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# ADDUCTOR CANAL BLOCK IS SUPERIOR TO FEMORAL CANAL BLOCK IN POST-OPERATIVE OUTCOME FOLLOWING TOTAL KNEE ARTHROPLASTY

Anaesthesiology

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## ABSTRACT

**Background and Objectives:** Postoperative pain management and early recovery play an important role in the functional outcome following Total Knee Arthroplasty (TKA). Various multimodal measures are currently considered for pain management after total knee arthroplasty. Femoral nerve block (FNB) and Adductor canal block (ACB) provide excellent postoperative analgesia and are now commonly used analgesic modalities for total knee arthroplasty pain control. We compared the postoperative pain and functional outcome in patients undergoing TKA.

**Methods:** 60 patients were scheduled for TKA of which 30 patients received continuous FNB and 30 patients received continuous ACB via a catheter. (20 ml of 0.5% of ropivacaine given initially followed by a continuous infusion of 0.2% ropivacaine, 4 ml/h for 48 hours). The outcome was to assess the VAS score and ambulatory distance at 6, 24, 48 hours following TKA.

**Results:** Adductor canal block provides better ambulatory distance of 35 meters (0-80 meter) and 55 meters (0-110 meter) when compared to femoral nerve block with 8 meter (0-40 meter) and 18 meters (0-70 meter) in POD 1 & 2 respectively. Whereas VAS scores are similar between FNB and ACB.

**Conclusion:** Adductor canal block provides early post-operative ambulation when compared to femoral nerve block following TKA without any significant difference in postoperative pain.

## KEYWORDS

Adductor canal block, Femoral nerve block, Knee Arthroplasty, Ropivacaine

## INTRODUCTION

Postoperative pain management and early recovery play an important role in the functional outcome following Total Knee Arthroplasty. [1] Various multimodal measures are currently considered for pain management after total knee arthroplasty. Femoral nerve block (FNB) and Adductor canal block (ACB) provide excellent postoperative analgesia and are now commonly used analgesic modalities for total knee arthroplasty pain control. [2] Our study is to compare the postoperative pain and function outcome of femoral nerve block and adductor canal block in patients undergoing primary TKA.

Anatomical study of the adductor canal demonstrated that the adductor canal may serve as a conduit for more than just the saphenous nerve, possibly including the vastus medialis nerve, medial femoral cutaneous nerve, articular branches from the obturator nerve, as well as the medial retinacular nerve. Thus, the sensory changes are not limited to the distribution of the saphenous nerve, but includes the medial and anterior aspects of the knee from the superior pole of the patella to the proximal tibia.

The femoral canal is an anatomical compartment, located in the anterior thigh. It is the smallest and most medial part of the femoral sheath. It is approximately 1.3cm long. The femoral canal is located in the anterior thigh, within the femoral triangle. It can be thought of as a rectangular shaped compartment. It has four borders and an opening: Medial border – Lacunar ligament. Lateral border – Femoral vein. Anterior border – Inguinal ligament. Posterior border – Pectineal ligament, superior ramus of the pubic bone, and the pectineus muscle. The opening to the femoral canal is located at its superior border, known as the femoral ring. The femoral ring is closed by a connective tissue layer – the femoral septum. This septum is pierced by the lymphatic vessels exiting the canal. [3]

Ropivacaine is a long-acting amide local anaesthetic agent and first produced as a pure enantiomer. It produces effects similar to other local anaesthetics via reversible inhibition of sodium ion influx in nerve fibres. Ropivacaine is less lipophilic than bupivacaine and is less likely to penetrate large myelinated motor fibres, resulting in a relatively reduced motor blockade. Thus, ropivacaine has a greater degree of motor sensory differentiation, which could be useful when motor blockade is undesirable. The reduced lipophilicity is also associated with decreased potential for central nervous system toxicity and cardiotoxicity. The drug displays linear and dose proportional pharmacokinetics (up to 80 mg administered intravenously). It is metabolised extensively in the liver and excreted in urine. The present article details the clinical applications of ropivacaine and its current place as a local anaesthetic in the group. [4]

## METHODS AND METERIALS

This study was conducted on 60 patients scheduled for TKA. 30 patients received continuous FNB and 30 patients received continuous ACB via a catheter. After obtaining approval from the Institutional ethical committee, all patients who were scheduled to undergo elective TKA surgery received information about the study, and patients who accepted to participate were enrolled in the study. A written informed consent was obtained from the patients willing to participate in the study. All patients were informed about the VAS score for pain assessment as well as trained for the timed up and go (TUG) test. [5] At the end of the surgery, patients were randomized to either receive ACB or FNB under ultrasound guidance**.** A linear ultrasound probe was used for performing both the blocks. For ACB, the ultrasound probe was placed at the mid-thigh level halfway between the anterior superior iliac spine and patella. The femoral artery underneath the sartorius muscle was identified. The saphenous nerve lies just lateral to the artery. An 18-G, Tuohy needle was introduced in plane and advanced into the adductor canal. On reaching the adductor canal, 2–3 ml of saline was injected to ensure correct placement of needle, i.e., spread of saline in the vicinity of saphenous nerve. After confirmation, 20ml of 0.5% ropivacaine was injected in the adductor canal.

For FNB, the needle was inserted in plane with the probe parallel to inguinal crease with slight cephalic tilt to identify the femoral artery and femoral nerve. [6] The needle was advanced towards the femoral nerve and 20ml of 0.5% ropivacaine given initially followed by a continuous infusion of 0.2% ropivacaine, 4 ml/h for 48 hours was injected. Adequate local anesthetic spread was confirmed in both the techniques. Routine monitoring was continued in the postoperative period. Further, all the study-related monitoring and evaluation was done by independent observer.

The outcome was to assess the VAS score and vital parameters at 6, 24, and 48 hours following TKA. [7] Rescue analgesia was given in the form of intravenous tramadol 2 mg/kg at VAS above 4. The time of rescue analgesia was recorded.

## RESULTS

**Table 1: Demographic variables in the groups.**

| Parameters | Group F n=30 (Mean±SD) | Group A n=30 (Mean±SD) |
|---|---|---|
| Age (years) | 55±4.5 | 56±4.7 |
| Sex (M/F) | 27/3 | 24/6 |
| ASA (I/II) | 21/9 | 23/7 |
| BMI (Mean) | 26.1±3.06 | 25.8±2.88 |
| Duration of surgery (min) | 120±11.8 | 124.2±13.4 |

The demographic parameters and patient characteristics were comparable in both groups. There were however a greater number of males compared to females in both groups.

**Table 2: Total analgesic consumption (Tramadol in mg)**

| Time (hours) | Group F | Group A | P value |
|---|---|---|---|
| 6-12 | 94±10 | 99±5 | 0.32 |
| 12-24 | 234±10 | 245±5 | 0.11 |
| 24-48 | 178±19 | 192±24 | 0.09 |

**The total analgesic consumption was comparable in both groups.**

**Comparison of VAS scale for pain in both the groups**

| Time(hours) | Group F | Group A | P value |
|---|---|---|---|
| 0 | 1.32±0.68 | 1.6±0.36 | 0.22 |
| 6 | 1.66±1.28 | 1.78±1.14 | 0.83 |
| 12 | 3.41±1.55 | 3.77±1.22 | 0.38 |
| 18 | 4.32±1022 | 4.55±0.55 | 0.21 |
| 24 | 5.11±1.14 | 5.22±0.86 | 0.25 |

VAS scores were comparable in both the groups. Ambulation was earlier in ACB group compared to FNB group. The VAS scores and rescue analgesic consumption between both groups was statistically insignificant ($P > 0.05$).

## DISCUSSION

Recent trends in pain management protocols following TKA have shifted toward effective analgesia with limited motor involvement. [8] Given the excellent analgesic effect, FNB is a commonly used modality as part of TKA pain control regimens and is considered to be the gold standard for postoperative analgesia after TKA. However, it may reduce quadriceps strength, which is essential for early mobilization and is associated with an increased risk of postoperative falls. Thus, ACB has emerged as a reasonable alternative to FNB that produces a predominantly sensory block with greater quadriceps strength preservation. [9] In addition; it provided excellent pain relief around the knee joint and motor strength preservation with minimal differences from baseline. Moreover, ACB catheters required fewer provider interventions per patient, thus decreasing the workload compared with FNB catheters. [10] The findings of this study suggest that ACB is a more appropriate analgesic modality than FNB in patients undergoing current multimodal perioperative protocols after TKA.

## CONCLUSION:

Both adductor canal block and femoral nerve block provide excellent pain relief in the post-operative period following knee arthroplasty. Adductor canal block provides early post-operative ambulation when compared to femoral nerve block without any significant difference in postoperative pain.

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