

Scapular dyskinesia and the effects on scapular kinematics and muscle activity in patients with rotator cuff disease: a pilot study

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Background: The Scapular Dyskinesia Test (SDT) has been validated with kinematics to visually distinguish obvious scapular dyskinesia (DYSK) from normal motion in overhead athletes only.

Purpose: Describe scapular kinematic and muscle activation in subjects with rotator cuff disease (RCD) and obvious DYSK.

Design and Setting: Prospective cross-sectional laboratory pilot study.

Subjects: Subjects with RCD (n=11); 5 with obvious DYSK and 6 without obvious DYSK (Non-DYSK) as identified by the SDT during 5 repetitions of weighted shoulder flexion.

Methods: Subjects performed 5 repetitions of active weighted shoulder flexion, while muscle activity and kinematics were recorded. Surface electromyographic (sEMG) recorded muscle activity from the upper(UT), middle(MT), lower(LT) trapezius and serratus anterior(SA). Electromagnetic sensors simultaneously tracked 3-dimensional motion of the trunk, scapula and humerus. Variables were calculated for humeral elevation, scapular upward rotation(UR), scapular posterior tilt(PT), and scapular internal rotation(IR), clavicle elevation(CE) and clavicular protraction(CP). Independent variables were group (DYSK, Non-DYSK) and arm angle (0–30°, 31–60°, 61–90°, 91–120° and 120°–max). Mean and standard deviation of sEMG and kinematics per group and arm angle were calculated. Differences >2° for kinematics and >10% for sEMG variables were considered meaningful differences between DYSK and non-DYSK for this pilot study.

Results: DYSK group had less UR (difference >2°) in all phases of arm elevation, and greater UR during arm lowering at 90°, 60° and 30°. DYSK had less IR (difference >2°) at 30° and 60° and greater IR in maximum elevation. DYSK had less PT(difference >2°) at 60° and 90° and greater PT at maximum elevation in both ascending and lowering. DYSK had more CE at 90° arm elevation and at 90°, 60°, and 30° of arm lowering. Simultaneously, UT had >10% greater sEMG at 90° elevation, but after 90° there was less activity (difference>10%). SA had >10% increased sEMG at 60° during elevation and lowering, but less at 120° elevation and during lowering at 120° and 90° (differences>10%). MT had >10% sEMG at 30° and 60° during arm elevation and lowering. LT had >10% increased activity at 90° arm elevation and 90°, 60° and 30° of lowering.

Conclusions: In this preliminary study altered scapular kinematics are somewhat similar to the prior validation study of overhead athletes with obvious DYSK. Patients with DYSK have altered clavicular elevation, scapular UR and scapular PT in a pattern that has been theorized to cause RCD. Muscle activation patterns seen in DYSK may be in an attempt to reduce/correct these scapular motion abnormalities.

Clinical Relevance: In patients with DYSK, exercises should focus on deactivating the UT and facilitating the activity of LT, MT and SA during shoulder flexion, which may serve to reduce DYSK.