

SCAPULAR MUSCLE RECRUITMENT AND ISOKINETIC FORCE PRODUCTION IN INDIVIDUALS WITH IMPINGEMENT SYNDROME

Geraldo F. S. Moraes, Luci F. Teixeira-Salmela, Christina D.C.M. Faria, Gustavo N.T. Ferreira
 Department of Physical Therapy/ Universidade Federal de Minas Gerais, Brazil e-mail: geraldmoraes@terra.com.br

INTRODUCTION

Dynamic neuromuscular imbalance of scapulohumeral rhythm has been related to the onset of the impingement syndrome and other related pathologies [1-2].

The aim of this study was to investigate muscular imbalance of the rotator cuff and scapular muscle recruitment in 10 individuals with impingement syndrome graded I and II compared to 10 asymptomatic subjects.

METHODS

Recruitment patterns and latencies were determined by the electromyographic activity of the scapular stabilizer muscles (trapezius and serratus anterior) during shoulder elevation in the scapular plane. Isokinetic measures of muscular performance were determined by the antagonist/agonist work ratios of the medial (MR) and lateral rotators (LR) obtained with the dynamometer Biodex at speeds of 60 and 180°/s in the supine position. Descriptive statistics and tests for normality (Shapiro-Wilk) were performed for all outcome variables. ANOVA (2x2) was used to investigate side and group differences, as well as interactions, with a significance level of $\alpha < 0.05$.

RESULTS AND DISCUSSION

No group or side differences were found for the recruitment patterns. Supporting previous studies, the activation sequence involved first, the superior trapezius, followed by serratus anterior, middle, and inferior trapezius [1-2]. However, as illustrated in Figure 1, subjects on the impact group showed significantly higher latencies for all scapular muscles ($F = 27.18 - 50.13$; $p < 0.001$). In addition, a group-by-side interaction was found, indicating that the differences were significant only for the affected side ($F = 18.75 - 37.39$; $p < 0.001$).

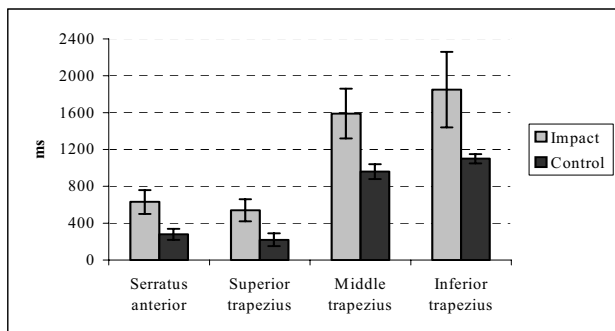


Figure 1: Means (± SD) of latencies (ms) for the impingement (affected side) and control groups

No significant group or side differences were found for the muscular performance measures (Figure 2), which are opposite to the findings reported by Leroux et al. [3], in which the measurements were taken in the seated position. Ng and Lam [4] also reported significant differences for the antagonist/agonist work ratios of athletes obtained in the supine position.

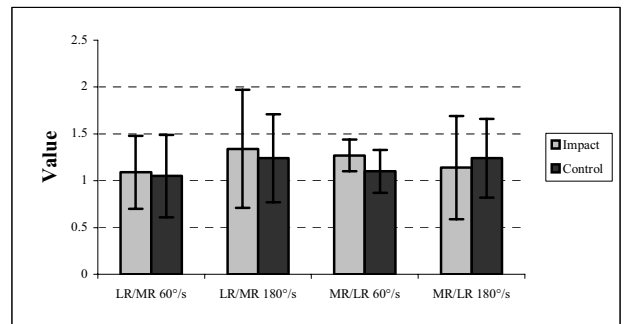


Figure 2: Means (± SD) of isokinetic ratios for both groups

CONCLUSIONS

Individuals with impingement syndrome presented significant delays for the recruitment of scapular muscles, indicating alterations of dynamic neuromuscular balance. Therefore, assessment of performance of the scapular stabilizer muscles appears to be more important for the detection of functional deficits in individuals with impingement syndrome, to better guide therapeutic interventions.

Isokinetic performance of shoulder rotators was not affected by the presence of impingement. Subject positioning during the isokinetic assessment may have provided a mechanical advantage for the rotator muscle actions and explain the lack of significant differences between groups for the muscle performance measures. These findings suggest that when performing shoulder isokinetic assessment, subject positioning should be controlled.

REFERENCES

1. Cools AM et al. Scapular muscle recruitment pattern: Electromyographic response of the trapezius muscle to sudden shoulder movement before and after a fatiguing exercise. *J Orthop Sports Phys Ther* **32**, 221-229, 2002.
2. Cools AM et al. Scapular muscle recruitment patterns: Trapezius muscle latency with and without impingement symptoms. *Am J Sports Med* **31**, 542-549, 2003.
3. Leroux J et al. Isokinetic evaluation of rotational strength in normal shoulders and shoulders with impingement syndrome. *Clin Orthop* **304**, 108-115, 1994.
4. Ng GYF & Lam PCW. A study of in men who play badminton. *J Orthop Sports Phys Ther* **32**, 399-404, 2002.