1 **Is premorbid scapulohumeral rhythm restored with Anatomic or Reverse Shoulder**
2 **Arthroplasty for cuff-intact osteoarthritis? An in-vivo Dynamic Radiography Study**

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Introduction

Anatomic total shoulder arthroplasty (aTSA) and reverse shoulder arthroplasty (RSA) are both treatment options for advanced glenohumeral osteoarthritis with an intact rotator cuff, however decision making is controversial, especially among younger active patients. Restoring native shoulder kinematics may be an important consideration for implant longevity and ultimate shoulder function, but *in-vivo* assessment and comparisons has been historically difficult. The purpose of this study was to compare scapulohumeral rhythm (SHR) between aTSA and RSA when performed for patients with cuff-intact osteoarthritis and compare these with preoperative values and normal controls. We hypothesized that TSA would restore SHR to values more typical of a normal shoulder than RSA and demonstrate a more significant improvement compared to preoperative values.

Material and Methods

This study included 71 shoulders that underwent arthroplasty for cuff-intact osteoarthritis, aTSA (n=28) and RSA (n=43), who had dynamic digital radiography (DDR) performed more than 6 months postoperatively and compared these to 32 normal controls. SHR was calculated at rest, 30°, 60°, 90°, and 120° of humerothoracic abduction. A paired subgroup analysis was performed on 14 aTSA and 14 RSA shoulders with both pre- and postoperative DDR. Data was compared using descriptive statistics, and inter-rater reliability of the manual measurements was assessed with intra-class correlations.

Results

The aTSA cohort had a similar median rest-120° SHR of 2.00 compared to 1.95 for the RSA cohort (p=0.948), but both were lower than normal controls with a SHR of 2.38 (p<0.001). Subgroup analyses of the aTSA and RSA cohorts show significant improvements in preoperative to postoperative median rest-120° SHR from 1.36 to 2.10 (p=0.0002) and 1.34 to 2.04 (p=0.002) respectively. The inter-rater reliability was 0.99.

Conclusions

Patients who underwent aTSA and RSA for rotator cuff-intact glenohumeral osteoarthritis are associated with lower SHRs than normal asymptomatic patients, however SHRs significantly improved from preoperative levels. There was no difference between postoperative SHRs for RSA and aTSA. aTSA and RSA both partially restore coordination between the glenohumeral and scapulothoracic joints although not to the extent of normal healthy shoulders.
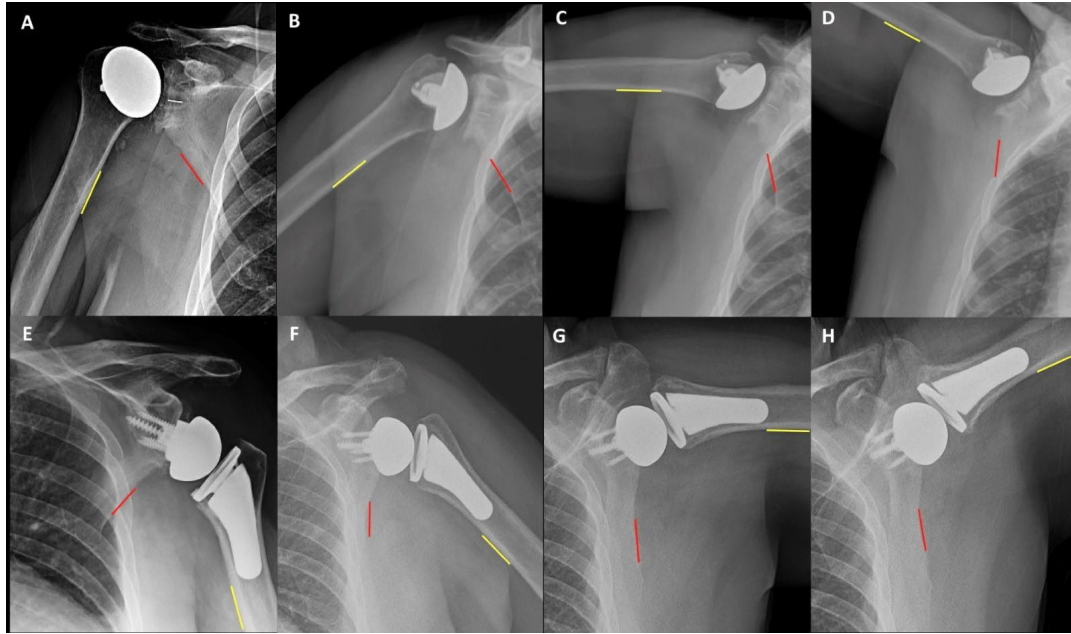
Figure 1: Radiographs showing humerothoracic abduction in a patient with aTSA (top row) and RSA (bottom row) at rest (A, E), 45° abduction (B, F), 90° abduction (C, G), and 120° abduction (D, H). TSA: anatomic total shoulder arthroplasty; RSA: reverse shoulder arthroplasty. Red line represents lateral border of the scapula, yellow line represents medial border of humerus.
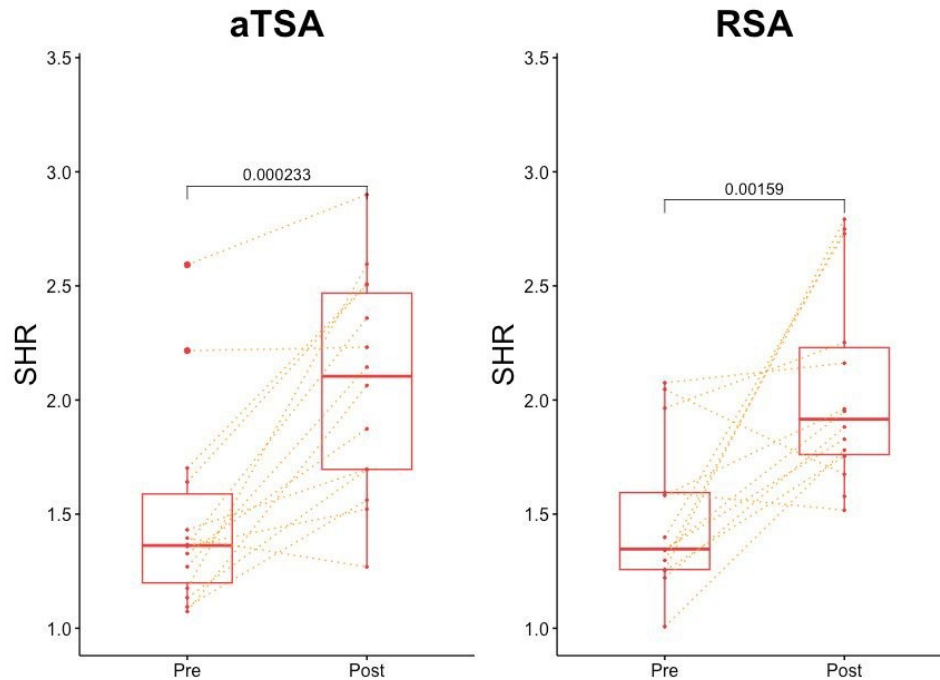

Figure 2: Subgroup analysis comparing changes pre- and postoperative rest–120° SHR for aTSA (n=14) and RSA (n=14) cohorts. Yellow dotted lines track individual patients change in SHR following surgical intervention.