SCAPULOHUMERAL RHYTHM OF REVERSE SHOULDER ARTHROPLASTIES DURING WEIGHTED AND UNWEIGHTED SHOULDER ABDUCTION

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INTRODUCTION

Reverse total shoulder arthroplasty (RTSA) is increasingly utilized to restore shoulder function in patients with osteoarthritis and rotator cuff deficiency [1]. There is currently little known about shoulder function after RTSA or if differences in surgical technique or implant design affect shoulder performance. The purpose of this study was to quantify scapulohumeral rhythm in patients with RSA during loaded and unloaded shoulder abduction.

METHODS

Seventeen patients with RTSA performed shoulder abduction (elevation and lowering) with and without a handheld 3kg weight during fluoroscopic imaging. Three RTSA designs were included (Figure 1). We used model-image registration techniques to determine the 3D position and orientation of the implants. Cubic curves were fit to the humeral elevation as a function of the scapular elevation over the entire motion. The slope of this curve was used to determine the scapulohumeral rhythm (SHR) [2]. Two-way repeated-measures ANOVA was used to compare groups. Tukey’s Honestly Significant Difference was used to perform pair-wise post-hoc comparisons. The level of significance for ANOVA was chosen to be 0.05.

RESULTS AND DISCUSSION

For abduction above 40°, shoulders with RTSA exhibited an average SHR of 1.2:1. There was no significant difference in SHR between shoulder abduction with and without 3kg handheld weights (1.6±0.2 unweighted Figure 1 and 3), nor was there a significant difference between elevation and lowering. SHR was highly variable for abduction less than 40°, with SHR ranging from a low of 1 to greater than 10. Differences in implant groups can be seen in figure 3. The lateral group has a significantly lower SHR than the medial group of RTSA shoulders.

CONCLUSIONS

At arm elevation angles less than 40°, SHR in RSA shoulders is highly variable and the mean SHR (2-5) with RTSA appears higher than SHR in normal shoulders (2-3) (Figure 2). At higher elevation angles, SHR in shoulders with RTSA (1.5-1.8) is much more consistent and appears lower than SHR in normal shoulders (2-4) (Figure 2). Ongoing analysis of reverse shoulder function with larger cohort sizes will allow us to refine our observations and determine if there are differences in shoulder function due to implant design, preoperative condition and rehabilitation protocols. These insights may lead to improvements in implant design, preoperative planning and rehabilitative strategies for RTSA surgery.
Figure 2: SHR for Lateral, Medial and Normal groups. SHR is found to be lower in RTSA groups than in Normal group.

REFERENCES

