NON OPERATIVE TREATMENTS IN PATIENTS WITH MASSIVE IRREPARABLE ROTATOR CUFF TEAR: COMPARISON BETWEEN TWO REHABILITATION PROTOCOLS. PROSPECTIVE, RANDOMIZED AND CONTROLLED STUDY

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Objective: The purpose of this prospective, randomized, blinded trial was to compare two shoulder rehabilitation protocols in patients with massive irreparable rotator cuff tear. One group was treated using anterior deltoid muscle rehabilitation and strengthening program, and the other using conventional exercises with elastic bands. Materials and Methods:Thirty selected voluntary patients with diagnosis of massive irreparable rotator cuff tear were included in this study. Group 1 (n = 15) was instructed in exercises of anterior deltoid muscle; group 2 (n = 15) was instructed in conventional exercises using elastic bands. Both groups were supervised by physical therapists three times a week during three months. The Constant score and visual analogue scale of patient satisfaction were recorded before and after the treatment. The final follow up was performed by a blinded observer. Results: The mean age was 76.9 years (range 68-88). The follow up was 19 months (range 6-28). The Constant score improved from mean 37 points (ST = 11) to mean 50 points (ST = 11). VAS satisfaction improved from mean 3.6 (ST = 1.3) to 5.3 (ST = 1.5) (P < 0.05, T test). Analysis between group differences showed better results in Constant score and VAS satisfaction in group 1 than in group 2. The Constant score difference between pre and post treatment in group 1 was mean 17 (ST = 10) whereas in group 2 was mean 7 (ST = 4) (P < 0.005 T-test). VAS satisfaction difference pre and post treatment was 2.6 (ST = 1.6) in group 1 and mean 0.8 (ST = 0.1) (P < 0.05, T test) in group 2. Conclusion: Both rehabilitation programs showed significant improvements in Constant score and VAS satisfaction. This study showed better outcomes using anterior deltoid muscle rehabilitation and strengthening program than conventional exercises with elastic bands in patients with massive irreparable rotator cuff tear.

AN EVIDENCED BASED, CLINICAL ALGORITHM FOR REHABILITATION FOLLOWING ROTATOR CUFF REPAIR

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Introduction: The post-operative management of patients following rotator cuff repair (RCR) is inexact, controversial, and often dictated by the surgeon. Surgical advances allow many rotator cuff tears, even large tears, to be repaired arthroscopically. Theoretically, less invasive repairs allow for earlier mobilization, but recent evidence suggests that for some, delayed rehabilitation is more appropriate. The decision to delay rehabilitation is just one of many during the post-operative course, and an evidenced based algorithm is necessary to guide the rehabilitation of patients after RCR. Purpose: An algorithm for the rehabilitation of patients following RCR will be presented. Different tracts for early and delayed rehabilitation will be described, but the authors acknowledge this decision is primarily based upon surgeon philosophy and intra-operative findings. Therefore, the primary purpose of this presentation will be to analyze the major rehabilitation decisions which therapists make routinely - selection and timing of specific interventions. The best available evidence from the basic science, orthopedic, and rehabilitation literature serves as the basis for this clinical algorithm.

Specifics: Specifically, this algorithm deconstructs the decision-making surrounding two critical aspects of the rehabilitation process: A clinical decision tree will be presented for the choice of range of motion activities utilized during the early post-operative period. Passive, active, and active assisted motions will be considered. In addition, the algorithm will address the prescription, dosing, and timing of resistive exercises for both early and delayed rehabilitation cases. Summary: An algorithm for the post-operative management of patients following RCR will be presented. Utilizing the best available evidence, the algorithm deconstructs the art of practice of physical therapy. Inexperienced clinicians can draw on the finished product of the algorithm as a guide. Veteran therapists will benefit from a critical analysis of the algorithm as it validates or challenges their own clinical practice.

THE EFFECT OF REHABILITATION ON SHORT TERM OUTCOME FOLLOWING ROTATOR CUFF REPAIR: A COMPARISON OF A STANDARD VERSUS DELAYED PROTOCOL

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Introduction: Studies in a rat model of rotator cuff injury and repair have shown that immobilization following repair improved the mechanical properties of the repaired insertion site. However, immobilization also increased shoulder stiffness transiently. Therefore, controversy exists regarding the early post-operative rehabilitation following rotator cuff repair. Early range of motion is advocated by those who believe it promotes healing and prevents stiffness; while others contend that delayed motion is ideal given the improved healing rates in the rat model. There is limited evidence comparing these protocols in a patient population. The purpose of this report is to compare the short-term effect of 2 rehabilitation protocols on range of motion, strength, pain, and function in patients following rotator cuff repair. Materials and Methods: The standard rehab group (n = 22, mean age = 54.5) began PROM 1 week after surgery. The delayed rehab group (n = 15, mean age = 62.4) began PROM an average of 4.5 weeks post-op. Both groups were compared regarding two critical aspects of the rehabilitation process: PROM and ROM, strength, and Penn Shoulder Score (PSS). Results: PROM and ROM were equal for both groups. There were no significant differences between groups for number of visits, PROM score, strength, and PSS at 3 months. There were differences in PROM & IR, AROM FE, ER, & IR. Conclusion: Delaying the start of PROM does not seem to have an adversarial effect on PROM FE, strength, or function. It also appears that this delay serves to also shift regaining ROM and strength to a later time-frame. Clinicians can use this information to make clinical decisions regarding rehabilitation following rotator cuff repair. Future studies will focus on comparing the long term outcome of both groups.
ROTATOR CUFF TEARS AND FUNCTIONAL SCORES

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Aim: To examine the effect of cuff tears on functional scores (Constant & Oxford) in a symptomatic population. Method: We retrospectively examined the functional scores of consecutive patients with subacromial pain, who had failed conservative treatment, before they underwent surgery. We used the operation records to identify cuff integrity (no tear, partial tear or full-thickness tear) and excluded patients with any pathology other than rotator cuff disease. We performed a test for trend on cuff status using multiple regression to adjust for age, sex and dominance. Results: The study groups (Constant n=368, Oxford n=64) were demographically identical to our data base cohort of nearly 600 patients. We found no significant effect on functional score from the size of cuff tear. Conclusion: The depth of a cuff tear may not be the significant factor in symptom production or functional deficits.

ACUTE CUFF TEARS - ARE THERE PROGNOSTIC INDICATORS TO IDENTIFY WHICH WILL GO ON TO BE COPERS AND WHICH WILL REQUIRE SURGICAL INTERVENTION?

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Introduction: There are no standardised guidelines to assist the clinician’s judgement as to whether a patient requires operative or non operative management of an acute cuff tear. Prompt surgery has been suggested as delay has been shown to affect outcome. Other authors have supported varying periods of conservative therapy and to offer surgery where this has failed. Further research is required to inform this debate. Methods: A retrospective review of all patients assessed in an Acute Shoulder Screening service by physiotherapists between Oct 2004 and Oct 2009, was conducted. Patients with cuff pathology were identified and from these 5 subjective variables and 5 objective variables were chosen. These include patient demographics, mechanism of injury range, strength and lag tests. Statistical analysis was used to determine if any showed a significant correlation with a positive scan result for a full thickness tear and then if there was any correlation with either a non operative or operative outcome. Results: Of 1196 patient records 34 were labelled with a clinical impression of cuff signs/tear and were then scanned. Of those who went on to have surgery, a number of variables have been shown to correlate with both a positive scan result and with surgical outcome. Conclusion: An understanding of the subjective and objective variables which suggest the presence of a cuff tear and likely requirement for surgery can assist clinicians triaging acute injury. This review highlights which subjective and objective variables have a correlation to help direct further research into this field.

KEY OUTCOMES FOR SHOULDER PAIN, FROM THE PATIENT’S PERSPECTIVE

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The purpose of this study was to gain patients’ perspectives on what outcomes should be included in the self-assessment of shoulder pain. Background: The pooling of data in systematic reviews of clinical trials has been impeded because of the lack of agreement on what outcomes should be assessed for shoulder pain. Gaining the views of patients on their experiences, beliefs, expectations and perceptions may improve their response to an intervention. However, despite the existence of many self-assessment questionnaires, patients with shoulder pain are rarely asked what outcomes are important to them. Methods: A qualitative approach was used to explore experiences of shoulder pain and identify important outcomes, from the patient’s perspective. Purposive, maximum variation sampling was used. In-depth individual interviews were conducted with fifteen patients awaiting treatment for shoulder pain. Data were analysed using a four-stage analytical framework. Results: Patients articulated personally relevant, important outcomes, which they hoped would enable them to return to some sort of normality. Patients expected to be symptom free, regain their former level of upper limb use, resume their usual activities, regain a sense of emotional well-being, resume their former family relationships and social interactions and independently manage their own healthcare condition. Conclusions: This study identified, at first hand, the important outcomes which patients may use to judge the success of an intervention for shoulder pain. However it is not known how adequately existing patient reported measures reflect these important outcomes. Further work is therefore needed to compare the results of this study with the content of existing outcome measures. Such work may not only assist clinicians and researchers in the selection of outcomes, which are relevant to patients, in future clinical practice and research but also enable patients to participate in evaluating and improving the quality of their own future healthcare.

KEY OUTCOMES FOR SHOULDER PAIN: AN ICF-BASED COMPARISON OF THE OUTCOMES WHICH PATIENTS CONSIDER IMPORTANT AND THE CONTENT OF PATIENT REPORTED MEASURES

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This study determined the extent to which the outcomes patients with shoulder pain consider important are currently assessed in existing patient reported measures (PROMS), using the International Classification of Functioning, Disability and Health (ICF) as a reference tool.

Background: The pooling of data in systematic reviews of clinical trials has been impeded because of the lack of agreement on what outcomes should be assessed for shoulder pain. Clinically based measures of impairment may not capture all aspects of the impact of shoulder pain on an individual. Whilst PROMS evaluate different aspects of physical, emotional and social functioning and disability, it is not known to what extent the outcomes which patients consider important are reflected in existing measures. Methods: Qualitative interview data, from 15 patients with shoulder pain, on the outcomes which they considered important were linked to the relevant categories of the ICF. Twelve validated shoulder region-specific PROMS were identified through a systematic literature review. ICF-based patient data were compared with the ICF-based content of PROMS. Results: Only the Disability of Arm, Shoulder and Hand (DASH) reflected all the outcomes patients considered important. Of the remaining PROMS four evaluated over ½ of outcomes, five evaluated just over ¼ of outcomes and two evaluated less than ¼ of outcomes. Conclusions: Whilst individual PROMS assessed a wide range of different outcomes, only the DASH reflected all outcomes patients identified as important in qualitative interviews. Understanding the extent to which existing PROMS reflect the outcomes which are relevant to patients may help clinicians and clinical researchers when selecting a measure, for their different purposes. Further work however is needed to gain a consensus amongst clinicians and clinical researchers on a standardised assessment of outcome, across all subgroups of patients, for shoulder pain. This may facilitate the pooling of data in future meta-analyses.
ASSESSMENT OF SHOULDER ROTATION AND POSTERIOR CAPSULE TIGHTNESS IN PROFESSIONAL BASEBALL PLAYERS
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Introduction: Internal rotation (IR) range of motion losses and posterior capsule tightness have been documented in athletes with repeated, but different demands of overhead movements such as tennis, volleyball, baseball, and swimming. To our knowledge, this deficits has not been mentioned yet in basketball players. The aim of this study was to evaluate shoulder IR, external rotation (ER) and posterior capsule tightness in male and female adult Brazilian National Basketball team. Method: The sample was composed of 10 female (mean age 25.8 ± 4.1 years) and 9 male (mean age 25.1 ± 3.4 years) professional basketball players (n=19). Goniometric passive measurements were made with the athletes in supine and 90°-90° of shoulder abduction and maximum passive range of motion of the posterior capsule were made using the standardized protocol. Differences between groups were analyzed using the ANOVA, and correlation analysis used Pearson’s correlation coefficient with a p-value of <0.05. Results: There were no significant differences between male and female athletes or rotations when comparing dominant and non-dominant shoulder. No statistically significant differences were observed in posterior capsule tightness, and also there were no correlations between the range of motion and posterior capsule measurement. Conclusion: Changes in mobility of the glenohumeral joint in professional basketball athletes were not found in our sample. Basketball throwing is different than others sports that use predominantly shoulder in abduction and ER. Therefore, glenohumeral IR deficits should be questioned in the biomechanics of this sport.

GLENOHUMERAL RANGE OF ROTATIONAL MOVEMENT, GIRD AND POSTERIOR CAPSULAR TIGHTNESS IN COMPETITIVE WATER POLO PLAYERS: RELATIONSHIPS AND PRACTICE EFFECTS
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Introduction: Alterations in glenohumeral joint (GHJ) range of rotational movement (RRM) and glenohumeral internal rotation deficit (GIRD) are theorised to be linked with posterior capsular tightness (PCT). Collectively they have been implicated in shoulder pain, particularly in sporting populations where repetitive overhead activities or high velocity throwing is involved. One sport which combines both of these shoulder activities is water polo. The aim of this study therefore was to investigate any relationship between GHJ RRM and PCT in competitive water polo players following exposure to a 1 hour water polo training session. The experimental group received one application of the Graston technique to the posterior shoulder between pre and post-training measurements. The control group did not receive any intervention. Results: There was no relationship found between PCT and GHJ RRM; p<0.05. Results: No relationship was found between PCT and GHJ RRM in the water polo players pre- and post 1 hour training session. Pearson’s correlation was used to examine any relationships, under each condition, between PCT and GHJ RRM: p<0.05. Results: No relationship was found.

THE INVESTIGATION OF SHOULDER STABILITY BETWEEN THE DOMINANT AND NON-DOMINANT ARMS IN HEALTHY BASEBALL PITCHERS
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Introduction: Shoulder neuromuscular control has been considered as an essential element for injury prevention despite of the expression of adaptive glenohumeral internal rotation deficit (GIRD) in baseball pitchers. This study compared shoulder stability of both arms using single arm lateral support test in healthy pitchers. Materials and Methods: 19 male asymptomatic baseball pitchers (Age: 19.4±1.8 years old, experience: 9.9±1.7 years, dominant arm: right 15; left 4) participated in this study. The range of motion (ER/IR) and stability (swing area and total length track of single-arm lateral support) of shoulder were assessed. Results: GIRD was found in all participants. A significant difference was found in swing area between the dominant (4.13±2.32 mm²) and non-dominant (8.61±6.58 mm²) arm (p<0.01). The horizontal (p=0.07) & vertical (p=0.62) deviations were found to be less in the dominant arm although the results did not reach significant level. Conclusion: The dominant arm demonstrated better shoulder stability than non-dominant arm in baseball pitchers. Clinical Relevance: Neuromuscular control might play an important role in preventing the development of symptom in pitchers with GIRD. Single arm lateral support test may be a simple tool that can be used to screen potential risk of shoulder injury for further rehabilitation programme.

THE GRASTON TECHNIQUE IS AN EFFECTIVE ACUTE TREATMENT FOR POSTERIOR SHOULDER TIGHTNESS
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Introduction: The deceleration phase of the throwing motion places a tremendous amount of force on the posterior shoulder often resulting in tightness and lost range of motion (ROM). This posterior shoulder tightness may present in the form of limited glenohumeral (GH) horizontal adduction and internal rotation ROM. Because this tightness has been associated with several shoulder and elbow pathologies, determining optimal interventions for alleviating such restrictions is critical. Although, instrument-assisted soft tissue mobilizations, such as the Graston technique, have proven effective for various disorders, no data are currently available that have examined the effects of this treatment on posterior shoulder tightness. Materials and Methods: A randomized, single-blinded, pre-test post-test design was used. Pre- and post-test GH horizontal adduction and internal rotation ROM were measured in the dominant arm of 35 collegiate baseball players (18 control and 17 experimental). The experimental group received one application of the Graston technique to the posterior shoulder between pre and post-test measurements. The control group did not receive any intervention between tests. Data were analyzed using a multivariate analysis of variance with repeated measures on time (P≤0.025). Results: Both GH horizontal adduction ROM (P=0.001; effect size=0.70) and GH internal rotation ROM (P=0.001; effect size=0.28) showed significant differences between groups. For GH horizontal adduction ROM the Graston group improved significantly more between tests (11.1°) than the control group (–0.12°). Similarly, for GH internal rotation ROM the Graston group improved significantly more between tests
(4.8 ± 1.04) than the control group (6.14 ± 1.14). Conclusion: The results of this study show that the Graston technique is an effective acute treatment for lengthening soft tissue restrictions of the posterior shoulder. Therefore, this instrument-assisted soft tissue mobilization technique should be considered a useful tool in the prevention and treatment of the various shoulder and elbow pathologies associated with posterior shoulder tightness.

**Glenohumeral Rotation Assessment in Brazilian National Handball Team Through Biophotogrammetry**
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Introduction: Glenohumeral internal rotation deficit has been associated with the development of secondary shoulder lesions in throwing athletes. Our aim was to assess external (ER) and internal (IR) shoulder rotations in athletes from the male juvenile and junior Brazilian National Handball teams. Materials and Methods: Twenty-one athletes participated in this study (18.85 ± 1.27 years, presenting 7.38 ± 2.01 years of sport training. For shoulder assessments, non-reflexive markers were placed on olecranon and styloid process of ulna. The examiner stabilized the scapula by applying mild pres- sure to its anterior aspect and rotated the shoulder to maximal point of rotation, when a photo was taken. These images were analyzed by a range of motion assessment tool (Computerized Biophotogrammetry) and quantified at a program [SAPo, v.0.67]. The statistical analysis used the Student t-test and the Pearson correlation coefficient (r), considering p < 0.05. Results: There were significant differences for ER, with the dominant shoulder presenting higher values (122.63 ± 8.92°) when compared to the non-dominant side (114.6 ± 12.09°, p = 0.001). For IR, athletes did not present significant decrease of range of motion between shoulders (68.27 ± 13.43° dominant versus 72.31 ± 12.12° non-dominant, p = 0.23). There were no significant correlations between age or practice time with range of motion. Conclusion: Although studies with throwing athletes demonstrate gains in ER with loss of IR in dominant shoulder, our study with juvenile and junior male Brazilian National Handball Teams found increased ER on the dominant shoulder, without significant loss of IR movement.

**The Role of Axial Rotation on Glenohumeral Motion and Subacromial Contact Pressure**
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Introduction: External rotation that occurs during shoulder elevation is believed to avoid impaction between the greater tuberosity and the coracoacromial arch and to obtain maximum motion. However, it is unclear whether concomitant axial rotation of humerus occurs during other shoulder motions and affects subacromial impingement and range of motion. The purpose of this study was to determine effect of axial rotation on subacromial contact pressure and range of motion. Methods: Nine fresh-frozen cadaveric shoulders were used. The shoulders were secured in an experimental device that allows 6 degree-of-freedom motion. Peak contact pressure on the coracoacromial arch and range of motion during passive elevations in the scapular (scoli) and sagittal (flexion) planes and horizontal adduction and abduction were measured. Each motion was performed in unconstrained and fixed axial rotation conditions. The axial rotation was fixed in neutral rotation at 0° of elevation. Results: During scoli, peak contact pressure in the fixed axial rotation condition (1.31 ± 0.82 MPa) significantly higher than that in the free axial rotation condition (0.52 ± 0.18 MPa) (p = 0.041). There was no significant difference between the two conditions in the other motions. In all shoulder motions, range of motion significantly decreased with fixed concomitant axial rotation. In the free axial rotation condition, external rotation occurred during all motions except horizontal abduction. Discussion: Lower peak contact pressure and larger range of motion in the free unconstrained axial rotation condition during scoli suggests that concomitant axial rotation is necessary to reduce the subacromial contact of the humeral head and to obtain maximum range of scoli. Although peak contact pressure did not change when constraining the axial rotation in the other motions, concomitant axial rotation appeared to be necessary to obtain maximum range of motion. Our findings suggest that concomitant axial rotation should be maintained or restored in treatment for shoulder disorders.

**Higher Torque Fluctuation of Shoulder Internal and External Rotation in Asymptomatic Overhead Athletes**
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Sensory-motor control is essential for functional joint stability and it is an important part of shoulder rehabilitation. Torque steadiness is a kind of integrated sensory-motor control evaluation. Asymptom- atic overhead athletes present proprioceptive and neuromuscular modifications, which may be related to sporting practice. So, it is important to recognize which alterations are related to sporting performance and which ones are related to shoulder injuries, in order to lead the treatment of this population. Methods: Three groups were evaluated: Athletes with Impinge- ment Symptoms (IS) [n = 21], Asymptomatic Athletes (n = 25) and a Control Group (n = 21), composed of subjects noninvolved in upper limb sports. Three maximal isometric contractions of 5-s duration were performed to determine the internal rotation peak torque (PT), with the dominant shoulder at 90° of shoulder abduction and 90° of external rotation, with the elbow at 90° of flexion. For assessment of the torque steadiness, 3 submaximal (35% PT) contractions were performed for 10-s each one. Visual feedback was provided. Standard deviation (SD) and coefficient of variation (CV) were measured from the submaximal trials. All variables (PT, SD and CV) were compared among the groups using the Kruskal-Wallis 1-way analysis of variance with an alpha level of 0.05. Post-hoc comparisons were made using Mann-Whitney tests, with the Bonferroni adjustment. Results: PT and CV were not different (P > 0.05) among the groups. Standard deviation was higher in Asymptomatic Athletes than Control Group (p = 0.006) while in Athletes with IS it was intermediate between the two others, with no statistical significance. Conclusion: Torque fluctuation was higher in overhead asymptomatic athletes, probably an adaptation due to the high activity of these muscles during throwing. Athletes with IS presented a trend to enhance the control of submaximal torque, which might be considered a compensatory mechanism to provide shoulder functional stability during throwing.

**Isolated Anterior Deltoid Palsy Following Shoulder Arthroplasty and Open Reduction Internal Fixation**
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Background/Purpose: The incidence of nerve injury during shoulder arthroplasty has been reported up to 4%. The brachial plexus or peripheral nerves can be traumatized during surgery resulting in palsy. Injury to the axillary nerve can result in palsy of all deltoid heads. The purpose of this case series is to discuss the occurrence of isolated anterior deltoid palsy following arthroplasty or surgery for proximal humeral fracture (PHF). Case Description: Four patients between the ages of 48-78 were treated in physical therapy...
post arthroplasty or open reduction and internal fixation (ORIF) for PHF. Surgical intervention required a deltopectoral approach in each case. Isolated paralysis of the anterior deltoid was identified between 6-8 weeks post surgery in all 4 patients. All patients demonstrated a significant lag between active and passive shoulder elevation. Careful isolated palpation of the anterior deltoid in elevation determined the clinical diagnosis of anterior deltoid palsy. Electrodiagnostic testing was only performed in one case. Outcomes: Three patients were followed-up between 7 and 18 months. Clinically demonstrated full return was found in 1 while 2 others demonstrated complete anterior deltoid denervation. Conclusion: Isolated palsy to the anterior branch of the axillary nerve may result following shoulder surgery requiring a deltopectoral incision. A possible cause may be sustained use of retractors to pull the deltoid laterally. Diagnosis is made clinically by careful palpation of the anterior deltoid. Follow-up electrodiagnostic testing is beneficial. To date this problem has not been discussed in the literature and although infrequent, isolated anterior deltoid palsy can significantly impair active elevation, delay recovery and result in a poor outcome.

DESCRIBING AND QUANTIFYING SCAPULOTHORACIC FUNCTION: ARE WE ALL ON THE SAME PAGE OR ARE WE EVEN READING THE SAME BOOK?

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Introduction: The importance of the scapulothoracic complex in shoulder dysfunction and management is widely accepted. Yet there is a lack of consensus as to how scapulothoracic position and movement are described and recorded in the clinical setting; potentially limiting effective communication and continuity of care. In order to develop a consensus approach to quantifying scapulothoracic position and movement, a review was undertaken in a systematic manner of the terminology and methods used in the scapulothoracic literature. Methods: Using key search terms on the databases of AMED (Allied and Complementary Medicine Database), British Nursing Index, EMBASE (Excerpta Medica Database) and Ovid MEDLINE, 1,760 abstracts from the period 2000 to the end of 2009 were identified. Review of these abstracts and cross referencing with citation tracking searches yielded 182 full papers which fulfilled the inclusion criteria. Results: Analysis of the papers revealed a diversity of approaches in the clinical literature relating to areas such as terminology, reference points and measurement tools. However there was greater homogeneity in the biomechanical and laboratory-based literature. The review provided evidence that there is little association between how scapulothoracic function is described and quantified from (i) a clinical perspective and (ii) a biomechanical / laboratory-based perspective.

This includes limited alliance between the approaches used in the clinical setting and what the biomechanical / laboratory-based literature indicates is of pathological relevance. Conclusion: Evidence is therefore provided of the need to develop a consensus approach for the describing and recording of scapulothoracic position and movement which can be used in the clinical setting, yet aligns with the biomechanical and laboratory-based literature. The Cardiff Interactive Shoulder Movement Alliance (CISMA) has been established as a web-based initiative to bring the shoulder community together in order to develop a unified approach to recording, quantifying and communicating scapulothoracic position and movement.

ALTERING NORMAL SCAPULAR POSITION IN HEALTHY SUBJECTS REDUCES SHOULDER STRENGTH

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Introduction: There is increasing evidence that supports the association between dyskinesis and both shoulder pain and instability. As strength testing is a fundamental part of shoulder assessment, strengthening has become an integral part of shoulder rehabilitation. Using healthy subjects, this study examined the influence of scapular protraction, retraction and posterior tilt, on isometric shoulder strength in the scapular plane. Methodology: In the scapular plane, 16 healthy volunteers (7 males, 9 females, mean age 35 years) conducted maximal isometric shoulder elevation strength tests in the positions of; self selected scapular neutral, maximal scapular protraction, maximal scapular retraction and posteriorly tilted scapula. A prospective, repeat measure, balanced test order was employed. A fixed dynamometer measured strength while simultaneously, electromagnetic sensors recorded and confirmed scapular sagittal excursion and angle of tilt. Using paired t tests, mean strengths in each position were compared to the self selected neutral position. Results: Recorded strengths were; protraction 5.3kg (SD 2.13), retraction 5.32kg (SD 2.55) and posteriorly tilted 5.01kg (SD 2.64). All three were statistically significantly weaker (p<0.001) than neutral 6.5kg (SD 2.66). These equated to strength losses of 18 to 23 percent. These losses were still significant (p<0.05), when data was split by gender. Conclusion: These results show that in this subject group, changing normal scapular position, results in reduced shoulder power. While this study does not propose to answer the question; does correcting dyskinesis improve shoulder pain or instability, it does contribute to that hypothesis.

RELATIONSHIP BETWEEN SCAPULAR POSITION AND SUBACROMIAL CONTACT BEHAVIOR: A CADAVERIC STUDY

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Introduction: Abnormal scapular position (decreases of scapular upper and external rotation and posterior tilt) is recognized to reduce the subacromial space. However, the actual effect of the scapular position on contact between the coracoacromial arch and humeral head is unclear. The purpose of this study was to determine the effect of scapular position on subacromial contact pressure. Methods: Ten fresh-frozen cadaveric shoulders were harvested to measure subacromial contact pressure using a custom-designed experimental device capable of 6 degree-of-freedom motion of the glenohumeral joint. A flexible tactile force sensor was set on the undersurface of the coracoacromial arch. A 3-dimensional electromagnetic tracking system was used to measure the angle of the glenohumeral joint. Peak contact pressure on the coracoacromial arch was measured during passive glenohumeral elevation in the scapular plane ranging from 0° to 75°. The decreases in scapular upper and external rotation and posterior tilt were simulated by tilting the scapula in 5° increments from normal position to 20°. The normal scapular position was defined based on previous kinematic studies. Results: Peak contact pressure decreased linearly with decreasing posterior tilt, and significant differences between normal scapular position (0.97 ± 0.88 MPa) and 20° decrease of posterior tilt (0.44 ± 0.18 MPa) was observed (p<0.05). However, in decreased external and upper rotation conditions, peak contact pressure did not change significantly. Discussion: Decrease of scapular posterior tilt causes relatively external rotation of the humerus in elevated arm position. This external rotation might avoid contact between the coracoacromial arch and greater
tuberosity. Decreases of scapular upper and external rotations did not appear to affect subacromial contact pressure. These findings suggest that the changes of the scapular position in the patient with subacromial impingement may not be “abnormal” but “compensatory” changes to reduce subacromial contact pressure.

SCAPULAR DYSKINESIS: EFFECTS OF SCAPULAR ASSISTANCE ON SUBACROMIAL SPACE

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Introduction: Scapular dysfunction is theorized to cause shoulder pain by decreasing the subacromial space (SAS). The scapular assistance test (SAT) is a clinical method used to identify scapular dyskinesis in patients with shoulder pain, performed by assisting the scapula in upward rotation (UR) and posterior tilt (PT), and is theorized to increase the SAS. The purpose was to compare the influence of the SAT on SAS and 3-dimensional scapular position and orientation between subjects with scapular dyskinesis (DYSK) and without (w/o DYSK). Methods and Materials: 40 healthy adults were classified, N=20 DYSK and N=20 w/o DYSK using a clinical exam demonstrated to be reliable and valid. The anterior outlet of the SAS was measured via the acromio-humeral distance (AHD) on ultrasound images captured with the arm at rest, 45°, and 90° of active scapular plane elevation with and without SAT. An electromagnetic motion analysis system was used to collect 3-dimensional scapular position in UR and PT with and without the SAT at each arm angle. Effects of SAT on AHD and 3D scapular position between subjects [DYSK and w/o DYSK] were compared using separate mixed-model ANOVAs for main effects of the SAT (w/SAT); without), presence of dyskinesis (DYSK; w/o DYSK), and interactions at each arm angle. Results: With active arm elevation, the SAT significantly increased AHD (mean increase 1.6-1.7mm; P<0.001) and scapular PT (mean increase 5.0-5.6; P<0.001) regardless of DYSK. The SAT induced greater UR in DYSK (mean increase 2.4-2.8°) at rest (P<0.016, 45° (P=0.016) and 90° (P=0.480) than w/o DYSK. Conclusions: Regardless of the presence of scapular dyskinesis, the SAT increases the linear dimension of the anterior SAS outlet and scapular PT in healthy individuals. The SAT induced greater scapular UR only in those with dyskinesis. The effect of SAT on SAS in patients with shoulder pain is unknown.

HOME BASED ISOLATED ECCENTRIC WRIST EXERCISE FOR TREATMENT OF CHRONIC LATERAL AND MEDIAL EPICONDYLITIS

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Objective: To assess the efficacy of home based eccentric wrist exercise added to standard treatment for chronic lateral and medial epicondylitis. Methods: Patients with chronic lateral epicondylitis were randomized into an eccentric group (6 men, 5 women; age 47±2 yr) or a standard treatment group (4 men, 6 women; age 51±4 yr). The Standard Treatment Group performed isometric wrist extensor strengthening and the Eccentric Group performed isolated eccentric wrist extensor strengthening, which involved twisting a rubber bar with concentric wrist flexion of the noninvolved arm and releasing the twist with eccentric wrist extension of the involved arm. DASH questionnaire, visual analog pain scale (VAS), tenderness, and wrist and middle finger extension strength were recorded at baseline and after the treatment period. For medial epicondylitis patients there was no control group. We currently have 6 patients enrolled. Results: Groups did not differ in duration of symptoms (Eccentric 6±2 mo vs. Standard 8±3 mo, P=7), physical therapy visits (9±2 vs. 10±2, P=81) or treatment duration (7±2: 8 wk vs. 7± 6 wk, P=69). Improvements in all dependent variables were greater for the Eccentric Group versus the Standard Treatment Group (percent improvement reported): DASH 76% vs. 12%, P=01; VAS 81% vs. 22%, P=002, tenderness 70% vs. 4%, P=003; strength (wrist + middle finger) 72% vs. 11%, P=032. The improvement regarding the medial epicondylitis patients was 83% for the DASH. Conclusions: All outcome measures for chronic lateral and medial epicondylitis patients were markedly improved with the addition of an eccentric wrist extensor exercise to standard physical therapy. This novel exercise, using an inexpensive rubber bar, provides a practical means of adding isolated eccentric training to the treatment of chronic lateral and medial epicondylitis patients.

UNRAVELLING COMPLEXITY: THE ROLE OF EXPANDED ASSESSMENT

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Introduction: Patients with atraumatic instability that is resistant to modern rehabilitation approaches present a challenge to therapists. Persistent pain has been shown to result in the reorganization of the primary sensory and motor cortices altering the representation of body schema and movement. Consequently perceptual and motor mechanisms based on these schema can become dysfunctional. Current evidence suggests that there are key sub-groups of patients with complex instability demonstrating deficiencies relating to normal motor development. These observations necessitate an assessment approach that can identify key deficits in the pain neuromatrix and explore motor development aspects to enable the development of effective treatment strategies. Materials and Methods: 42 patients, 34 females and 8 males, with a diagnosis of atraumatic instability (type III and type II/III) were entered into the study. Patients had an average of three episodes (2-6) of physotherapy comprising rotator cuff rehabilitation, scapula control exercises and movement pattern correction which had been unsuccessful in alleviating their symptoms. The average duration of symptomology was 4 years (range 2-7). A series of assessment tools were employed including two point discrimination, laterality recognition, modified clinical test of sensory integration and balance, angels in the snow and reciprocal imitations to assess deficits in the pain neuromatrix and motor development. Results: 15 patients demonstrated significant deficits in tests specific to the pain neuromatrix and 11 patients demonstrated deficits relating to motor development. 16 patients had measurable deficits attributable to both the pain neuromatrix and motor development. Conclusions: The expanded assessment tool enables therapists to identify key sub-groups of patients with complex instability. Identifying deficiencies relating to normal motor development and/or alterations in sensory and motor cortices organisation enables therapists to design rehabilitation approaches specific to sub groups. These findings help to elucidate why more traditional rehabilitation approaches fail in these patient groups.