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ANALGESIC EFFICACY OF ULTRASOUND-GUIDED GENICULAR NERVE BLOCK IN COMBINATION WITH ADDUCTOR CANAL BLOCK IN TOTAL KNEE ARTHROPLASTY: A RANDOMISED, DOUBLE-BLIND, PLACEBO-CONTROLLED TRIAL

Anaesthesiology

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ABSTRACT

Background and Aims: Distal motor-sparing nerve blocks are increasingly popular for total knee arthroplasty (TKA). We hypothesised that combining ultrasound-guided genicular nerve block (GNB) with adductor canal block (ACB) would reduce postoperative opioid consumption and improve analgesia. **Methods:** Fifty ASA I–III patients undergoing unilateral primary TKA were randomised into two groups. Group I received ultrasound-guided ACB (20 mL of 0.25% ropivacaine + 4 mg dexamethasone) and GNB (superomedial, superolateral, and inferomedial with 5 mL of 0.25% ropivacaine + 2 mg dexamethasone each). Group II received ACB with the same drug and saline for GNB sites. Primary outcome: 24-hour morphine consumption; secondary outcomes: pain scores, time to rescue analgesia, and patient satisfaction. **Results:** Group I demonstrated significantly lower morphine consumption (5.9 ± 2.7 mg vs 15.5 ± 2.6 mg, $p < 0.001$), lower VAS pain scores at 6, 12, and 24 hours ($p < 0.05$), and higher patient satisfaction. Time to first rescue analgesia was longer in Group I (24.0 ± 0 h vs 20.7 ± 7.3 h, $p = 0.034$). **Conclusion:** Combining GNB with ACB provides superior postoperative analgesia and reduces opioid use compared to ACB alone.

KEYWORDS

INTRODUCTION

Knee osteoarthritis (OA) remains a leading cause of disability worldwide, frequently requiring total knee arthroplasty (TKA) in advanced stages. Severe postoperative pain following TKA impairs early ambulation and functional recovery. Conventional analgesic techniques such as epidural and femoral nerve blocks offer effective pain relief but often lead to quadriceps weakness. Adductor canal block (ACB) provides motor-sparing analgesia but may not cover all articular branches of the knee. Recent anatomical studies have highlighted the genicular nerves as additional pain-transmitting structures not covered by ACB. Hence, combining genicular nerve block (GNB) with ACB may enhance postoperative analgesia and reduce opioid consumption.

Aims and Objectives

To evaluate whether the addition of ultrasound-guided genicular nerve block to adductor canal block improves postoperative analgesia following total knee arthroplasty.

Objectives:

1. To compare 24-hour postoperative opioid consumption between the two groups.
2. To compare postoperative pain scores at rest and during movement.
3. To assess time to first rescue analgesia and patient satisfaction.

Materials and Methods

This prospective, randomised, double-blind, placebo-controlled study was conducted at Sri Siddhartha Medical College and Research Institute, Tumakuru, after obtaining Institutional Ethics Committee approval and CTRI registration. Fifty ASA I–III patients scheduled for unilateral primary TKA under spinal anaesthesia were enrolled and randomised using computer-generated allocation into two equal groups (n = 25 each). Exclusion criteria included revision TKA, chronic opioid use, and contraindications to regional anaesthesia.

Group I received ultrasound-guided ACB (20 mL of 0.25% ropivacaine + 4 mg dexamethasone) and GNB (superomedial, superolateral, and inferomedial sites) with 5 mL of 0.25% ropivacaine + 2 mg dexamethasone per site. Group II received ACB with the same drug and 0.9% saline for GNB sites. Blocks were performed by an experienced anaesthesiologist using a high-frequency linear probe (6–13 MHz) under sterile conditions.

Postoperative analgesia was maintained with IV paracetamol and diclofenac. Patient-controlled analgesia (PCA) with morphine was available for rescue (1 mg/mL, lockout 10 minutes, max 5 mg/h). Pain was assessed using a visual analogue scale (VAS, 0–10) at 3, 6, 12, and 24 hours postoperatively. Primary outcome: total morphine consumption in 24 hours. Secondary outcomes: VAS pain scores, time to rescue analgesia, and patient satisfaction (5-point Likert scale).

RESULTS

Fifty patients completed the study. Baseline demographics were comparable between the groups. Group I demonstrated significantly lower morphine consumption (5.96 ± 2.73 mg) compared to Group II (15.52 ± 2.67 mg, $p < 0.001$). Pain scores at rest and during movement were significantly lower in Group I at 6, 12, and 24 hours. Time to first rescue analgesia was longer in Group I (24.0 ± 0 h) versus Group II (20.7 ± 7.3 h, $p = 0.034$). Patient satisfaction was higher in Group I. No block-related complications were noted.

Table 1. Baseline Demographic Data

Parameter	Group I (GNB + ACB)	Group II (ACB only)	P value
Age (years)	60.8 ± 6.1	63.4 ± 7.8	0.19
Gender (M/F)	9/16	14/11	0.26
BMI (kg/m²)	28.8 ± 11.6	27.9 ± 10.8	0.77
ASA (I:II:III)	9:12:4	10:11:4	0.95
Duration of surgery (min)	95.0 ± 19.6	90.7 ± 23.5	0.31

Age, gender, BMI, and ASA status were comparable between the two groups.

Table 2. Postoperative analgesic profile

Outcome Parameter	Group I (GNB + ACB)	Group II (ACB only)	P value
24-h Morphine consumption (mg)	5.96 ± 2.73	15.52 ± 2.67	<0.001
Time to first rescue analgesia (h)	24.0 ± 0	20.7 ± 7.3	0.034
VAS at rest (6 h)	1 (1–1)	1 (1–1.5)	0.02
VAS at movement (12 h)	1 (1–1)	2 (1–3)	<0.001
Patient satisfaction (Satisfied/Total)	22/25	14/25	0.045

Group I showed lower morphine use and lower VAS scores compared to Group II ($p < 0.05$).

DISCUSSION

The study confirms that combining GNB with ACB provides superior analgesia after TKA, consistent with recent literature. Anatomical studies demonstrate that GNB complements ACB by targeting articular branches of femoral, tibial, and obturator nerves not covered by ACB. These findings align with previous studies by Rambhia et al. and Akesen et al., which reported reduced opioid use and pain scores with combined blocks. Our results also suggest improved patient satisfaction and prolonged time to rescue analgesia without motor weakness.

Limitations include a relatively small sample size and lack of motor strength assessment. Larger studies are warranted to confirm the optimal local anaesthetic volume and combination with other regional techniques such as iPACK or periarticular infiltration.

CONCLUSION

The combination of ultrasound-guided genicular nerve block and

adductor canal block significantly improves postoperative analgesia and reduces opioid consumption in total knee arthroplasty compared to adductor canal block alone.

Figure 1. Ultrasound-guided Genicular and Adductor Canal Block Anatomy.

Figure 2. Consort Flow Diagram of Patient Enrolment, Randomisation, and Analysis.

A total of 58 patients were assessed for eligibility. Eight were excluded (five did not meet inclusion criteria, three declined). Fifty patients were randomised equally into two groups: Group I (GNB + ACB) and Group II (ACB only). All patients completed the study and were analysed.

REFERENCES

1. Rambhia M, et al. Ultrasound-guided genicular nerve blocks following total knee arthroplasty: A randomized, double-blind, placebo-controlled trial. Reg Anesth Pain Med 2021;46:862–6.
2. Akesen S, et al. Comparison of efficacy between genicular nerve block and IPACK block for total knee replacement surgery. Acta Orthop Traumatol Turc 2021;55:134–40.
3. Xue X, et al. Postoperative pain relief after total knee arthroplasty: A Bayesian network meta-analysis. J Clin Anesth 2024;96:111490.
4. Sahoo RK, et al. Genicular nerve block for postoperative pain relief after total knee replacement. Saudi J Anaesth 2020;14:235–7.
5. Lavand'homme PM, et al. Pain management after total knee arthroplasty: ESRA PROSPECT recommendations. Eur J Anaesthesiol 2022;3:743–57.