Perioperative Outcomes Between Cryoneurolysis Needle Configurations in Total Knee Arthroplasty

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INTRODUCTION: Effective pain management following total knee arthroplasty (TKA) is essential for optimizing recovery and reducing opioid reliance. Cryoneurolysis, which provides temporary analgesia through targeted sensory nerve ablation, is delivered using two needle configurations: a 3-short-needle (3SN) system and a single-long-needle (LN) system (Figure 1). This study aimed to compare perioperative outcomes of LN and 3SN cryoneurolysis against a control group (CG) without cryoneurolysis, hypothesizing that LN would provide superior pain control.

METHODS: A retrospective 1:1:1 matched cohort of 318 patients (106 per group) was analyzed. All procedures were performed by a single fellowship-trained arthroplasty surgeon between June 2018 and September 2024. Matching was based on sex and preoperative opioid use, with age (±5 years) and BMI (±5 kg/m²) permitted limited variation. Demographic and perioperative variables were collected from electronic medical records. Primary outcomes were length of stay (LOS) and postoperative opioid use (MME). Group comparisons were performed using one-way ANOVA, with post hoc Tukey's tests for pairwise analysis.

RESULTS: The female-to-male ratio was 78:28 across all groups, with five patients per cohort using opioids preoperatively. Mean ages were 70.5 years (LN), 69.4 years (3SN), and 69.3 years (CG) (p=0.39). Mean BMIs were 31.7 (LN), 31.1 (3SN), and 31.3 (CG) (p=.79). The LN group had the shortest LOS (1.19 days) compared with 1.88 days (3SN) and 1.94 days (CG) (p<.005), with Tukey's tests confirming significance between LN and both 3SN and CG. The LN group also had significantly lower opioid consumption (29.8 MME) compared with 159.9 (3SN) and 140.0 (CG) (p<.005). No significant differences were observed between 3SN and CG for either outcome.

DISCUSSION: LN cryoneurolysis demonstrated superior perioperative outcomes compared with both 3SN and CG, with meaningful reductions in LOS and opioid consumption. These findings suggest that needle configuration plays an important role in the effectiveness of cryoneurolysis. Limitations include the retrospective design and single-surgeon cohort, which may limit generalizability.

SIGNIFICANCE/CLINICAL RELEVANCE: LN cryoneurolysis may provide more effective perioperative pain control and reduce opioid requirements following TKA, representing a practical strategy for enhanced recovery and improved patient outcomes.

IMAGES:
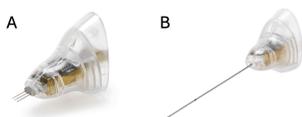
Figure *1.* Two cryoneurolysis needle configurations. (A) 3-short needle system. (B) Single-long needle system.