

Évaluation des effets potentiellement délétères d'exercices de l'épaule en fonction des pathologies rencontrées

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Background

Shoulder strength training exercises represent a major component of rehabilitation protocols designed for conservative or post-surgical management of shoulder pathologies. Numerous methods are described for exercising each shoulder muscle or muscle group. Limited information is available to assess potential deleterious effects of individual methods in respect to specific shoulder pathologies.

Objectives

To use a patient specific 3D motion capture system for evaluation of a set of shoulder strength training exercises regarding glenohumeral, labral and subacromial compression as well as elongation of individual rotator cuff muscles.

Methods

One healthy right-handed male volunteer (28 years old, 180 cm, 80 kg) participated to the study. The outcome of interest was the impact of a set of common shoulder rehabilitation exercises on articular cartilages and labrum compression, subacromial space height, and rotator cuff elongation. After 3D reconstruction, a kinematic evaluation according to a previously validated protocol was used.

Results

According to the type of strengthening exercise, important variations in glenoid cartilage and labrum compression, subacromial space height and tendons elongation were observed, as indicated by the calculated P -values below the significance level at $P > 0.05$. Glenoid cartilage compression varied up to 1.98 mm and labral compression up to 1.80 mm, with maximal average penetration depths obtained during the strengthening of middle/inferior trapezius, deltoid, supraspinatus, infraspinatus and teres minor. Exercises performed with TheraBand™ had the lowest impact on cartilages compression, whereas exercises executed with the body weight induced the greatest penetration depths. Contacts were all located between the antero- and postero-superior sectors of the glenoid. Minimal subacromial height ranged between 0.15 mm to 3.60 mm in average for targeted muscles exercises according to the training technique used. Least favorable target muscles training with respect to subacromial space height

were serratus, biceps brachii, pectoralis major and supraspinatus. Overhead strength training resulted in significant decrease ($P = 0.001$) of subacromial space height.

Conclusion

To our knowledge, this study represents the first screening of shoulder strengthening exercises to identify potential deleterious effects on the shoulder joint. Motion capture allows for reliable assessment of glenohumeral, labral and subacromial compression as well as tendon muscle elongation during shoulder strength training exercises. Data may be used to design rehabilitation protocols specific to shoulder pathological states.