The Effect of Epinephrine-Infused Irrigation Fluid on Visual Clarity in Arthroscopic Shoulder Surgery: A Meta-Analysis

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INTRODUCTION: In shoulder arthroscopy, clear visualization is essential for safe and efficient procedures, yet intraoperative bleeding frequently compromises the surgical field. Several randomized studies have demonstrated that using epinephrine to the irrigation fluid significantly reduces bleeding and enhances visual clarity. Early research, supported by more recent trials, indicates that epinephrine improves the surgeon's view without incurring notable cardiovascular risks. This meta-analysis integrates findings from various studies to critically assess the overall efficacy and safety of epinephrine in improving intraoperative visualization during arthroscopic shoulder surgery.

METHODS: A systematic literature search was performed in PubMed, Scopus, the Cochrane Library, and Google Scholar for studies published up to April 12, 2025. We included randomized controlled trials and comparative observational studies evaluating the effect of epinephrine added to irrigation fluid during shoulder arthroscopy in adults. Six studies meeting the inclusion criteria were analyzed. Key outcome measures included surgeon-rated visual clarity (scored on a 1-to-10 scale), the need for increased pump pressure (used to enhance joint distention and visualization, where lower values indicate better outcomes), operative time, the total volume of irrigation fluid used, and mean arterial pressure.

RESULTS: Epinephrine use was associated with significantly improved surgeon-reported visual clarity, with a mean difference of 2.32 (95% CI: 0.32 to 4.32; $p = 0.02$) compared with procedures performed without epinephrine. Moreover, the epinephrine group demonstrated a lower likelihood of requiring an increase in pump pressure, reflected by a risk ratio of 0.50 (95% CI: 0.29 to 0.88; $p = 0.02$). Although operative time was reduced by an average of 4.38 minutes (95% CI: −10.41 to 1.64; $p = 0.15$) and the total volume of irrigation fluid used was decreased by 0.83 liters (95% CI: −2.04 to 0.37; $p = 0.18$) in the epinephrine group, these differences did not reach statistical significance. Additionally, there was no significant difference in mean arterial pressure between the two groups ($p > 0.05$).

DISCUSSION AND CONCLUSION: In the studies reviewed, epinephrine in irrigation fluid during arthroscopic shoulder surgery significantly increases visual clarity. Based on surgical and patient-specific factors, this should be taken into consideration for arthroscopic shoulder procedures.