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Influence of Assistant Experience on the Learning Curve of Reverse Shoulder Arthroplasty: A Comparative Analysis of Three Surgeons

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Introduction and Background

Reverse shoulder arthroplasty (RSA) is increasingly used for cuff tear arthropathy, irreparable rotator cuff tears, and advanced osteoarthritis. Despite improvements in implant design and surgical planning systems, RSA remains technically demanding, particularly during early learning. While previous studies focused on operative time as a learning indicator, the influence of prior assistant experience—especially exposure to mature operative technique—on surgical proficiency has not been fully clarified.

Material and Method

This retrospective comparative learning curve analysis evaluated the first 100 RSA cases performed independently by Surgeon A and Surgeon B and the first 50 RSA cases performed by Surgeon C. Surgeon A began independent surgery with minimal assistant experience during RSA introduction. Surgeon B assisted approximately 100 RSA procedures before operating independently, whereas Surgeon C assisted approximately 100 procedures after technique standardization. Operative time, intraoperative blood loss, and early postoperative complications (<30 days) were collected. Learning progression was assessed using cumulative summation (CUSUM) analysis for operative time and LOESS smoothing and segmented boxplots for blood loss.

Results

All surgeons demonstrated progressive improvement in operative performance. Surgeon A and Surgeon B showed steep initial learning slopes followed by stabilization on CUSUM curves, whereas Surgeon C achieved an earlier plateau. Blood loss trends demonstrated gradual reduction and delayed stabilization relative to operative time, suggesting independent learning domains for workflow efficiency and hemostasis. Surgeon C also demonstrated reduced variability in blood loss earlier than the other surgeons. Early postoperative complications occurred more frequently during initial cases and decreased with accumulated experience.

Conclusions

Assistant experience, particularly when gained during exposure to refined and standardized technique, appears to accelerate RSA proficiency acquisition. Incorporating structured assistant participation and staged surgical autonomy may support safer and more efficient RSA learning.

