INTRODUCTION

Control of the scapular rotator muscles is important for efficient movement of the upper limb (Kibler, 1998). Because latent myofascial trigger points (LTrPs) are common (Simons et al. 1999) and many daily activities involve repetitive scapular plane elevation, the purpose of this study was to establish whether their presence affects the timing of activation of fatigued shoulder girdle muscles.

METHODS

Forty-two pain-free adult subjects with functionally normal shoulder girdles were assessed for the presence (n=28) or absence (n=14) of LTrPs in the scapular rotator muscles. The latter acted as a control group. Surface electromyography (SEMG) was used to measure time of activation of five muscles of the dominant arm including the upper and lower trapezius and serratus anterior (upward scapular rotator muscles), the infraspinatus (rotator cuff representative) and the middle deltoid (prime mover), during elevation in the scapular plane. A custom built microswitch allowed the time of muscle activation to be normalised to the time at the start of the movement.

Fatigue was induced by asking subjects to continuously elevate the arms in time with a metronome (80°/sec) while holding hand-weights (females 1.5kg, males 3.5kg) until they could no longer maintain the cadence. After 2 seconds rest to obtain a baseline signal, three trials of scapular plane elevation were performed without weights. Of the 28 LTrP subjects, 14 received a treatment known to remove LTrPs (myofascial dry needling) and 14 received placebo treatment (sham ultrasound). All LTrP subjects then repeated the SEMG evaluation in a fatigued state. The time between the completion of the fatigue bout and its repetition was approximately 30 minutes.

RESULTS

Repeated measures ANOVA revealed a number of significant differences (p<0.05) in the muscle activation pattern between groups. Where LTrPs existed, the infraspinatus muscle was activated significantly earlier in the movement. After dry needling, subjects displayed a post-fatigue activation pattern that was not significantly different to that found for the non LTrP group prior to fatigue. There were also differences in the variability of muscle activation times between the LTrP subjects pre and post dry needling for the upper trapezius, serratus anterior and lower trapezius as depicted in Figure 1.

DISCUSSION AND CONCLUSIONS

Chabran and colleagues (2002) suggested that co-activation of muscles occurs as a coping strategy during fatigue. Prior to fatigue being induced, control group subjects displayed a relatively stable, reproducible and sequential order of muscle activation. After fatigue, although the sequence of muscle activation remained the same, there was an increase in co-contraction of muscles and all muscles were activated within a shorter time period.

The presence of LTrPs in the scapular rotator muscles affects the recruitment pattern of fatigued shoulder girdle muscles both in the timing of activation and the variability and instability of the recruitment pattern. McQuade and co-workers (1995) found kinematic differences in scapulohumeral rhythm when local muscles had been fatigued through repetitive arm elevation exercises. These authors suggested the changes that occurred post-fatigue could lead to a reduced space under the acromion in which the humeral head could rotate without impinging subacromial structures. In the current study, the delayed activation of the upper trapezius
in LTrP subjects may cause a delayed or reduced acromial elevation that could contribute to the same outcome.

Removing LTrPs changes the order of muscle recruitment to a more sequential, stable pattern that is not significantly different to that displayed by the control group prior to fatiguing exercise. This suggests that removing LTrPs may allow subjects to better cope with the effects of fatigue, as evidenced by the reduced variability in activation times and the reduced co-activation of the muscles investigated.

REFERENCES