Longitudinal analysis of scapular kinematics in rotator cuff syndrome

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Summary

Rotator cuff syndrome (RCS) is the most common shoulder musculoskeletal disorder. This study explored scapular kinematic changes over time in the presence of RCS. Sixty participants with chronic shoulder pain were tracked over a year. Results showed decreased upward rotation and increased anterior tilt, suggesting time-related changes could contribute to ongoing pain and injury. Longer-term studies are recommended due to small difference magnitudes. Age and sex also influenced kinematics, aligning with previous research. Untreated scapular kinematics could hinder RCS recovery and prolong injury.

Introduction

In Canada, 11% of individuals are expected to experience chronic shoulder pain at any time [1]. RCS is the most common source of chronic shoulder pain. Certain scapular kinematic alterations (reduced upward rotation, increased internal rotation, increased anterior tilt) are associated with RCS and may contribute to its long-term nature [2]. Recent cross-sectional research has identified a potential relationship between shoulder biomechanics and duration of rotator cuff injury, but true longitudinal data are needed. Therefore, the objective of this study was to explore scapular kinematic changes over time in an RCS population. It was hypothesized that scapular kinematics would regress to more "harmful" movement patterns over time.

Methods

Sixty participants (39 female) with chronic shoulder pain lasting for at least three months and confirmed with impingement-related provocation tests were included. In two sessions (baseline and 1 year later), torso and upper limb motion were tracked with a passive optical motion capture system during an overhead reach (OR) (performed unilaterally with each arm) and overhead lift (OL) (performed bilaterally). Scapular orientations (internal rotation, upward rotation, tilt) at 30° increments of humeral elevation were extracted during the upwards portion of the movements for all shoulders with pain. Mixed methods ANOVAs ($p<.05$) assessed the influence of session, age, and sex on scapular kinematics. Age was categorized as "younger" (<35) and older (>= 35) for this analysis.

Results and Discussion

Preliminary main effects results are presented in this abstract. Between sessions, upward rotation decreased during the OL ($p = .03$, max difference -3.2°) and anterior tilt increased in both tasks (Figure 1). Males demonstrated increased upward rotation in both tasks compared to females ($p = .014$, max difference +7.4°). Finally, internal rotation was increased in the older group across all humeral elevation levels of both tasks ($p = .019$, max difference +5.4°).

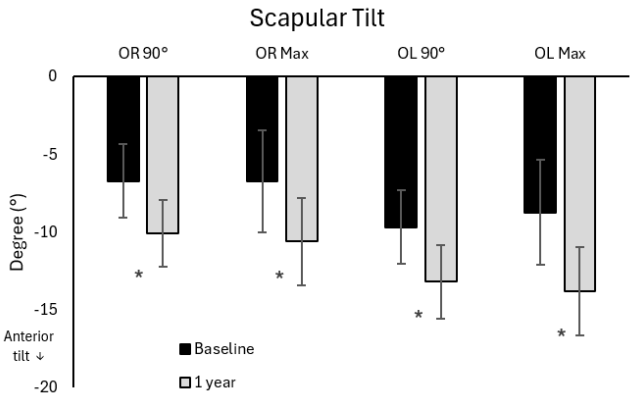

Figure 1: Scapular anterior tilt at 90° and maximum humeral elevation during the overhead reach (OR) and overhead lift (OL). *denotes statistical significance ($p<.05$)

The primary hypothesis was supported; decreased upward rotation and increased anterior tilt were present at the 1-year session, suggesting that kinematic changes over time could contribute to continued pain and injury. However, it should be noted that the average changes were small (~3-5°). A change of this magnitude is within error bounds for the procedures [3] and should be interpreted with caution. Further measurements over a longer period may elucidate larger differences along this trend. Sex and age both influenced kinematics, consistent with previous research [4]. Further analyses are ongoing to examine the interaction of time and participant characteristics.

Conclusions

Scapular kinematics displayed small but potentially harmful changes over time in a sample of individuals with RCS. If left untreated, scapular kinematics could prevent recovery from RCS and contribute to long-term injury, but future analyses will further explore this relationship.

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References

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