

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/318926023>

The effects of latent myofascial trigger points in the scapular rotator muscles on the temporal sequence of muscle recruitment during loaded scapular plane elevation.

Conference Paper · July 2001

CITATIONS

0

READS

76

3 authors:



Karen R Lucas

La Trobe University

9 PUBLICATIONS 484 CITATIONS

SEE PROFILE



Barbara Polus

RMIT University

53 PUBLICATIONS 1,274 CITATIONS

SEE PROFILE



Peter Adrian Rich

RMIT University

60 PUBLICATIONS 603 CITATIONS

SEE PROFILE

The effects of latent myofascial trigger points (LTrPs) in the scapular rotator muscles on the temporal sequence of muscle recruitment during loaded scapular plane elevation

KR Lucas^{*}, BI Polus PhD^{*}, PA Rich PhD[†]

^{*}Department of Complementary Medicine, RMIT University

[†]School of Medical Sciences, RMIT University

Introduction

It has been suggested that chronic shoulder pain is associated with altered timing in the onset of muscle activity of the scapular rotator muscles (Wadsworth and Bullock-Saxton, 1997). It is also understood that the scapula relies upon the appropriate action of the scapular rotator muscle group, which acts to dynamically stabilise the scapula and the glenoid during elevation of the arm, to perform its role in force transfer from the trunk to the upper limb (Kibler, 1998). However, it is not known whether a pain-free muscle dysfunction, such as latent myofascial trigger points (LTrPs), in the scapular rotator muscles affects the timing of scapular muscle activation during elevation in the scapular plane or subsequently, what effect this has on the timing of activation of muscles more distal in the kinetic chain of the upper limb.

Methods

After gaining approval from the University Human Research Ethics Committee, 42 pain-free subjects who volunteered from the University environment were assessed for joint and muscle dysfunction of the upper back, neck and shoulders. In cases where this assessment revealed functionally 'normal' shoulder girdles, subjects were examined for LTrPs in the scapular rotator muscles (all parts of the trapezius and rhomboids, the serratus anterior, levator scapulae and pectoralis minor, which can rotate the scapula in the sagittal plane), using the examination procedure outlined by Lucas et al. (2000).

Fourteen control subjects without LTrPs in the scapular rotator muscles (8 males, 6 females, mean age = 32.42 ± 9.39 years) were compared with 28 subjects (16 males, 12 females, mean age = 33.30 ± 11.81 years) who had LTrPs in this muscle group. Surface electromyography (SEMG) was used to measure time of onset of muscle activity of five muscles of the dominant arm. The upper and lower trapezius and serratus anterior represented upward scapular rotator muscles, the infraspinatus was selected as a representative of the rotator cuff muscle group and the middle deltoid as a prime mover, during loaded elevation in the scapular plane.

Bipolar Ag/AgCl electrodes were positioned according to Cram and Kasman (1998). The raw SEMG signal from each muscle was recorded using an eight channel data recording system (Powerlab, ADInstruments, NSW, Australia). The SEMG signal was amplified, filtered (high pass=10Hz, low pass=500Hz) and then rectified and smoothed using a root mean square (RMS) calculation. The sampling speed was 2000 samples per second.

Recordings were carried out according to the procedures reported by Wadsworth and Bullock-Saxton (1997), except that elevation of the arms in the scapular plane was performed without allowing the subject to externally rotate at the end of the range. This restricted subjects to approximately 160° of elevation and was assumed to constrain the role of the infraspinatus to glenohumeral stability. Hand-held weights were chosen to represent a load that may be incurred through activities of daily living (males=3kg, females=1.2kg).

Subjects practised the velocity of movement (40°/sec) with a metronome. This was then followed by three experimental trials of the movement with a four second rest between trials.



Figure 1: Performing loaded elevation of the arm in the scapular plane. Note the lateral aspect of the hand-weight remains in contact with the movement guide to prevent external rotation at the shoulder.

Of the 28 LTrP subjects, 14 received treatment known to remove LTrPs (myofascial dry needling) and 14 received placebo treatment (sham ultrasound) so that the LTrPs remained. All LTrP subjects then repeated the SEMG evaluation. The time at muscle activity onset was related to the time at which the forearm left the thigh (movement start), as measured with a custom-built microswitch.

Results and Discussion

T tests were used to identify significant differences ($P < 0.05$) in the time onset of muscle activity (msecs) between groups for each muscle. F ratios were used to identify significant differences ($P < 0.05$) in the variability in the time of onset of muscle activity between groups for each muscle. These results are displayed in table 1 below.

Group Comparisons	Sig diff ($p < 0.05$) in time at onset	Sig diff ($p < 0.05$) in variability in time at onset
Control V's LTrP	UT, INF, SA, LT	UT, INF, MD, SA
LTrP pre treatment V's LTrP post treatment	UT, INF, SA, LT	UT, INF, MD
Control V's LTrP post treatment	No differences	SA

Table 1: significant differences ($p < 0.05$) between groups in the time at the onset of muscle activity and also significant differences ($p < 0.05$) in the variability in the time at the onset of muscle activity. UT=upper trapezius, INF=infraspinatus, MD=middle deltoid, SA=serratus anterior, LT=lower trapezius.

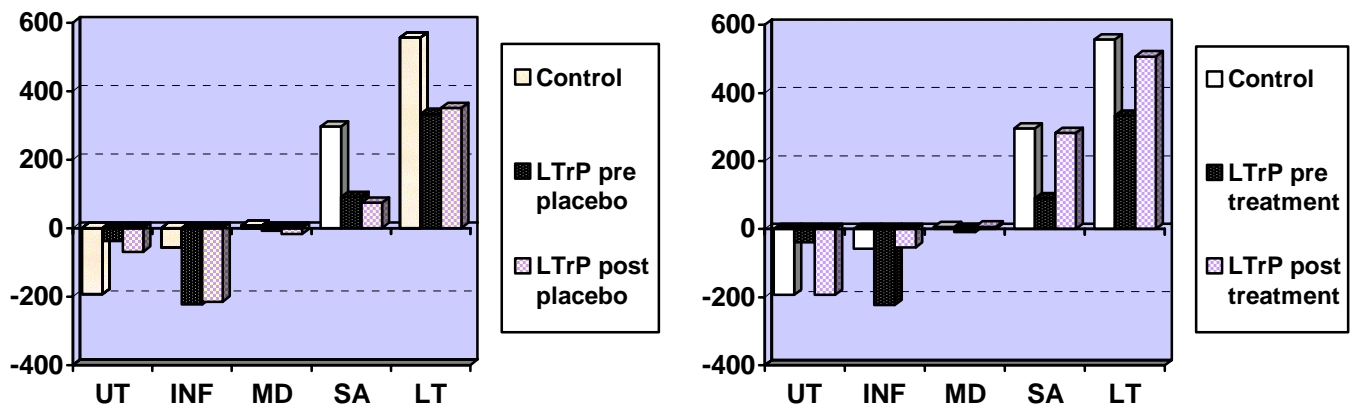


Figure 2: Time at the onset of muscle activity (msecs) comparing control subjects to LTrP subjects pre and post placebo treatment (left) and pre and post true treatment (LTrPs removed) (right). Muscle abbreviations as in table 1. Time zero = movement start.

For the control group, in all trials, the order of muscle recruitment was the same. In contrast, the only consistency in the LTrP subjects was that in 95.24% of trials, the infraspinatus was the first muscle activated. Subjects with LTrPs had significantly ($P < 0.05$) more variability in the timing of muscle recruitment for each individual muscle than that of the control group in all muscles except the lower trapezius. After the LTrPs were removed, only the serratus anterior remained more variable in the timing of activity onset than the same muscle in the control subjects. There were significant differences ($P < 0.05$) between time at onset of muscle activity for all muscles except the middle deltoid between control subjects and LTrP subjects. This result was replicated between the pre and post-treatment values of the LTrP subjects that had their LTrPs removed. There was no difference in time of onset between the LTrP group that received placebo treatment on the pre and post-treatment values.

These data suggest that there is a different temporal sequence of muscle activation employed to elevate the arm in the scapular plane under load when LTrPs are present in the scapular rotator muscles as compared to when they are not present. Removal of the LTrPs is associated with a change in the temporal sequence of muscle activation to a pattern that more closely resembles that of the control group.

References

- Cram JR and Kasman GS *Introduction to Surface Electromyography*, 237-378, Aspen Publishers, 1998.
 Kibler WB *Med Sci Sports Ex* **30**(4), 79-85, 1998.
 Lucas et al *Proceedings of the 3rd Meeting of the International Shoulder Group*, 2000.
 Wadsworth DJ and Bullock-Saxton JE *Int J Sports Med* **18**, 618-622, 1997.

Acknowledgements

Australian Spinal Research Foundation (ASRF) for providing financial support for equipment and consumables associated with this study.
 International Society of Biomechanics (ISB) for a Student Congress Travel Grant for assistance with travel costs associated with attendance at the ISB Congress 2001.

