Conjoint Tendon Lengthening Results in Improved Internal Rotation and Pain Following Reverse Shoulder Arthroplasty: A Combined Randomized Clinical Trial and biomechanical study

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Introduction

Although reverse shoulder arthroplasty (RSA) reliably restores active forward elevation of the shoulder, internal rotation is often unsatisfactorily restored or even lost after RSA. This limited internal rotation is one of the independent factors that negatively affects patients' subjective rating of the procedure [ ]. The purpose of this study was to investigate how intraoperative lengthening of the conjoint tendon would affect the shoulder range of motion, especially the internal rotation, pain, and complication profile following RSA through a randomized clinical trial. We hypothesized that patients receiving conjoint tendon lengthening would have significantly improved internal rotation compared to patients receiving no such lengthening with no negative impact on the pain scores or complication profile. A separate cadaveric study was performed in parallel to prove biomechanically the concept of such lengthening.

Material & Methods

Patients undergoing primary RSA for osteoarthritis, cuff tear arthropathy, or massive rotator cuff tear were prospectively enrolled and randomized into two groups (Lengthening vs. Control group). All RSAs were performed by a single shoulder surgeon using an inlay reverse system through the deltopectoral approach The Lengthening group received a Z-lengthening of the conjoint tendon, which led to approximately a 3-cm tendon lengthening. Range of motion including active internal rotation, VAS pain scores, and complication profiles were compared between the two groups at minimum 6-month follow-up. In a separate cadaveric study, RSA was performed using the same inlay system through the deltopectoral approach in 6 shoulder specimens. The tension of the conjoint tendon (Nm), and shoulder extension and internal rotation angles were measured before and after conjoint tendon lengthening in each specimen.

Results

For the clinical trial part, a total of 55 patients (27 in the Lengthening and 28 in the Control group) were enrolled for a complete data analysis. The mean age was 72 years, and there were 30 female patients. There were no significant differences in age, sex, BMI, diagnosis, and duration of follow-up between the 2 groups. At a minimum of 6 months follow-up, the Lengthening group showed a significantly higher mean internal rotation level than the Control group (2.04 vs. 0.86, $p < 0.001$). The mean pain score was significantly lower in the Lengthening group than in the Control group (0.12 vs. 1.14, $p = 0.002$). There were no significant differences in active forward elevation or active external rotation between the two groups. The Lengthening group showed no complications including instability, infection, or neurologic deficit, while the Control group had one patient with persistent pain and one with subjective instability feeling. For the biomechanical study part, the specimens showed a significantly decreased mean conjoint tendon tension ($p=0.025$), and significantly increased mean extension and internal rotation angles ($p<0.001$ and 0.001, respectively) after conjoint tendon lengthening compared to before conjoint tendon lengthening.

Discussion

This combined clinical and laboratory study demonstrated that conjoint tendon lengthening is a safe and effective intraoperative measure that can potentially improve internal rotation following RSA without compromising the prosthesis stability or impairing neurologic or functional outcomes.