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Continuous Erector Spinae Plane Blocks to Treat Pain Following PCNL: A Randomized, Triple-Masked, Placebo-Controlled Trial

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Introduction

Percutaneous nephrolithotomy (PCNL) causes significant postoperative pain. Single-injection erector spinae plane block (ESPB) improves analgesia and decreases opioid requirements; however duration of analgesia is usually shorter than moderate to severe pain associated with PCNL. Although continuous ESPB has been studied versus systemic opioids or alternative blocks, adding continuous to single-injection ESPB remains unexamined. We performed a randomized, triple-masked, placebo-controlled trial hypothesizing that adding continuous ESPB would decrease pain and opioid consumption following PCNL.

Materials and Methods

This triple-masked, placebo-controlled trial was approved by the University of California San Diego Institutional Review Board and registered at ClinicalTrials.gov (NCT05121168). Written informed consent was obtained from all participants. Adults ≥18 years undergoing ambulatory unilateral PCNL were enrolled and underwent preoperative ultrasound-guided perineural catheter insertion at the ipsilateral 8th transverse process. Following saline injection to confirm placement, bupivacaine 0.25% with epinephrine (20 mL) was administered via catheter. Participants were then randomized to receive postoperative infusion of ACTIVE (bupivacaine 0.25%) or PLACEBO (normal saline) via portable pump delivering 21 mL automatic intermittent boluses every 4 hours (300 mL reservoir for approximately 57 h). Dual primary outcomes were average daily pain scores (Numeric Rating Scale 0-10) and cumulative opioid consumption during postoperative days 0-2, analyzed using Mann-Whitney test with gatekeeping procedure controlling familywise error at 5%.

Results/Case Report

50 participants were enrolled with successful catheter insertion in all. Groups were well-balanced with no covariate adjustments required. During the first 2 postoperative days, median [interquartile range] average daily pain (Numeric Rating Scale) for ACTIVE (n=25) was 3.5 [2.0, 4.5] versus 3.0 [1.3, 4.5] for PLACEBO (n=25; 95% CI difference -1.0 to 1.5; p=0.538). Cumulative oxycodone consumption was 10 [0, 25] mg for ACTIVE versus 15 [0, 30] mg for PLACEBO (95% CI difference -15 to 5; p=0.358). Maximum daily pain was 7.0 [4.3, 8.0] for ACTIVE versus 6.5 [5.5, 8.0] for PLACEBO (p=0.754). Sleep disturbances

the second night were 0 [0, 1] for both groups (p=0.423). Pain interference with physical and emotional functioning (Brief Pain Inventory) the day after surgery was 10 [0, 33] for ACTIVE versus 8 [23, 48] for PLACEBO (p=0.587). Time to first opioid use was 16 [13, 20] hours for ACTIVE versus 18 [13, 21] hours for PLACEBO (p=0.642). Eight (32%) ACTIVE participants avoided opioids entirely versus 11 (44%) PLACEBO participants (p=0.567). One participant per group required readmission for pain. No inadvertent catheter dislodgments occurred.

Discussion

We did not identify any benefits of adding a continuous ESPB to a single-injection ESPB following PCNL.

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