 09, Issue 06, 2022

Mean rescue analgesia time for group A was 556.40 min while for group B it was 616.15 min which was significantly higher (P=0.004).

Table 3: Rescue analgesia time

Groups	A group	B group	t value	p value	Sig.
Time of rescue analgesia	556.40	616.15	-3.053	0.004	S

Discussion

In this prospective, double blind randomized comparative clinical study, we compared dexamesthesone as adjuvant to 0.25% ropivacaine versus 0.25% ropivacaine alone in Ultrasound guided Fascia iliaca compartment block for positioning of patient for administering spinal anaesthesia for patients posted for proximal femur fracture surgery.

The FICB was first described in 1989 and was performed initially on children and later on adults. It was mainly used to provide analgesia following surgical procedures in the hip, femur and knee, treatment of burns on the thigh and in pre-hospital treatment of fracture femur.

Candal-Couto *et al*., demonstrated that FICB allows patients being able to tolerate a sitting position with femoral neck fracture [9].

FICB is more effective in blocking lateral cutaneous nerve of thigh and femoral nerve. The FICB is not only easy to perform but it is also associated with minimal risk as the LA agent is injected at a safe distance from the femoral artery and femoral nerve. It is always safe to perform the FICB prior to spinal anaesthesia as the patient can respond during administration of the local anaesthetic and can prevent intraneuronal injections. There are reports of postoperative neuropathy when FICB was attempted after spinal anaesthesia [1, 10] Although, ultrasound guidance is theoretically an attractive means of preventing intraneural injection due to real-time imaging of the needle and nerve.

This study examined the effect of dexamethasone on 0.25% ropivacaine for FICB in patients with fracture femur. We observed that prolongation of block duration was significantly higher when dexamethasone was added as an additive to plain ropivacaine. This block prolongation was also observed when dexamethasone was combined with mepivacaine for supraclavicular blocks.

Similarly, K. C. Cummings *et al*. [10] also observed that, dexamethasone significantly prolonged the duration of ropivacaine and bupivacaine when used for the interscalene block. And the existing literature supports the clinically important benefit we observed in our study.

Elderly patients with fracture femur are more prone to delirium because of pain and medications. Adequate analgesia not only prevents delirium but also, allows increased mobility and shorter hospital stay.

Till date no trial has reported neurotoxicity attributable to dexamethasone. In our study, no adverse events were detected. Additionally, epidural corticosteroids have been used safely for a long time in treating patients with radicular pain arising from nerve root irritation dexamethasone in particular has been studied as an adjuvant to epidural local anaesthetics.

Steroids administered peri-neurally are eventually absorbed and produce systemic effects. Given IV several steroids have been shown to improve postoperative pain and reduce postoperative nausea and vomiting there were no significant differences in pain score for first 30 min in both the groups, although pain relief was achieved earlier in group B (ropivacaine with dexamethasone).

Demographic parameter such as age, sex, weight between two groups were comparable. Age ranged from 27-78 years of age. Age group in our study was consistent with other similar studies.

Time of rescue analgesia was noted with VAS score of four or more in both the groups, and it was significantly more in group B (ropivacaine with dexamesthsone group), Mean rescue analgesia 616.15 minutes in group B versus 556.40 minutes in group A (p value = 0.004).

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This result is in contrast with Suresh *et al.* [11] study which almost showed double duration of time of rescue analgesia in group with dexamethasone as adjuvant with significantly low p value.

The incidence of heamatoma, accidental intravascular injection, convulsion and paresthesia were nil in both the groups.

We have reported zero complications in our study. It might be because of extreme caution and attention given to every detail in order to avoid intravascular injection or damaging the nerve. We always made sure that the needle tip was clearly visible throughout the procedure [12].

Vital parameters like pulse rate, systolic blood pressure, diastolic blood pressure, saturation values were similar in both the groups. No patients in either groups required any interventions both pre-operatively and pos-operatively.

Although both the groups had comfortable and pain free positioning for administering spinal anesthesia before surgery, we recommend adjuvant dexamethasone as it not only gave lower pain scores earlier to ropivacaine only group (group A) but also provided prolonged analgesia compare to ropivacaine only group.

Conclusion

USG guided FICB is easy to perform block and give excellent analgesia for positioning and mobilisation of femur fracture patients pre and post operatively both, and dexamethasone as adjuvant to 0.25% ropivavaine prolong its local anesthetic effect significantly.

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