

Comparative Evaluation of Postoperative Analgesia Between Femoral Nerve Block, Adductor Canal Block, and Multimodal Analgesia in Arthroscopic Knee Surgery

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1. INTRODUCTION

Arthroscopic knee surgery is widely performed for diagnostic and therapeutic purposes due to its minimally invasive nature and faster recovery compared to open procedures. Despite smaller incisions and reduced soft tissue trauma, patients often report moderate to severe pain in the immediate postoperative period. This pain hampers early mobilization, delays discharge in day-care procedures, and negatively influences rehabilitation outcomes. Effective postoperative pain management is therefore crucial in ensuring patient comfort, enhancing early physiotherapy, and preventing complications associated with immobility such as venous thromboembolism and pulmonary dysfunction.

Traditionally, intramuscular administration of non-steroidal anti-inflammatory drugs (NSAIDs) such as diclofenac has been the mainstay for postoperative analgesia following arthroscopic knee surgery. However, systemic NSAIDs provide intermittent and inconsistent pain relief, often leading to breakthrough pain and requiring frequent rescue doses. Furthermore, NSAIDs are associated with gastrointestinal, renal, and cardiovascular adverse effects, especially in patients with comorbidities.

Peripheral nerve blocks have gained increasing popularity in recent years for providing prolonged, site-specific analgesia while avoiding systemic side effects. Among these, the femoral nerve block (FNB) has been extensively studied and provides excellent analgesia after knee surgery. However, its major drawback is significant quadriceps weakness, increasing the risk of falls and hindering early mobilization. To address this limitation, the adductor canal block (ACB) has been introduced as an alternative, providing effective pain relief while preserving quadriceps strength. Given these considerations, this study compares the efficacy and safety of femoral nerve block, adductor canal block, and multimodal systemic analgesia for postoperative pain control in arthroscopic knee surgeries.

Aims and Objectives with Methodology

Aim: To compare postoperative analgesia provided by femoral nerve block, adductor canal block, and multimodal analgesia in patients undergoing arthroscopic knee surgery

Objectives:

1. To evaluate pain scores using the Visual Analogue Scale (VAS).
2. To compare duration of analgesia and need for rescue analgesics
3. To assess side effects and complications of each modality.

Methodology: This prospective, randomized study included patients undergoing arthroscopic knee surgery under general anaesthesia. Patients were allocated into three groups: Group F (Femoral Nerve Block), Group A (Adductor Canal Block), and Group M (Multimodal Analgesia with systemic NSAIDs and opioids as required). Standard monitoring and anaesthetic techniques were applied. Postoperative pain scores were recorded at regular intervals using the VAS. Rescue analgesia, time to first analgesic request, and adverse effects were documented and statistically analyzed.

2. RESULTS

The study compared 90 patients undergoing arthroscopic knee surgery, divided equally into three groups (n=30 each). Pain scores, duration of analgesia, and need for rescue medication were assessed. As shown in Table 2 and Figure 1, patients in the femoral nerve block and adductor canal block groups experienced significantly lower VAS scores in the immediate postoperative period compared to those receiving multimodal systemic analgesia. The mean duration of analgesia was longest in the femoral nerve block group, followed closely by the adductor canal block group (Table 3 and Figure 2), whereas patients in the multimodal group reported the shortest analgesia duration and highest need for rescue analgesics (Table 3 and Figure 3). No major complications were observed in any group, although quadriceps weakness was more commonly noted in the femoral block group. These findings highlight the effectiveness of regional techniques over systemic multimodal analgesia for early postoperative pain relief.

Table 1: Distribution of study population

Group	Age (yrs)	Male/Female	BMI (kg/m ²)
Femoral Block	34±6	18/12	24.1±2.5
Adductor Block	33±5	17/13	23.9±2.8
Multimodal	32±7	16/14	24.3±2.6

Table 2: VAS Scores at Different Intervals

Group	VAS 6h	VAS 12h	VAS 24h
Femoral Block	2.1±0.6	3.4±0.8	4.2±1.1
Adductor Block	2.3±0.7	3.5±0.9	4.4±1.0
Multimodal	3.8±0.9	5.2±1.1	6.0±1.3

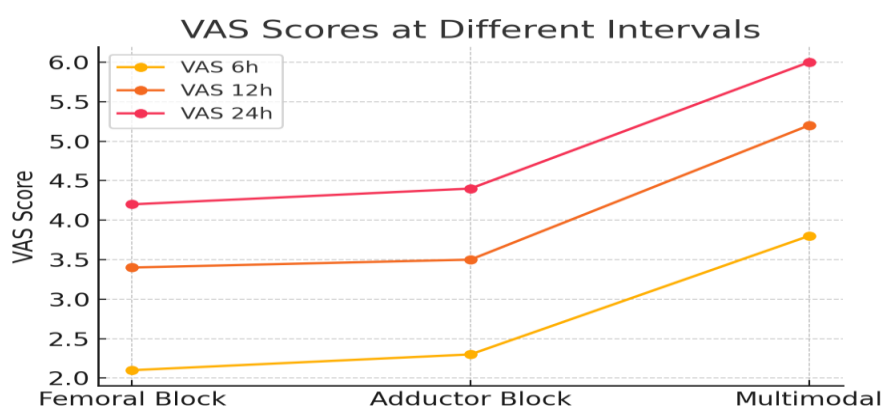
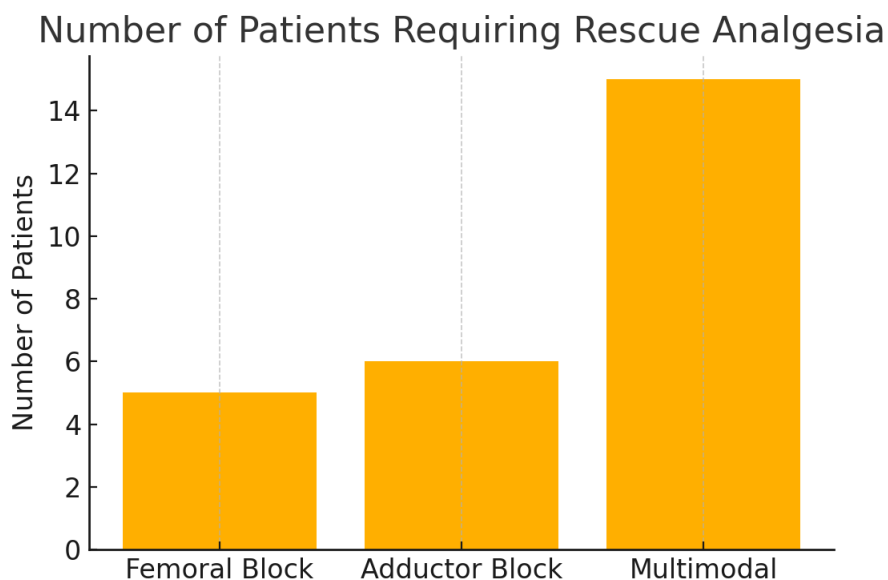
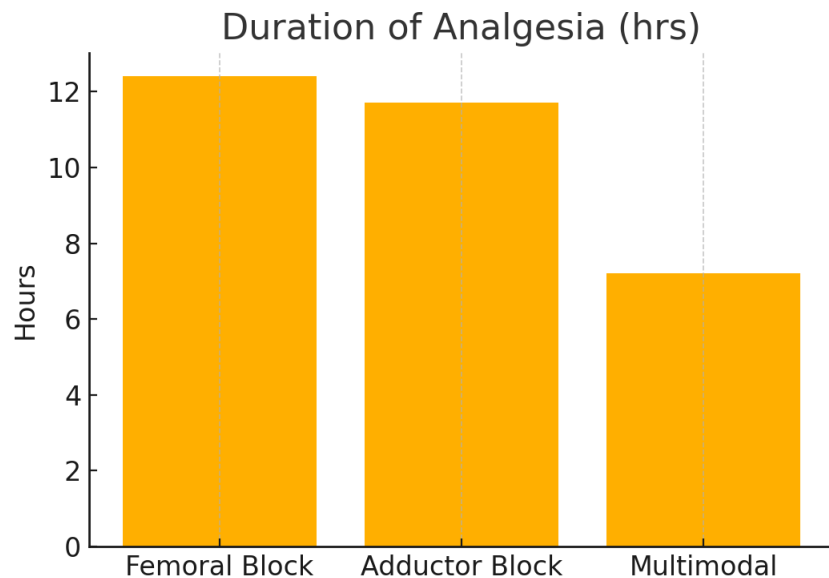


Table 3: Duration of Analgesia (hrs)

Group	Duration Analgesia (hrs)	Rescue Analgesia (n)
Femoral Block	12.4±2.1	5
Adductor Block	11.7±2.0	6
Multimodal	7.2±1.8	15



3. DISCUSSION

This study demonstrates that both femoral nerve block and adductor canal block provide superior postoperative analgesia compared to multimodal systemic analgesia following arthroscopic knee surgery. As evidenced by Table 2 and Figure 1, patients receiving nerve blocks reported lower VAS scores and required fewer rescue analgesics in the first 24 hours after surgery. The femoral nerve block group experienced the longest duration of analgesia (Table 3, Figure 2), consistent with previous reports. However, the concern of quadriceps weakness remains, which can impact early mobilization and rehabilitation.

The adductor canal block provided nearly comparable analgesic efficacy while preserving quadriceps strength, making it an attractive option for early mobilization and functional recovery. These findings support growing evidence that adductor canal block balances effective pain control with better rehabilitation outcomes compared to femoral block. Multimodal analgesia, although effective in some contexts, was less successful in maintaining sustained analgesia in this study (Table 3, Figure 3), reinforcing the value of regional techniques for enhanced recovery.

4. CONCLUSION

Adductor canal block provides effective analgesia after arthroscopic knee surgery while preserving quadriceps strength compared to femoral nerve block. Multimodal analgesia remains useful but is less effective in providing sustained pain relief. Peripheral nerve blocks, particularly adductor canal block, should be preferred for optimal pain management and enhanced recovery in arthroscopic knee surgeries

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