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Original Research Article

A Randomised Controlled Prospective Study of the Role of Patellar Denervation in Total Knee Arthroplasty Surgery without Patellar Resurfacing

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Abstract

Background: Anterior knee pain (AKP) remains a common cause of dissatisfaction after total knee arthroplasty (TKA). Circumpatellar denervation using electrocautery has been proposed to reduce postoperative pain by ablating nociceptive fibers in peripatellar tissues.

Aim: To evaluate the effect of intraoperative patellar denervation by electrocautery on postoperative anterior knee pain and functional outcomes in patients undergoing primary TKA for osteoarthritis.

Methods: This prospective randomized comparative study was conducted at BGS Global Hospital, Bangalore, between July 2019 and May 2021. Seventy patients aged 45–80 years with advanced primary knee osteoarthritis undergoing TKA were randomized into two groups: electrocautery (n=35) and control (n=35). All patients underwent standard TKA. The intervention group received circumpatellar electrocautery using monopolar diathermy. Outcomes were assessed preoperatively and at 1, 3, 6, and 12 months using the Visual Analogue Scale (VAS), Insall Knee Score (KSS), Patellar Score (PS), and range of motion (ROM). Statistical analysis was performed using repeated-measures ANOVA.

Results: Both groups showed significant postoperative improvement. However, the electrocautery group demonstrated significantly lower VAS scores at all follow-ups (12-month mean: 0.03 vs 0.49; $p<0.001$). Functional outcomes were superior in the intervention group, with higher KSS (94.63 vs 89.74) and PS (27.23 vs 22.26) at one year ($p<0.001$). ROM improved in both groups without statistically significant intergroup difference.

Conclusion: Circumpatellar patellar denervation during TKA significantly reduces anterior knee pain and improves functional outcomes. The technique is simple and safe, though larger long-term studies are recommended.

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Introduction

Osteoarthritis (OA) of the knee is one of the most prevalent degenerative joint disorders and a leading cause of chronic pain, disability, and reduced quality of life worldwide. The disease is characterized by progressive cartilage degeneration, subchondral bone remodeling, osteophyte formation, and synovial inflammation. With increasing life expectancy and rising prevalence of obesity, the burden of knee OA continues to grow, particularly among the elderly population.

Total Knee Arthroplasty (TKA) has been established as the most effective surgical treatment for end-stage knee osteoarthritis, providing reliable pain relief and functional restoration. However, despite overall high success rates, a significant proportion of patients report persistent anterior knee pain (AKP) following TKA. Patellofemoral complications remain one of the most common causes of postoperative dissatisfaction, morbidity, and secondary procedures.

The role of patellar resurfacing in preventing anterior knee pain has been widely debated. While some meta-analyses demonstrate reduced reoperation rates with resurfacing, many studies

show no consistent reduction in AKP. Increasing evidence suggests that nociceptive fibers within the peripatellar soft tissues—rather than the articular cartilage—may be the primary pain generators. Circumpatellar denervation using electrocautery has therefore emerged as a simple adjunctive technique aimed at ablating these pain fibers. The procedure is technically straightforward, adds minimal operative time, and avoids complications associated with patellar resurfacing. However, the clinical effectiveness of this intervention remains controversial.

The present randomized comparative study was undertaken to evaluate the impact of intraoperative patellar denervation by electrocautery on postoperative anterior knee pain and functional outcomes in patients undergoing primary total knee arthroplasty for osteoarthritis.

Review of Literature: The knee joint is a complex synovial hinge joint formed by the femur, tibia, fibula, and patella, stabilized by the cruciate and collateral ligaments and supported by surrounding musculature. The patellofemoral articulation plays a crucial role in knee biomechanics by increasing the quadriceps lever arm and protecting the anterior joint surface.

The menisci improve load transmission and joint congruity, while the ACL and PCL provide anteroposterior stability. The knee receives blood supply mainly from the genicular branches of the popliteal artery and is innervated by branches of the femoral, saphenous, tibial, obturator, and common peroneal nerves.

Articular cartilage lacks neural supply; therefore, pain in osteoarthritis is believed to arise from richly innervated structures such as the synovium, retinacula, periosteum, and infrapatellar fat pad. Histological studies have demonstrated the presence of substance-P nociceptive fibers in peripatellar tissues, forming the theoretical basis for patellar denervation. Previous studies comparing patellar resurfacing versus retention in TKA have reported mixed outcomes. Keblish et al. and Calvisi et al. found comparable functional results between groups. Meta-analyses by Fu et al. and Pavlou et al. showed reduced reoperation with resurfacing but no consistent reduction in anterior knee pain. Van Jonbergen et al. (2011, 2014) reported significantly lower AKP with circumpatellar electrocautery without resurfacing. Altay et al. and Baliga et al. also demonstrated improved functional scores following denervation. Conversely, Gupta et al. and Sadigursky et al. reported no significant pain advantage, though some functional benefits were noted.

Overall, current literature suggests that circumpatellar electrocautery is safe and may reduce anterior knee pain, but results remain heterogeneous. Further randomized controlled studies with adequate follow-up are required to clarify its true clinical value.

Aims & Objectives

Aim: To evaluate the effect of intraoperative patellar denervation by electrocautery on postoperative anterior knee pain and functional outcomes in patients undergoing total knee arthroplasty for osteoarthritis.

Objectives: To assess the impact of patellar denervation on postoperative anterior knee pain using VAS To evaluate functional outcome using the Insall Knee Score (KSS), To assess patellofemoral function using the Patellar Score, to compare postoperative range of motion between intervention and control groups, to determine the overall clinical benefit of circumpatellar electrocautery in primary TKA.

Materials & Methods

Study Design and Setting: A prospective randomized comparative study was conducted in the Department of Orthopaedics, BGS Global Hospital Bangalore, from July 2019 to May 2021.

Study Population: Seventy patients aged 45–80 years with advanced primary osteoarthritis of the knee undergoing primary TKA were included. Patients were randomized into:Group 1: Circumpatellar electrocautery (n=35), Group 2: Control (no electrocautery) (n=35).

Inclusion Criteria: Age 45–80 years, Advanced primary knee OA, Unilateral or bilateral TKA candidates, Willing to participate.

Exclusion Criteria: Infection, Rheumatoid arthritis, Long-term steroid use, Refusal of consent.

Preoperative Assessment: All patients underwent - Detailed history and clinical examination, VAS pain score, Insall Knee Scor, ePatellar Score, ROM measurement using goniometer, Routine laboratory investigations.

Surgical Technique: All procedures were performed using a standard medial parapatellar approach under spinal/combined anesthesia. After femoral and tibial preparation and trialing. Osteophytes were removed in all cases, Patellar tracking assessed, Lateral release performed if required, Cemented components (Zimmer NexGen / PFC Sigma) used. In the intervention group, circumpatellar electrocautery was performed using monopolar diathermy at 50 W within 1 cm of the patellar rim.

Figure 1:

Figure 2:

Postoperative Protocol: IV cefuroxime prophylaxis, DVT prophylaxis, Early mobilization with full weight bearing, Standard physiotherapy.

Follow-up Schedule: Assessments were performed at:2 weeks, 1 month, 3 months, 6 months, 12 months.

Statistical Analysis: Data were analyzed using SPSS v22. Continuous variables were expressed as mean ± SD. Repeated-measures ANOVA was used. $p < 0.05$ was considered statistically significant.

Results

A total of 70 patients were equally distributed between the electrocautery and control groups. The mean age was 66.11 ± 7.52 years, with female predominance in both groups.

Pain Outcomes (VAS): Preoperative VAS scores were comparable between groups (~7.2). Postoperatively, both groups showed progressive improvement; however, the electrocautery group demonstrated significantly lower pain scores at all follow-ups. At 12 months, mean VAS was 0.03 in the intervention group versus 0.49 in controls ($p < 0.001$), indicating superior pain relief.

Functional Outcome (KSS): Baseline KSS was similar (~27). Postoperative improvement was observed in both groups, but the electrocautery group consistently showed higher scores. At one year: Electrocautery: 94.63,

Control: 89.74($p < 0.001$). This indicates better overall knee function with denervation. Patellar Score: Patellar scores improved significantly more in the intervention group. At 12 months: Electrocautery: 27.23, Control: 22.26($p < 0.001$). This suggests improved patellofemoral function following denervation. Range of Motion: ROM improved markedly in both groups post-TKA. Although the electrocautery group showed slightly higher mean ROM (114° vs 108° at 12 months), the difference was not statistically significant ($p > 0.05$).

Summary of Findings

Significant reduction in anterior knee pain, Significant improvement in functional scores, better patellar outcomes, No significant ROM difference. Overall, circumpatellar electrocautery demonstrated meaningful clinical benefit.

Discussion & Summary

This randomized comparative study evaluated the effectiveness of intraoperative patellar denervation by electrocautery in patients undergoing total knee arthroplasty for osteoarthritis. The findings demonstrate that circumpatellar electrocautery significantly reduces postoperative anterior knee pain and improves functional outcomes without adversely affecting range of motion.

The demographic profile of the present study, with a mean age of approximately 66 years and female predominance, is consistent with the known epidemiology of knee osteoarthritis and comparable to previous studies such as Gupta et al. and Baliga et al. Both groups showed substantial postoperative improvement, reflecting the overall success of TKA as a procedure.However, patients who underwent electrocautery exhibited significantly lower VAS pain scores at all follow-

up intervals. These findings are in agreement with Altay et al. and Van Jonbergen et al., who reported reduced anterior knee pain following circumpatellar denervation. The likely mechanism is ablation of substance-P containing nociceptive fibers in the peripatellar soft tissues. Functional outcomes measured using the Insall Knee Score and Patellar Score were also significantly superior in the intervention group. This supports the hypothesis that reduction in anterior knee pain translates into improved functional performance and patient satisfaction. Similar improvements have been reported in several randomized trials, although some studies such as Gupta et al. and Sadigursky et al. failed to demonstrate significant pain differences, highlighting ongoing controversy. Range of motion improved substantially in both groups after TKA but did not differ significantly between them. This suggests that while electrocautery enhances pain and functional outcomes, it does not independently influence postoperative knee mobility. Comparable findings were reported by Yim et al. The strengths of this study include its randomized design, standardized surgical technique, and one-year follow-up. Limitations include relatively small sample size and short-term follow-up, which may not capture late patellofemoral complications. Overall, the present study adds to the growing body of evidence supporting circumpatellar electrocautery as a simple, safe, and potentially beneficial adjunct in primary TKA.

Conclusion

Circumpatellar patellar denervation using electrocautery during total knee arthroplasty significantly reduces postoperative anterior knee pain and improves functional and patellar scores compared with standard TKA alone. The technique is simple, safe, cost-effective, and does not adversely affect range of motion. Although early outcomes are promising, the lack of significant improvement in knee mobility and variability in previous literature indicate the need for larger, multicenter studies with long-term follow-up before routine universal adoption can be recommended.

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