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AN OBSERVATIONAL STUDY TO COMPARE THE EFFICACY OF ROPIVACAINE ALONE AND ROPIVACAINE WITH DEXMEDETOMIDINE IN ULTRASOUND GUIDED FASCIA ILIACA COMPARTMENT BLOCK FOR ANALGESIA IN POSITIONING OF THE PATIENT IN SUBARACHNOID BLOCK PERFORMED IN UNILATERAL FEMUR FRACTURE SURGERY

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Abstract

Introduction: Patients encountered with fracture shaft and neck femur require some anaesthesia or pain relief to allow radiological, orthopedic and other procedures to be performed. Regional anaesthesia is the most widely used an aesthetic technique for orthopedic procedures in lower limbs. Fascia iliaca blocks provide a safe, cheap and effective form of pain relief for patients with neck of femur fractures. Animal studies have proven the combination of dexmedetomidine with ropivacaine to be safe and neuro-protective. Fascia iliaca compartment block which involve femoral nerve, lateral cutaneous nerve of thigh and obturator nerve. This study is designed to compare Fascia Iliaca Compartment Block under ultrasound guidance with ropivacaine and ropivacaine plus dexmedetomidine positioning during spinal anesthesia in femur fractures.

Material and methods: This study was conducted at Mahatma Gandhi hospital and Mathuradas Mathur hospital, Jodhpur during January 2019–January 2020. 60 Patients admitted in Orthopaedic ward age group 21-60 yrs. of both sex were the source of data. Patients undergoing elective surgery for fracture femur (neck of femur and intertrochanteric) under SAB were included in the study.

We divided the cases into 2 groups of 30 each, as

- **GROUP R**: Patients were received 30 ml 0.50% Inj. ropivacaine + 2 ml Normal saline with a total volume of 32 ml in unilateral FICB.
- **GROUP RD**: Patients were received 30 ml 0.50% Inj. Ropivacaine + 2 ml Inj. Dexmeditomidine (0.5mcg/Kg) with a total volume of 32 ml in unilateral FICB.

Standard protocol followed to administering regional anaesthesia. All data were collected and analysed with the help of suitable statistical parameters.

Results: Our study results in that Fascia Iliaca Compartment Block with combination of ropivacaine and dexmedetomidine is more efficacious than ropivacaine alone for positioning during spinal anaesthesia in surgery for fracture femur.

Key words: Spinal Anaesthesia, Fascia Iliaca Compartment Block, Ropivacaine, Dexmedetomidine.

Introduction

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage. [1] Pain management is an essential component of care provided by anaesthesiologists. Nowadays the number of patients encountered with fracture shaft and neck femur and those having multiple trauma. These patients require some anaesthesia or pain relief to allow radiological, orthopedic and other procedures to be performed.

Current methods of providing analgesia include: paracetamol, non-steroidal anti-inflammatory drugs (NSAIDS), oral or parenteral opioids and regional anaesthesia techniques. Paracetamol is an effective and safe analgesic, but insufficient for a significant number of

patients when used alone. NSAIDs are largely contraindicated in this patient group due to their nephrotoxicity and gastrointestinal side effects. Opioids provide reasonable analgesia at rest but are relatively ineffective for dynamic pain (pain on movement). Opioids can lead to Opioid-related side effects are very common like respiratory depression, hypotension.[2-4]

Nerve blocks have come up as an effective and a safe alternative to provide pain relief. Regional anaesthesia is the most widely used anaesthetic technique for orthopaedic procedures in lower limbs. Regional anaesthesia has many advantages over general anaesthesia as it provides a good perioperative pain relief, reduces systemic analgesic requirements, decreases poly pharmacy, avoids unnecessary airway manipulation, permits early ambulation and decreases chances of deep vein thrombosis.

Fascia iliaca blocks provide a safe, cheap and effective form of pain relief for patients with neck of femur fractures, and indeed for those with femoral shaft fractures.[5-6] .

One of the most important properties of a long-acting local anaesthetic is to reversibly inhibit the nerve impulses, thus causing a prolonged sensory or motor blockade appropriate for anaesthesia in different types of surgeries. Bupivacaine is a well-established long-acting regional anaesthetic, which like all amide anaesthetics has been associated with cardiotoxicity when used in high concentration or when accidentally administered intravascularly. Ropivacaine is a long-acting regional anaesthetic that is structurally related to Bupivacaine. It is a pure S(-)enantiomer, unlike Bupivacaine, which is a racemate, developed for the purpose of reducing potential toxicity and improving relative sensory and motor block profiles.[7]

When dealing with perioperative pain, local anesthetics such as lignocaine and bupivacaine are mostly preferred as local anaesthetics for peripheral field block. Ropivacaine and levobupivacaine are the new local anesthetic agents introduced into clinical practice.

Animal studies have proven the combination of dexmedetomidine with ropivacaine to be safe and neuro-protective. The use of dexmedetomidine decreases inflammation around peripheral nerves, thereby decreasing the potential for peripheral nerve injury. [15] In human beings, the beneficial effects of adding dexmedetomidine to local anesthetics during regional anesthesia and some peripheral nerve blockade procedures have proved to be efficacious for the surgical patients.[16,17,18] This peripheral nerve block in lower limb can be achieved by femoral nerve block alone or by fascia iliaca compartment block which involve femoral nerve, lateral cutaneous nerve of thigh and obturator nerve.

This study is designed to compare Fascia Iliaca Compartment Block under ultrasound guidance with ropivacaine and ropivacaine plus dexmedetomidine positioning during spinal anaesthesia in femur fractures.

Material and Method

Study place and time:

This study was conducted at Mahatma Gandhi hospital and Mathuradas Mathur hospital, jodhpur during January 2019–January 2020.

Study population:

60 Patients admitted in Orthopaedic ward were the source of data. Patients undergoing elective surgery for fracture femur (neck of femur and intertrochanteric) under SAB were included in the study.

Methodology:

We conducted a observational, prospective, randomized controlled study of 60 cases from Orthopaedic department between age group 21-60 yrs. of both sex . After obtaining approval from the Institutional Ethics Committee and obtaining written informed consent, the study was conducted on sixty patients who fulfilled the inclusion criteria scheduled to undergo surgery under spinal anesthesia for fracture femur. We evaluated these patients pre-operatively for their fitness. They were kept fasting for 10 to 12 hrs. After shifting patients to operation theater, intravenous (IV) cannula with 18G vasofix was secured, all monitors attached and baseline heart rate (HR),ECG, systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and oxygen saturation (SpO2) VAS and NRS score were recorded.

All patients were randomly divided into two groups of 30 each using computer generated random table.

- **GROUP R**: Patients were received 30 ml 0.50% Inj. ropivacaine + 2 ml Normal saline with a total volume of 32 ml in unilateral FICB.
- **GROUP RD**: Patients were received 30 ml 0.50% Inj. Ropivacaine + 2 ml Inj. Dexmeditomidine (0.5mcg/Kg) with a total volume of 32 ml in unilateral FICB.

Spinal anaesthesia was given at either L3/4 or L4/5 interspace with hyperbaric Bupivacaine (5 mg/ml) 15 mg using a 23/25 G Quincke's spinal needle. Post-operative analgesia were standardized in all patients of both groups with Inj.Tramadol 2mg/kg I.V. 8th hourly; first dose was given whenever patient complained of pain orVAS and NRS >4.

Data Analysis- Data was recorded as per Performa. The data analysis was computer based; SPSS-22 will be used for analysis. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between groups. *P-value* <0.05 was considered as significant.

Result

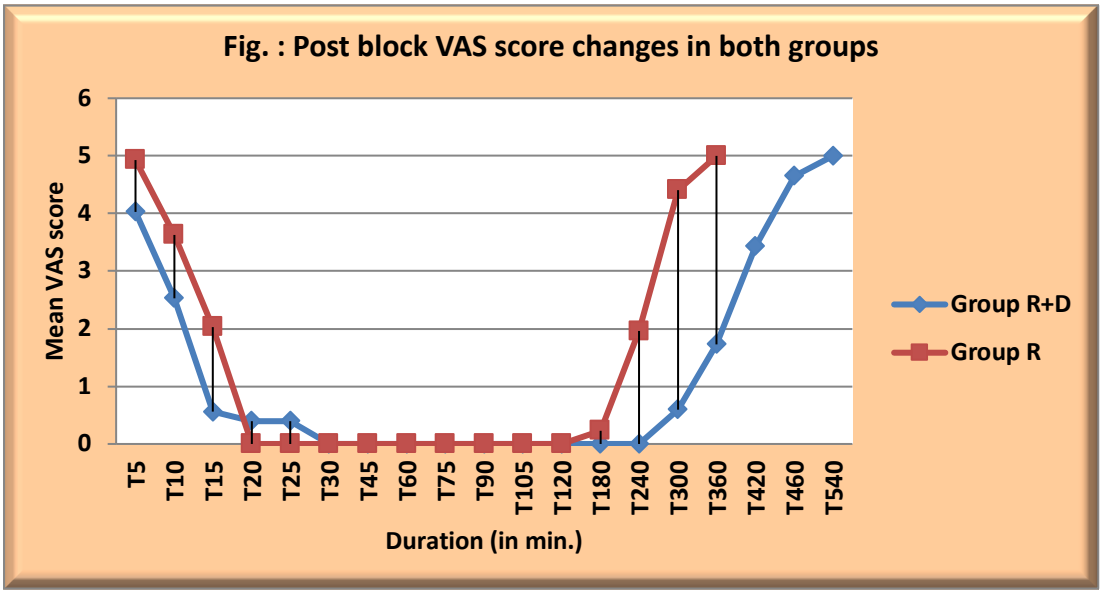

Figure 1: Post block VAS score changes in both groups

Among the patients undergoing spinal anaesthesia in fracture femur surgery, there was a statistically significant difference in relation to VAS score during positioning between R+D group (4.03±0.61) and R group (4.93±0.63) with a p value of <0.05 as per unpaired t test.

Table 1: Post block patients satisfaction score in both groups

Satisfaction score at 15 minutes	Group R+D	Group R	Total
1	00	01	01
2	02	05	07
3	08	19	27
4	20	05	25
15 minutes [mean± SD]	**3.60±0.62**	**2.93±0.69**	P value of 0.0002

Among the patients undergoing spinal anaesthesia for fracture femur surgery, there was statistically significant difference in relation to satisfaction score between R+D group (**3.60±0.62)** and R group (**2.93±0.69**) with a P value of 0.0002 as per chi squared test.

Table 2: Time of First Rescue Analgisia in both groups

Time of First Rescue Analgisia	Group R+D	Group R	Total
250 – 350	00	30	30
350 – 450	16	00	16
450 – 550	14	00	14
Mean± SD	**459.56±27.82**	**283.10±28.28**	**<0.0001**

Among the patients undergoing spinal anaesthesia for fracture femur surgery, there was statistically significant difference in relation to time of first rescue analgesia between R+D group (**459.56±27.82**) and R group (**283.10±28.28**) with a p value of >0.05 as per chi squared test.

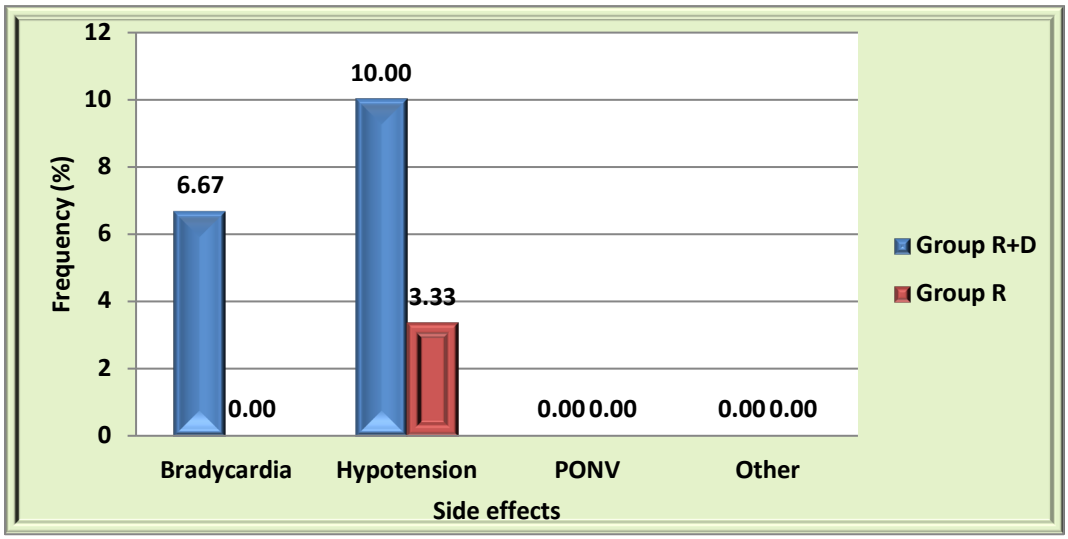

Figure 2: Side effects in both groups

Among the patients undergoing spinal anaesthesia for fracture femur surgery, there was no statistically significant difference in relation to side effects between R+D group (bradycardia 6.67%,hypotension 10%) and R group (hypotension 1.33%) with a p value of >0.05 as per chi squared test.

Discussion

Spinal anaesthesia is the most commonly used anaesthetic technique of choice in orthopaedics for lower limb fractures. While regional anaesthesia has been shown to be more beneficial compared to general anaesthesia, patient positioning for neuraxial blockade may cause severe pain in patients with femur fractures. Pain management is an integral part of providing care in the emergency setting. Lower extremity pain from hip fractures, burns, and other trauma is a common presenting complaint. Intravenous analgesia can be associated with respiratory depression, hypotension, mental status changes, and vomiting. NSAIDs can increase bleeding risk and exacerbate underlying gastrointestinal (GI) problems. Acetaminophen alone is often not sufficient for severe pain. Hip fractures, in particular, can cause considerable pain, and often occur in elderly adults with multiple co-morbidities which make analgesia challenging. A fascia iliaca compartment block can provide superior analgesia with minimal side effects. It can be deployed in a relatively quick fashion after a small amount of training and can be executed with high success rates under ultrasound guidance. In a study by Monzon et al. patients who received a fascia iliaca compartment block for a hip fracture had significantly reduced pain levels. The pain was initially rated at an average of 8.5 on a 10 point scale but decreased to an average of 2.3 at 2 hours post-injection. [12]

Fascia iliaca compartment block, first described by Dalens et al is a simple, low skill and safe technique that can be used during pre-hospital care, emergency department and in the pre-operative setting [13]. It blocks the femoral, lateral femoral cutaneous nerve and sometimes the obturator nerve. The usage of ultrasound guidance to visualize the fascia iliaca and to deposit the drug beneath & lateral to the femoral nerve increases the success rate of block and further reduces the risk of neurovascular injury. [14]

***Dinesh sood et al* (2019)** [15] compare the effect of ropivacaine alone group A and addition of 1 mcg/kg dexmedetomidine to 3 mg/kg ropivacain group B in Fascia iliaca compartment block (FICB). Results shows Mean time of administration of first rescue analgesic was significantly earlier in group A at 275.29±226.31 minutes as compared to 465.8±325.56 minutes in group B and concluded that the addition of dexmedetomidine to ropivacaine significantly prolongs the duration of analgesic effect of FICB without any adverse effects. Similar results were produced in our study. (**Table-2**)

Hemantkumar et al 2018[16] studied the patients who presented with the fracture of femoral shaft and neck in the emergency department were randomly divided into two groups of 30 patients each: group D (n = 30): patients were administered 15 mL ropivacaine (0.5%) plus dexmedetomidine 1 µg/kg body weight (total volume, 16 mL) and group R (n = 30): patients were administered 15 mL ropivacaine (0.5%) plus 1 mL saline the efficacy of dexmedetomidine added to ropivacaine in FNB with regard to onset, duration, efficacy of analgesia, and patient acceptance and concluded that the addition of dexmedetomidine to ropivacaine in FNB provides early onset of analgesia, prolongs the duration of analgesia, improves the quality of analgesia, and has better patient acceptance.

In this prospective, randomized study, the efficacy of fascia iliaca compartment block under ultrasound guidance with ropivacaine and dexmedetomidine was compared with ropivacaine alone for positioning during spinal anaesthesia in femur fractures. 60 patients satisfying the inclusion

criteria were chosen and divided into two groups of thirty each randomly. Group R+D received 32ml of 0.50% Ropivacaine and Dexmedetomidine under ultrasound guidance fifteen minutes before positioning, while Group R received 32 ml of 0.50% Ropivacaine alone under ultrasound guidance fifteen minutes before positioning.

Both the groups were comparable in terms of age, sex, weight and ASA grading. The Visual Analogue Scale score during positioning at 5mins,10 mins and 15 mins were(4.03±0.61),(2.53±0.57)(0.56±0.77) respectively in R+D group where as the Visual Analogue Scale score during positioning at 5mins,10 mins and 15 mins were (4.93±0.63), (3.63±0.61),(2.03±0.61) in R group and was statistically significant with a P value of <0.0001. (**Fig. 1**)

It shows that fascia iliaca compartment block provides better analgesia in patient positioning for subarachnoid block in fracture femur surgeries. A time interval of fifteen minutes before the block in R+D group and R group was chosen as the onset of action of ropivacaine is 5 to 10 minutes. Dexmedetomidine has analgesic and sedative property when used as an adjuvant in regional anaesthesia. [16] The addition of dexmedetomidine to ropivacaine significantly prolongs the duration of analgesic effect of FICB without any adverse effects. [16]

The onset and duration of analgesic effect of ropivacaine may be enhanced by adding the dexmedetomidine which was assessed by VAS and NRS score both were better in R+D group. The Visual Analogue Scale score during positioning at 5mins, 10 mins and 15 mins were (4.03±0.61), (2.53±0.57)(0.56±0.77) respectively in R+D group where as the Visual Analogue Scale score during positioning at 5mins,10 mins and 15 mins were (4.93±0.63), (3.63±0.61), (2.03±0.61) in R group and was statistically significant with a P value of <0.0001. It shows that fascia iliaca compartment block with combination of ropivacaine and dexmedetomidine provides better analgesia than ropivacaine alone in patient positioning for subarachnoid block in fracture femur surgeries. The satisfaction score was also higher which was assessed in both groups at 15 min post block in R+D group compare to R group in patients positioning for subarachnoid block with a mean of 3.60±0.62 when compared to R group which had a mean 2.93±0.69. It was statistically significant with a P value of 0.0002. (**Table-1**) It means that fascia iliaca compartment block with ropivacaine and dexmedetomidine had more sedative effect than ropivacaine alone.

Fascia Iliaca Compartment Block could also be more useful in procedures like placing an epidural or in patients with spinal abnormalities where the patients may have to be in a sitting position for a longer time. Also, the placement of a catheter in the fascia iliaca compartment and inclusion of additives would further increase the duration of post op analgesia.

Conclusion

It is concluded that Fascia Iliaca Compartment Block with combination of ropivacaine and dexmedetomidine is more efficacious than ropivacaine alone for positioning during spinal anaesthesia in surgery for fracture femur.

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