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Effects of scapular upward rotation exercises on alignment of scapula and clavicle and strength of scapular upward rotators in subjects with scapular downward rotation syndrome

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ABSTRACT

The purpose of this study was to investigate the effects of a 6-week scapular upward rotation exercise (SURE) on scapular and clavicular alignment and scapular upward rotators strength in subjects with scapular downward rotation syndrome (SDRS). Seventeen volunteer subjects with SDRS were recruited from university populations. The alignment of the scapula and clavicle was measured using radiographic analysis and compared in subjects before and after a 6-week self-SURE program. A hand-held dynamometer was used to measure the strength of the scapular upward rotators. The subjects were instructed how to perform the self-SURE program at home. The 6-week self-SURE program was divided into two sections (the first section with non-resistive SURE during weeks 1–3, and the second section with resistive SURE using thera-band during weeks 4–6). The significance of the difference between pre- and post-program was assessed using a paired *t*-test, with the level of statistical significance set at $p < 0.05$. Significant differences between pre- and post-program were found for scapular and clavicular alignment ($p < 0.05$). Additionally, the comparison between pre- and post-program measurements of the strength of the scapular upward rotators showed significant differences ($p < 0.05$). The results of this study showed that a 6-week self-SURE program is effective for improving scapular and clavicular alignment and increasing the strength of scapular upward rotator muscles in subjects with SDRS.

1. Introduction

Ideal scapular alignment is described as the vertebral border parallel to the spine and positioned 3 in. from the midline of the thorax (Sobush et al., 1996). The scapula is normally positioned between the spinous process of the second and seventh thoracic vertebrae and rotated 30° anterior to the frontal plane (Kendall et al., 2005; Magee, 1997; Sahrmann, 2002; Hoppenfeld, 1976). Alteration in normal scapular alignment affects muscle balance, sacpulo-humeral rhythm during arm movements, neck-shoulder pain, stability of glenohumeral joint (Azevedo et al., 2008; Kibler and Sciascia, 2010; Reinold et al., 2009).

The alignment of scapula is important for optimal functioning of the shoulder joint (Kibler and Sciascia, 2010). Additionally, When the inferior border of the scapula is more medial than the superior border, the scapula is considered to be in SDR; the shoulder is lower and slopes downward at the acromial end (Caldwell et al., 2007). Changes in alignment of the scapula and clavicle can potentially influence the biomechanics of the shoulder region by altering tension at the cervicoscapular muscle (increased upper trapezius muscle length, and levator scapula stiffness), which may lead to insufficient scapular upward rotation, instability of the glenohumeral joint, thoracic outlet syndrome during arm elevation, and prolonged compressive loading of the cervical spine (Sahrmann, 2002; Caldwell et al., 2007; Szeto et al., 2002). The clavicle is the sole bony structure connecting the trunk to the shoulder girdle via the sternoclavicular joint medially and the acromioclavicular joint laterally (Ljunggren, 1979). Although ideal alignment of clavicle has not been defined, alignment of clavicle can be used as an indicator to determine the scapula alignment.

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