Impact of Age on Shoulder Range of Motion and Strength

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INTRODUCTION: Total shoulder arthroplasty (TSA) is a surgical technique commonly used to treat patients with arthritis and a deficiency of the rotator cuff. Its purpose is to reduce pain and improve shoulder function, namely range of motion (ROM) and strength. While shoulder ROM and strength have been studied extensively in patients with various shoulder pathologies, there is a dearth of knowledge with regards to the asymptomatic population. The purpose of this study is to determine normal shoulder ROM and strength in asymptomatic patients of varying ages.

METHODS: A cross-sectional study was conducted in the outpatient orthopaedic clinic following Institutional Review Board approval. Patients 18 years of age and older with at least one asymptomatic and healthy shoulder with no prior history of shoulder surgery, injury, or pain were enrolled in the study. Demographic information, ROM, and strength measurements were collected for 256 shoulders, evenly stratified into groups by age and sex. A goniometer was used to measure forward elevation, abduction, and external rotation, and a handheld dynamometer was utilized for measuring strength. Statistical evaluation was conducted using Pearson correlations, ANOVA, and Bonferroni and Mann Whitney post hoc tests, with $p<0.01$ indicating a significant difference.

RESULTS: Abduction strength ($p<0.001$), external rotation strength ($p<0.001$), and internal rotation strength ($p<0.001$) were negatively correlated with age when viewing the data as a whole and after stratification of males and females. Age and shoulder ROM, namely abduction ($p<0.001$) and forward elevation ($p<0.001$), were also significantly negatively correlated, although internal rotation decreased with age as well. When comparing across age groups, abduction, forward elevation, abduction strength, and internal rotation strength varied significantly. Abduction ($p=0.001$) and forward elevation ($p=0.001$) were significantly higher in group 1 (18-35) when compared to group 4 (66+), but external rotation wasn't significantly different between these groups. External rotation ($p=0.001$) was only significantly different between groups 2 (36-50) and 4. Variation in external rotation strength was also found. Group 4 was found to have significantly less strength than all 3 of the other groups.

DISCUSSION AND CONCLUSION: Shoulder strength significantly decreased with age, with abduction strength and external rotation strength displaying the strongest negative correlations. Decreases in strength were most prominent in patients 66 years of age and above. Shoulder ROM was not as tightly correlated with age, although abduction, forward elevation, and internal rotation were found to generally decrease over time. Differences in external rotation were not clinically significant. These correlations provide useful controls for patients of various ages regarding their clinical outcomes when presenting with shoulder pathology. This is helpful to determine postoperative outcomes and expectations based on patients' ages.