

1st INTERNATIONAL CONGRESS OF SHOULDER THERAPISTS

May 2–5, 2004

Washington, DC, USA

1 AN EVALUATION OF PHYSIOTHERAPEUTIC REHABILITATION IN THE TREATMENT OF PATIENTS WITH MASSIVE ROTATOR CUFF TEARS

Ainsworth RL, Conboy V, Seymour R: Torbay Hospital, Torquay, England, UK

Objectives: This study examined the effectiveness of a physiotherapy regime for the treatment of patients with massive rotator cuff tears.

Methods: Patients identified through primary and secondary care referrals to physiotherapy with a clinical diagnosis of a massive rotator cuff tear underwent an ultrasound scan to confirm the diagnosis. A massive cuff tear was one where the leading edge of the tear had retracted past the glenoid margin. The clinical diagnosis was based on the presence of some or all of the following signs, positive humeral thrust on elevation, gross weakness and wasting of supraspinatus and infraspinatus, infraspinatus lag and rupture of the long head of biceps. Eligible patients were invited to take part in the study and informed consent was obtained. The baseline assessment was carried out and then the patient undertook the treatment programme. Outcome measures were reassessed 12 weeks from the baseline assessment.

Design: A cohort study of 10 patients evaluating the change from baseline to twelve weeks in the shoulder function of patients undergoing a programme of anterior deltoid strengthening and functional rehabilitation. The outcome measures used were the Oxford shoulder disability questionnaire and SF36. The Oxford shoulder disability questionnaire is validated for use with the UK population and has 12 questions with 5 point responses. The lowest (best) score is 12 and the highest (worse) score is 60.

Results: Scores on the Oxford shoulder disability questionnaire improved with all patients. The mean improvement was 9 (range 3 to 16, standard deviation 10.3). The SF36 showed an improvement in the pain scores for all patients (mean 22 points) and an overall improvement of 10 points for the sections on role limitation due to physical health. There was an overall decline in perceived general health (9 points) and in role limitation due to emotional health (23 points).

Conclusions: As all 10 patients showed improved scores on the Oxford shoulder disability questionnaire, in spite of the long standing nature of many of their shoulder problems, this rehabilitation programme was shown to improve shoulder function in this group of patients. The variation shown in the quality of life scores reflects the age group of this cohort who had a mean age 75.5 years (range 70 - 83). In spite of one patient having a stroke and another complications associated with an amputation, all patients deemed their pain and function to have improved over the three month period.

2 ASSESSMENT OF SCAPULAR SYMMETRY IN PATHOLOGIC AND NON-PATHOLOGIC SUBJECTS USING A THREE-DIMENSIONAL MOTION ANALYSIS SYSTEM

Tripp BL, Uhl TL, Kibler WB, Gecewich BD: University of Kentucky, Lexington Sports Medicine Center, Lexington, Kentucky

Objective: Patients with shoulder pathology frequently display abnormal scapular resting position as well as kinematics. Clinical

assessment of scapular motion is often conducted visually through bilateral comparisons. Asymmetries in both the magnitude and quality of motion may be observed. The purpose of this study was to assess the symmetry of scapular kinematics in both pathologic and non-pathologic shoulders using three-dimensional motion analysis.

Methods: Forty subjects volunteered to participate (19 pathologic and 21 non-pathologic). Subjects were categorized into three groups: rotator cuff tendon pathology (n=12), labral pathology (n=7) or no pathology (n=21) by the examining orthopedic surgeon (WBK). Subjects were instrumented with receivers from an electromagnetic tracking device, the MotionMonitor System utilizing the Flock of Birds. Receivers were taped to the posterior acromial angle of each scapula and a reference receiver taped to the sternum. The subjects were digitized with both local and global coordinate systems defined according to the International Society of Biomechanics (ISB) protocol. Symmetry of scapular kinematic data were measured in reference to the thorax. Subjects were instructed to elevate their arms six times in the sagittal plane, and after a two-minute rest; six times in the scapular plane to 150° of elevation. A metronome was used to control the rate of movement. Asymmetry of scapular motion was defined as left to right differences exceeding thresholds of 7° of internal rotation, 8° degrees of posterior tilt or 1.6 cm of superior/inferior translation.

Design: All subjects were classified as either symmetric or asymmetric and the motion of asymmetry was recorded. A Chi-Square analysis was used to determine if statistical differences in the percentage of asymmetries were observed between diagnoses.

Results: Asymmetry of scapular motion occurred in 73% of all subjects, including 86% of subjects with labral pathology, 58% of rotator cuff tendon pathology subjects and 76% of non-pathological subjects. There were no significant differences found between groups (p>.05). Further analysis of the coupled motion of external rotation and posterior tilt revealed asymmetry in 43% of the labral, 33% of the rotator cuff and 29% of non-pathological groups.

Conclusion: Asymmetries in scapular kinematics occur in both pathologic and non-pathologic shoulders and are not related to a specific diagnosis. Therefore, the simple observation of asymmetry is not indicative of pathology. Further analysis with a specific interest combined motion of external rotation and posterior tilt with pathology is warranted.

3 MUSCLE ACTIVITY COMPARISON OF FOUR COMMON SHOULDER EXERCISES IN UNSTABLE AND STABLE SHOULDERS

Kuschinsky N, Uhl TL, Sciascia A, Mair S, Nitz AJ, Mattacola CG: University of Kentucky, Lexington/Kentucky

Study Design: A comparison of shoulder muscular activity using repeated measure statistical analyses.

Objectives and Background: Shoulder instability is a common medical condition often treated with a conservative strengthening program of the glenohumeral and scapulothoracic musculature. Research on effectiveness and efficiency of shoulder strengthening exercises in unstable shoulders is limited. The objective is to eval-

uate shoulder muscle electromyographical (EMG) activity while individuals performed four shoulder strengthening exercises to determine differences between individuals with unstable shoulders and stable shoulder conditions.

Subjects: Thirty-nine subjects were classified as having either multidirectional instability (MDI), anterior instability (AI), generalized laxity (GL), or a stable shoulder (N) based on one orthopedic surgeon's evaluation.

Methods and Measures: Indwelling electrodes were used to study supraspinatus, infraspinatus, and teres major amplitude, onset, and duration of activity while surface electrodes were used for the serratus anterior, middle deltoid, and upper trapezius muscles. Four exercises studied were scaption, prone horizontal abduction (PHA), prone external rotation (PER), and a kneeling push up plus.

Results: The GL group displayed significantly higher muscle amplitude activity than the normal and AI groups during PHA in the supraspinatus and infraspinatus muscles ($p < 0.05$). The GL group produced significantly greater activity in the infraspinatus during push up plus exercise over the normal group ($p < 0.05$).

The onset of activation and duration of muscular activity was not significantly different between the four groups for all exercises. The serratus anterior was found to be most active and on the longest during the push up plus exercise. The infraspinatus was most active and activated the longest for PER. During PHA the infraspinatus and supraspinatus were activated for the longest duration and to the highest amplitude. The supraspinatus was active throughout scaption and displayed the highest average amplitude.

Conclusions: Scaption, PER, PHA, and push-up with a plus appear to activate their target muscles in an unstable population as effectively as in a stable population. These are effective exercises for inclusion in an instability rehabilitation program. Individuals with generalized joint laxity appear to activate shoulder musculature more to dynamically stabilize the glenohumeral joint to compensate for compromised ligamentous stability.

Keywords: Rehabilitation, EMG, Instability, Conservative treatment

4 STANDARDISING A PHYSIOTHERAPY PROTOCOL FOR THE TREATMENT OF "PAINFUL ARC"

Watson H, Lamb S, Mackie A, Moser J, Sibilia K, Williams J: Physiotherapy & Orthopaedic Departments, Freeman Hospital, Newcastle upon Tyne, UK

Objective: To establish a standardised physiotherapy protocol for the treatment of painful arc of the shoulder. This could then be used as an intervention in a planned randomised controlled trial of the treatment of painful arc.

Methods: A review of the current literature revealed that there are no standardised physiotherapy protocols for the treatment of painful arc of the shoulder. According to a recent Cochrane review of physiotherapy interventions for shoulder pain the evidence is inconclusive but suggests exercises and mobilisation may be beneficial.

A working party of senior physiotherapists, with a special interest in shoulder conditions, agreed a basic treatment protocol, which included an assessment tool and an algorithm of treatment modalities. The protocol was evaluated over a six-month period on 50 patients as part of a pilot study looking at conservative treatment of painful arc. It was consequently modified to produce a protocol suitable for trial with non-specialist physiotherapists.

After a 1 hour education seminar, staff in seven local out-patient departments trialled the protocol. Following feedback from these departments, the working party agreed on the final protocol.

Results: Patients presenting with a painful arc combined with stiffness were difficult to treat with the protocol alone. Most therapists were happy with the protocol and found it effective in treating the painful arc. Experienced staff were on the whole happy with the protocol although some had to abandon outdated or personal

techniques that were not in the protocol. Less experienced staff, although understanding the concept of the protocol, frequently needed more training in its implementation.

Conclusions: We have developed a standardised physiotherapy intervention for treatment of painful arc. It was found necessary to do at least a half-day training course accompanied by a treatment manual. Monitoring of its implementation is essential to ensure a standardised delivery. There is the potential to use this as an intervention in a randomised control trial. It will be necessary to do a reliability study of the delivery of the standardised protocol.

5 SCAPULOTHORACIC MUSCLE PROPRIOCEPTION: LATENT MUSCLE REACTION TIME

Brindle TJ, Nyland JA, Nitz AJ, Shapiro R: Biodynamics Laboratory, University of Kentucky, Lexington, KY

Objectives: The purpose of this study was to identify latent muscle reaction times (LMRT) of scapulothoracic muscles between trained overhead throwing athletes and age matched control subjects. We also evaluated differences among specific muscles and between dominant and non-dominant limbs. This is important because a muscles' response to sudden changes in position can begin to link proprioceptive feedback and motor performance.

Methods: Fifteen trained overhead throwers (intercollegiate baseball pitchers) and 15 untrained subjects (not active in competitive throwing sports). Subjects were tested while seated with their upper extremity positioned in 90° of abduction/external rotation (scapular plane), with their elbow flexed and forearm placed in a custom shoulder wheel, which also imparted the internal rotation perturbation. Scapulothoracic muscle LMRT's were assessed as subjects tried to stop a variably timed, sudden internal rotation perturbation. EMG analysis of the upper trapezius (UT), serratus anterior (SA) and middle trapezius/rhomboids muscle group (MT/R) are reported relative to onset of movement following the perturbation.

Design: Observational cross-sectional design.

Results: There was no significant difference in LMRT's of muscle activity between groups ($p = 0.6$) but the dominant extremity demonstrated delayed onset of the LMRT's ($p = 0.03$), compared to the non-dominant group. The LMRT of the UT was significantly delayed compared to the SA ($p = 0.003$) and MT/R muscle group ($p = 0.001$). There was no significant difference in muscle duration activity between the groups, among muscles and between the extremities that were tested.

Conclusion: While sport-specific training, such as overhead throwing, does not appear to affect scapulothoracic muscle latency to imposed perturbation, the dominant extremity demonstrates delayed LMRT compared to the non-dominant extremity. These results may be explained by the magnitude of the perturbation. The velocity of the perturbation in this study appears to identify subtle differences between the dominant and non-dominant limbs. However, much faster velocities might be needed to identify differences between highly trained throwers and subjects in our control group. Identifying muscle latency characteristics is important for training and rehabilitation of overhead throwing athletes.

6 ELECTROMYOGRAPHY OF SHOULDER AND SCAPULAR MUSCULATURE DURING AN ELEVATION STRENGTHENING PROGRESSION

**Gaunt BW, †Uhl TL, †Humphrey L, †Calico RM, ‡McCluskey GM: *The Human Performance and Rehabilitation Center; Columbus, GA, †University of Kentucky; Lexington, Kentucky; ‡McCluskey Orthopaedic Clinic, Columbus, GA, United States*

Objective: Limited evidence exists which delineates muscular demands during exercises that may promote full active forward elevation (AFE). The purpose of this study was to examine the electromyography activity (EMG) of shoulder and scapular musculature while performing ten shoulder exercises which are used to

promote active forward elevation, to determine if an order of progressively increasing demand on the musculature exists.

Methods: Fifteen individuals with healthy shoulders participated in this study. Subjects were free from previous fracture, dislocation, or surgery and demonstrated full pain-free shoulder active range of motion (AROM). The supraspinatus and infraspinatus were evaluated with fine wire electrodes. The anterior and posterior deltoid, serratus anterior, upper and lower trapezius, and pectoralis major were evaluated with bipolar surface electrodes. All muscles were normalized to a maximal voluntary isometric contraction (MVIC). Subjects performed five repetitions of each exercise: towel slide on table, rope and pulley assisted elevation in the plane of the scapula, side lying gravity eliminated active forward elevation with arm supported on a table top, supine active flexion from 90°-160° against a red Theraband® resistance, wall walk active assistive elevation, ball roll on wall with arm at 90° of elevation in the scapular plane, T-bar active assistive forward elevation with and without independent eccentric lowering, overhead wall taps, and AFE. The order of exercises was counterbalanced to prevent bias.

Design: All EMG data was analyzed as a percentage of MVIC using root mean squared amplitude. A repeated measure ANOVA was used to compare the EMG activity between exercises for each muscle independently.

Results: A significant differences between all exercises studied was found ($p < .05$), indicating greater muscular demand for particular exercises. Post hoc analysis revealed multiple significant differences between exercises and that a progressive increase in demand could be determined for each muscle.

Conclusion: In individuals with healthy shoulders performing the selected exercise routine, there appears to be a trend of increasing muscle demands in rotator cuff, deltoid, and scapula musculature activation from a very low demand to demands similar to AFE. As clinicians prescribe exercises following shoulder surgery, it is necessary to have a knowledge of the demands on the impaired tissues in order to prevent a re-injury, a delay in recovery time, or a damage to additional structures.

7 THE EFFECTS OF MUSCLE FATIGUE ON THREE DIMENSIONAL (3D) SCAPULAR KINEMATICS

Ebaugh DD, McClure P, Delgiorno J, Karduna A: Drexel University, Biomechanics Lab, Philadelphia, Pennsylvania, USA

Objective: Muscle fatigue and shoulder pain are commonly reported in manual laborers who repetitively use their hands at or above shoulder level. Shoulder muscle fatigue may result in altered kinematics of the shoulder complex, which could lead to abnormal forces being placed upon tissues associated with this region. The purpose of this study was to investigate the effects of two protocols for shoulder girdle muscle fatigue on 3D scapular kinematics.

Methods: Sixteen subjects, without a history of shoulder injury, volunteered to participate in the study. The Polhemus 3Space Fastrak was used to collect 3D scapular kinematics. A thoracic receiver was placed over T3, a humeral receiver was placed at the level of the deltoid tuberosity, and a scapular receiver was fixed to a scapular tracker device that was attached to the scapular spine and acromion process. Surface electrodes were used to record electromyographic (EMG) activity from the upper and lower trapezius, serratus anterior, anterior deltoid and infraspinatus muscles. Data were collected during arm elevation before and after a series of fatiguing activities. The first step was to collect baseline measurement of EMG and kinematics during scapular plane elevation. Subjects then went through a fatigue protocol, classified as either "high" or "low" intensity. Immediately afterwards, EMG and kinematic data collection was repeated. After a one-hour rest period, each subject repeated the protocol (baseline testing and post-fatigue testing) at the other intensity level. Order of performance of the high or low intensity protocol was determined randomly.

Design: A within subjects repeated measures design was used for this study. Results: The MPF decreased across all muscles for

both the low (2 - 22%) and high (7 - 25%) intensity protocols. Significant increases in scapular rotations were noted following both fatigue protocols for all three rotations. For upward and external rotation, the low load protocol resulted in greater changes, approaching 10° at some elevation angles. For posterior tilting, the effects of fatigue were greater for the high load protocol, however, for both protocols, the changes were small.

Conclusions: Scapular rotations were found to be affected by shoulder muscle fatigue. Particularly important are the increases in upward rotation, since we recently demonstrated in a cadaver model that an increase in upward rotation may result in a decrease in subacromial clearance. Consequently, shoulder fatigue may be associated with increased compressive forces on tissues within the subacromial space due to changes in scapular kinematics.

8 LONGTERM OUTCOME FOLLOWING A PROXIMAL HUMERUS FRACTURE IN THE UK

Hodgson SA, Mawson S, Saxton J Stanley D: Sheffield Hallam University, United Kingdom

Objectives: To follow-up patients who fractured their proximal humerus two years ago and were recruited to a Randomised Controlled Trial (RCT) that began in 1998 in Sheffield, UK.

Methods: Each patient was sent a shoulder disability questionnaire at 2 years following their original injury. The Croft Shoulder Disability Questionnaire (CSDQ) asks the patient to evaluate their shoulder function in response to 22 questions. A score of zero indicates no shoulder disability and a score of over 5 and over represents significant shoulder disability.

Design: This forms part of an RCT involving 86 patients who fractured their proximal humerus (minimally displaced fracture) and were randomly assigned to receive either immediate (Group-A) physiotherapy (within 1 week of injury) or after 3 weeks immobilisation in a collar and cuff (Group-B). Both groups had the same physiotherapy programme based on maximising shoulder function within pain tolerance.

Results: At 2 years 74 patients (86%) completed and returned the CSDQ. In Group-A, 16 (43.2) patients reported some level of shoulder disability compared with 22 (59.5%) in Group-B. At 2 years the number of subjects scoring 5 or more (i.e. significant shoulder disability) on the disability questionnaire was 12 (32.4%) and 13 (35.2%) in Group A and B, respectively.

Conclusions: This difference is not statistically significant, but the results suggest that patients continue to experience high levels of shoulder disability at 2 years following their original injury. Starting physiotherapy immediately after the fracture does not cause fracture complications and maximises the persons shoulder function, however a large percentage of patients in both groups continue to report some level shoulder disability. The excellent recovery reported by previous papers within 1 year of injury is not supported by these findings.

9 RELIABILITY OF A CLASSIFICATION PROTOCOL FOR THE ASSESSMENT OF SCAPULAR MOTION IN PATIENTS WITH SHOULDER PATHOLOGY

Johnson MP, van den Heuvel VA, Savers EL: Department of Physical Therapy, University of the Sciences, Philadelphia, PA, USA, and Department of Sports Health Care, Arizona School of Health Sciences, Mesa, AZ, USA

Objective: Dyskinetic scapular motion is frequently cited as a primary or secondary source of shoulder pathology. A dynamic scapular classification protocol to assess the quality of scapular motion has been developed to assist the clinician in accurately classifying normal and abnormal scapular kinematics. The specific aim of this study was to determine the intra- and inter-rater reliability of the dynamic scapular classification protocol for classifying normal and abnormal scapular motion using athletes and non-athletes with active shoulder pathology.

Methods: A convenience sample of 27 subjects with active shoulder pathology were videotaped during the performance of six test maneuvers; raising and lowering both arms overhead in the frontal and sagittal planes (weighted and un-weighted), push-ups off a table, and resisted isometric glenohumeral external rotation. Scapular motion in both shoulders of each subject was assessed by two examiners and classified dichotomously as either (1) normal or (2) abnormal for each of the six tests. The percent agreement and kappa statistic were utilized to determine the intra- and inter-rater reliability for each of the six test maneuvers and the combination of these six maneuvers for assessing scapular motion abnormalities.

Design: A methodological research design was utilized to evaluate the intra- and inter-rater reliability of the dynamic scapular classification protocol for the assessment of scapular motion in patients with shoulder pathology.

Results: The intra-rater reliability for the six test maneuvers ranged from poor to excellent (Right shoulder = 77 - 96% agreement, $k = 0.25 - 0.74$; Left shoulder = 81 - 96% agreement, $k = 0.18 - 0.87$). The intra-rater reliability for the combination of all six tests was substantial for the right shoulder (89% agreement, $k = 0.66$) and fair for the left shoulder (73% agreement, $k = 0.39$). The inter-rater reliability for the six test maneuvers ranged from poor to substantial (Right shoulder = 81 - 96% agreement, $k = -0.1 - 0.74$; Left shoulder = 70 - 93% agreement, $k = 0.0 - 0.76$). The inter-rater reliability for the combination of all six tests was fair for both the right (85% agreement, $k = 0.51$) and left (81% agreement, $k = 0.59$) shoulders.

Conclusions: In general, abnormal scapular motion was more reliably detected under loaded conditions. In addition, patients with clinical evidence of shoulder impingement and shoulder instability had a higher frequency of observable abnormal scapular motion. Future studies are necessary to further explore the clinical value of scapular classification protocols in patients with more clearly defined shoulder pathologies.

10 SHOULDER STRENGTH AND FLEXIBILITY OF YOUTH BASEBALL PLAYERS

Uhl TL, Mair SD, Robbe, R, Brindle KA: University of Kentucky, Lexington, KY, USA

Objective: The repetitive microtraumatic stresses placed on the shoulder during overhead throwing may lead to a breakdown of the shoulder's surrounding tissues. Little research has been performed to examine strength and flexibility of the rotator cuff muscles in adolescent athletes. The purpose of this study was to obtain descriptive data on 8 to 15 year old youth baseball players.

Methods: Seventy-nine males volunteered to be in this study with age ranging from 8-15 y.o. All subjects filled out a written questionnaire with their parent or legal guardian regarding demographic information, shoulder injury, and throwing history. Subjects had their shoulder range of motion (ROM) and strength measured by a single investigator. The participant was placed supine with the arm abducted 90° and elbow flexed to 90°, and actively rotated the arm into maximal internal and external rotation. Their throwing velocity was also measured with a radar gun. The strength data was recorded as a percentage of body weight. The data was separated into 4 groups according to subject's age for statistical analysis. Group 1 was 8-9 year olds ($n = 15$), Group 2 was 10-11 year olds ($n=19$), Group 3 was 12-13 year olds ($n=31$), and Group 4 was 14-15 year olds ($n=14$).

Design: A mixed model repeated measures ANOVA with a two within factors (dominance and direction) and a between factor (group) were performed for flexibility and strength dependent measures. An ANOVA determined ball velocity differences between groups.

Results: The results revealed a significant interaction for strength, internal rotation strength (22% BW) was significantly greater than external rotation strength (19.5% BW) for both dominant and non-dominant arms ($p<0.05$). Significantly greater ex-

ternal rotation was found on the dominant side rather than on the non-dominant side for all age groups except for Group 1 ($p < 0.05$). Total range of motion, summing internal and external rotation, was found to be significantly greater on the dominant side ($187 + 12.32$) over the non-dominant side ($182 + 11.44$) ($p < 0.05$). Ball velocity was found to be significantly different between all 4 age groups Group 4 ($66 + 9$ MPH) > Group 3 ($56 + 7$ MPH) > Group 2 ($50 + 5$ MPH) > Group 1 ($38 + 6$ MPH).

Conclusions: These findings suggest early adaptive changes are occurring in overhead throwing athletes prior to maturation. These findings may help clinicians develop realistic goals in management of youth baseball athletes. Further research into these physical characteristics as related to injury prevalence is needed.

11 ADVANCES ON REHABILITATION PROCEDURES FOR TREATMENT OF ANTERIOR SHOULDER MICRO-INSTABILITIES IN THE OVERHEAD THROWING ATHLETE

Tyler, T, Pro Sports PT, Scarsdale, NY

Objectives:

- Define micro-instability
- Determine possible causes
- Results of micro-instability
- Treatments: Surgical vs Conservative
- Keys to success
- Prevention

Assessment: In this section discussion of various methods of assessing patients shoulder strength, range of motion, scapular stability, posterior shoulder tightness, and capsular integrity will be evaluated.

Treatment: This section will highlight key areas of rehabilitation for this population including proper general shoulder and internal/external rotation stretches, inferior/posterior glides of the humeral head, external rotator and deltoid strengthening at various stages and how to achieve proper scapulohumeral rhythm.

Evidence: Throughout the presentation current publications that relate to all aspects of the talk will be discussed including: Moseley et al, *AJSM*, 1994; Kido T et al. *AJSM*, 2003; Townsend et al, *AJSM*, 1991; Townsend et al, *AJSM*, 1991; Wilk & Arrigo: *Current Concepts AJSM* 2002.

Conclusion: At the end of the lecture the practitioners will be able to walk away with a clear understanding of what the cause and effect of micro-instability is in the overhead throwing athlete and how to treat it.

12 SHORT-TERM OUTCOMES ACHIEVED WHEN APPLYING AN ALGORITHMIC INTERVENTION PROGRAM IN PATIENTS WITH PRIMARY FROZEN SHOULDER

Martin J. Kelley, PT, OCS and Brian Leggin, PT, OCS. University of Pennsylvania Medical Center, Philadelphia, PA

Objective: The purpose of this study was to assess short-term outcomes using an algorithmic intervention program.

Design: This case series was carried out at an institutional setting.

Methods: Eleven patients (2 men and 9 women) with mean age of 51.5 (range 42-65 years) treated for primary frozen shoulder. All patients were instructed in a passive and active assisted range of motion exercise program and treated with joint mobilization techniques. Only one patient required an intra-articular injection. The average length of treatment was 4 weeks (range 2-6 weeks) and average number of treatments was 4 (range 2-6 visits). Outcome was assessed by pain, satisfaction, function and passive range of motion.

Results: Results revealed pain scores improve from 16.0/30 to 23.4/30. Satisfaction improved from 1.5/10 to 6.4/10 and function improved from 34.2/60 to 45.9/60. The combined score for all subjects improved from 51.2 /100 to 75.0/100. Mean passive elevation improved from 118.6 to 135 degrees and pas-

side external rotation at neutral improved from 31.4 to 37.3 degrees. Changes in passive elevation and active functional internal rotation were found to be statistically significant $p > .003$, however, passive external rotation was a poor indicator of improvement.

Conclusion: This study demonstrated that an algorithmic interventional program applied to patients with primary frozen shoulder resulted in a significant improvement in the patient's perception of pain, satisfaction, function and passive elevation range of motion. These outcomes were achieved in a short time frame with an average of 4 visits. Success and criteria for discharge should be based on pain reduction, improved satisfaction and function not regaining normal range of motion.

13 AN EXAMINATION ALGORITHM FOR DETERMINING THE PRESENCE OF SCAPULAR MUSCLE PALSY

Martin J. Kelley, PT, OCS and Brian Leggin, PT, OCS. University of Pennsylvania Medical Center, Philadelphia, PA

Topic area: Dynamic control.

Objectives: To discuss the etiology of scapular muscle palsy. Present a sequence of examination tests to identify the presence of a palsy.

Assessment approach: Initially active range of motion is assessed in both the sagittal and coronal planes to determine scapular movement. Resisted motion testing with the arm at the side is performed and scapular stability assessed and identified. The "plus sign" is performed to determine if the serratus anterior is active. Next resisted testing is performed at approximately 135 degrees and 60 degrees of sagittal plane elevation. The middle trapezius, lower trapezius and rhomboid are then assessed while prone. This sequence of testing is presented with an algorithmic approach to identify if a palsy is present.

Evidence: Multiple studies will be presented in addition to case series.

Conclusions: The proposed algorithmic approach to examination is useful in determining the presence of a scapular muscle palsy.

14 ABSTRACT FOR CASE STUDY/STIFF SHOULDER

O'Toole, J.: Boston, Massachusetts

This is submitted as a case study for the stiff shoulder section, but with the details TBA!

So, I would like to volunteer a case study under the topic of Stiff Shoulder. At this time, there is not a specific patient in mind, but feel certain that by the time of the International Meeting there will be an patient who would fall into this category.

I am thinking especially of someone who has undergone treatment for breast cancer that will present with a stiff shoulder and who would make for an interesting case presentation. It would be my goal to include a patient whom I could highlight the soft tissue changes from radiation and perhaps have some discussion about radiation fields and the effect of radiation on the soft tissue structures that influence shoulder function.

15 THE VALIDITY OF THE LAG SIGNS IN THE DIAGNOSIS OF FULL THICKNESS TEARS OF THE ROTATOR CUFF

Ahern C, Forrester-Gale G, Green M, Allen G: Coventry University, Coventry, United Kingdom

Objective: To investigate whether the lag signs are valid tools in diagnosing full thickness tears (FTT) of the rotator cuff in patients with painful shoulders. Design: The design was a prospective correlation study using blinded examinations.

Methods: 37 consecutive patients with shoulder pain, referred for diagnostic ultrasound over a four-month period, were included in the study. Ethical approval was granted and informed consent from all patients obtained. The lag signs for each subject were

assessed using a blinded examination. In this study ultrasound was considered the gold standard for diagnosing FTTs of the rotator cuff and the results of the lag signs were compared with the gold standard to determine their validity.

Results: 33% of subjects had evidence of a FTT of the rotator cuff. Inferential statistics using the KAPPA statistic demonstrate that the External Rotation Lag Sign (ERLS) and the Drop Sign had clinically acceptable levels of agreement with the diagnosis of a tear of infraspinatus and supraspinatus on ultrasound (0.48). The Internal Rotation Lag Sign (IRLS) did not have acceptable KAPPA agreement levels with a diagnosis of a FTT in subscapularis (0.36). Diagnostic validity values for the lag signs demonstrated that the IRLS had a high sensitivity for diagnosis a FTT of subscapularis (100%) however it had a low Positive Predictive Value (PPV) for the diagnosis of a FTT (28%). The ERLS had high specificity (93%) but a very low sensitivity (46%) for the diagnosis of FTT of the supraspinatus and infraspinatus. The Drop sign demonstrated moderate levels of sensitivity and specificity (73% & 77%) for the diagnosis of FTTs of the supraspinatus and infraspinatus tendons. Subjects with higher Visual Analogue Scale (VAS) ratings had an increased number of false positive results on assessing the IRLS and Drop Sign. Subjects with other pathology diagnosed in the glenohumeral joint had also an increased number of false positive results on assessing the IRLS and Drop Sign.

Conclusion: The lag signs are not consistently accurate in the diagnosis of full thickness tears of the rotator cuff. The presence of pain and other pathology in the glenohumeral joint can affect the result of the lag signs. A negative IRLS or Drop sign may be useful in ruling out a rotator cuff tear. A positive ERLS is a useful clinical result, which can assist with the diagnosis of a full thickness tear of supraspinatus and infraspinatus. Although the findings suggest the Lag Signs are insufficient for certain diagnosis, it is suggested they play a part with other tests in the clinical evaluation of a full thickness tear of the rotator cuff.

16 A STANDARDISED PHYSIOTHERAPY REGIME VERSUS SOFT TISSUE MANIPULATION IN FROZEN SHOULDER: A RANDOMISED CONTROLLED PILOT STUDY

Wies JT, Humphreys H, Enrico P, Latham M, Viljoen T, Hazleman BL, Speed CA: Rheumatology Research Unit, Addenbrookes Hospital, Cambridge, England

Objectives: To compare the efficacy of a standard manual and exercise based physiotherapy regime and a soft tissue manipulation technique in the treatment of frozen shoulder.

Methods & Design: Thirty participants with frozen shoulder were randomised to receive a supervised physiotherapy regime, soft tissue manipulation, or to a placebo group. All participants were seen in six, 45-minute sessions over a nine-week period. Outcome measures were recorded by a blinded assessor at baseline, and one week following completion of treatment and included a Shoulder Pain and Disability Index (SPADI), subject satisfaction score and range of active and passive shoulder abduction.

Results: All groups improved significantly with respect to shoulder pain and disability scores with no significant difference between the groups. (Mean (SD) SPADI initial and final measures: physiotherapy: 41.5 (25.0) v 22.8 (13.7); soft tissue manipulation: 49.6 (29.3) v 10.8 (10.8); placebo 58.3 (19.7) v 32.1 (28.2)). Improvements in passive abduction were seen in both the treatment groups, reaching statistical significance in the physiotherapy group only. Active abduction was significantly improved in both treatment groups. (Mean (SD) active ROM: physiotherapy 89.6 (33.1) v 128.9 (28.6); soft tissue manipulation 85.3 (25.2) v 136.9 (22.1); placebo 96.3 (29.2) v 99.9 (43.5)). Although all three groups showed improved satisfaction with their shoulder status, this reached significance in the physiotherapy group only. (Mean (SD) physiotherapy: 57.2 (22.0) v 82.0 (22.3); soft tissue manipulation: 64.8 (16.2) v 78.4 (15.3); placebo: 58.4 (22.8) v 71.8 (16.6)).

Conclusions: This study confirms that there is a natural improve-

ment with time in shoulder pain and disability in patients with frozen shoulder. However, a manual and exercise based physiotherapy regime and soft tissue manipulation are both superior to placebo in improving range of motion and a supervised physiotherapy regime results in greater participant satisfaction with the status of their shoulder. As treatment of soft tissue restrictions in combination with therapeutic exercise appears to be effective in improving active and passive range of motion of the glenohumeral joint in patients with idiopathic frozen shoulder, intervention is warranted in these patients.

17 INTERIM RESULTS OF A RANDOMISED PLACEBO-CONTROLLED STUDY OF PHYSIOTHERAPY TREATMENT FOR ROTATOR CUFF TENDINOPATHIES

Wies JW, Humphreys H, Latham M, Enrico P, Viljoen T, Hazleman BL, Speed CA: Rheumatology Research Unit, Addenbrookes Hospital, Cambridge, England

Objectives: The purpose of this study was to assess the efficacy of physiotherapy approaches to treatment of Rotator cuff tendinopathies (RCT). RCT affects up to 30% of the general population and become more prevalent and disabling with age. Patients with RCT have significant levels of impairment and associated disability. There has been little evidence to support physiotherapy treatment of this condition.

Methods & Design: The results for 47 participants (mean age 53 (sd=14) and mean duration of symptoms 46 weeks (sd=34) and 56 shoulders treated are included here. All participants gave informed consent. Participants recruited for a randomised, controlled trial of treatment for RCT were assessed at the beginning and end of a twelve-week treatment period. All participants were assessed by a chartered physiotherapist blinded to treatment-allocation and treated by a second chartered physiotherapist. All participants completed several outcome measures including the primary measure for this study, the Shoulder Pain and Disability Index (SPADI) - a 0 to 100 scale in which 0 represents normal and a decrease in 10 indicates the minimal clinically meaningful change. Participants were randomised to one of four groups: Therapeutic Exercise (TE), Manual Therapy (MT), Combined manual therapy and therapeutic exercise (CT), or Placebo (P) (consisting of breathing exercising, effleurage massage, and pain-free range of motion exercises).

Results: The statistical analyses were carried out using an SPSS package. The association between variables was measured using the Kruskal-Wallis Test and the changes within groups were measured using a two-tailed, two-sample unequal variance t-test. Mean SPADI scores improved in all treatment groups ($p=0.027$). The CT group ($n=10$) improved by 29.5 (sd=16.7; $p=0.002$), the TE group ($n=10$) by 25.9 (sd=19.9; $p=0.007$), the MT group ($n=21$) improved by 15.5 (sd=16.9; $p=0.009$), and the P group ($n=15$) improved by 9.4 (sd=16.9; $p=0.33$).

Conclusions: Physiotherapy treatment resulted in decreased pain and disability as measured by the SPADI. SPADI scores did not improve significantly for participants receiving placebo treatment. Physiotherapy employing a combination of manual therapy and therapeutic exercise appears to be most effective in treating rotator cuff tendinopathies. Based on current results 85 participants are needed to complete the trial to give 95% confidence and 80% power and employing a factorial design.

18 HUMERAL NON-UNION WITH MULTIPLE COMPLICATIONS - SURGICAL AND REHABILITATIVE SOLUTIONS

Michaud, E J: Lutheran Hospital of the Cleveland Clinic Health System, Cleveland, Ohio

History: A year after falling at work, this 72 year old male presented with a chronic non-union following multiple failed open reduction and internal fixation of the right humerus with areas of vascular necrosis and radiation changes to both bone and soft

tissue. During that year, conservative management, intermedullary rod fixation and internal fixation with plates and screws all failed. Approximately ten years prior to the humeral fracture he had a malignant soft tissue tumor resection followed by radiation and chemotherapy.

Physical Examination: There was significant scarring and radiation changes throughout the soft tissue of the arm in the area where the biceps was removed. There was much lymph edema to the entire forearm, probably as a result of both the venous thrombosis and the limited lymphatic drainage associated with the irradiated axilla. Active shoulder motions were: elevation 110 degrees, external rotation of 80 degrees and internal rotation to T8. Passively elevation was 125 degrees. Elbow active motion was normal for flexion and to 30 degrees extension. Pronation and supination were normal actively, but supination was weakened by lack of biceps. Triceps and brachialis strengths were functional. Distal sensation, circulation, and tendon function all were within normal limits and the entire humerus moved as a unit.

Clinical Course: A period of conservative treatment was initiated since he had minimal pain and light functional use. Treatment consisted of shoulder and arm rehabilitation, compressive dressings, water exercises and use of an ultrasound bone stimulator. After that failed, surgical solutions included a revision open reduction and internal fixation of the humeral shaft using a long-stemmed hemi-arthroplasty prosthesis and fresh frozen allograft humeral strut with autologous cancellous graft to the humerus secured in place with circlage wires. Therapy after this surgical treatment was intensive including: low stretch compressive dressings distally; intensive elevation; slinging the arm; passive motion exercises to the shoulder; and active motion exercises to the elbow, forearm and hand. Then after several weeks the shoulder exercises were expanded to include pool exercises, light active use and active assistive exercises too. Eventually, strengthening and more intensive active use was encouraged to the entire arm.

Outcome: At discharge, the shoulder motions were: active/passive elevation of 95/130 degrees, external rotation of 70 degrees and internal rotation to T12. Elbow active extension/flexion was 27/125. All other distal active motions were within functional limits. He was able to lift 7 pounds to shoulder height and 25 pounds at lower levels using just the right arm. Using two arms he handled up to 45 pounds on occasion. Weight bearing demonstrated a tolerance for 40 pounds on the affected arm. There was no complaint of pain. He returned to work, full duty, and had regained excellent functional use.

19 INSTRUCTIONAL COURSE, 17TH SECEC, HEIDELBERG, GERMANY CONCEPTS OF SHOULDER REHABILITATION. OPTIMIZE YOUR RESULTS IN SHOULDER SURGERY

Jan Nowak MD, PhD. Berith Svensson PT Shoulder Service, Dept of Orthopaedics, University Hospital, SE-851 25 Uppsala, Sweden. E-mail: jan.nowak@skulderkliniken.se

To optimize your results in shoulder surgery you have to work in a team with physio therapists that have a special interest in shoulder rehabilitation. Whether you work with one physio therapists or refer your patients to several other physio therapists you need the same view/vocabulary and a baseline of rehabilitation plans for different diagnosis with standardized phases and exercises.

To achieve this goal you need recurrent educational meetings and consensus on different aspects of the "chain of care", as the "Chain is not stronger than the weakest link"

It is essential for the surgeon to point out the restrictions in the postop rehabilitation plan for the physio therapists and to enclose a copy of the surgeons report from the operation.

In Uppland, Sweden, the county where we work, with about 250 000 inhabitants and with one unit that operates shoulders, we have developed a rehabilitation system that facilitate communication and team work with physio therapists. This system is used in four other counties in Sweden of the same size. The system is also

meant for scientific use as a very small amount of controlled studies are carried out in this specific area. Suggestions are shown on different aspects of how to optimize the pre- and postoperative management, as well as for patients that are not operated. Hand-outs are provided.

20 OCCUPATIONAL THERAPY AND THE SHOULDER

Julie Upton DipCOT SROT - Head Occupational Therapist Nottingham Shoulder and Elbow Unit, Nottingham City Hospital, Hucknall Road, Great Britain jupton1@ncht.trent.nhs.uk

Occupational Therapy: an approach to healthcare that focuses on the nature, balance, pattern and context of occupations and activities in the lives of individuals, family groups and communities.

The main aim of Occupational Therapy (OT) is to maintain, restore or create a balance, beneficial to the individual, between the abilities of the person, the demands of his/her occupations in the areas of self care, productivity and leisure, and the demands of the environment.

The OT process begins with assessment. This includes their physical state and an analysis of what the daily demands on the shoulder are. Once the problems are identified and some treatment goals agreed with the patient we can begin a treatment program. The principles which guide the treatment of any shoulder problem are as follows. Pain relief should be maximised, range of movement needs to be optimum and appropriate scapular control is required for a functional shoulder. Sufficient strength and stamina to complete tasks throughout the day are also essential for function.

Unlike physiotherapists who would use exercises as a treatment media, Occupational Therapists use activities. If possible the actual activity that the patient wishes to return to is used. If this is not practical, we find a way to simulate the movements required. Gaining range of movement and scapular control can both be aided by the use of a device called the OB help arm. This device supports the arm in a sling and uses an adjustable counterbalance to give active assisted movement. It is useful in the early stages of rehabilitation post-surgery when trying to regain range and before full active movement can be done, for example when protecting a rotator cuff repair. It also allows therapist and patient to work together on gaining scapular control and using optimum external rotation elevation to prevent impingement. Having the arm supported by the device gives the therapist both hands free and the ability to move around the patient to monitor their movement pattern.

When considering helping a patient to return to activity, assessing their abilities is only one half of the equation. A careful activity analysis of their tasks is required to establish what movements; postures, strength and stamina are needed allow us to tailor the treatment to the individual. Once we know what the patient needs to be able to do we can simulate this and practice to gain improvement in areas of weakness. This can be achieved in many different ways depending upon the task. It could be a traditional low-tech option or a modern IT driven version.

In summary, if a patient wishes to gain a successful return to activity without further injury, we need to help them to achieve scapular control, appropriate movement patterns and then a sufficient level of strength and stamina. Using an Occupational Therapy task based treatment programme that complements the physiotherapy input provides a comprehensive rehabilitation service.

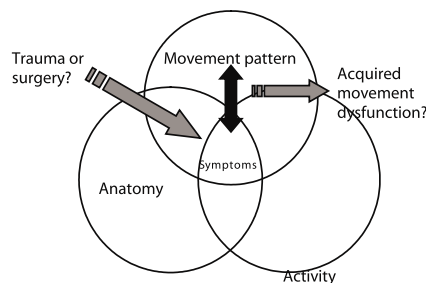
21 THE SCAPULA AFTER TRAUMA & ELECTIVE SURGERY - TREATMENT STRATEGY

M. A. Scott BSc MCSP SRP Nottingham Shoulder & Elbow Unit, Nottingham City Hospital NHS Trust Nottingham NG5 1PB, UK, E-mail: mScott3@ncht.trent.nhs.uk

The scapula is a vital component to consider when performing rehabilitation after trauma or elective surgery. Poised upon the strut of the clavicle, the scapula forms a link between the trunk and the

arm. Account must be taken both of its articulation with the thorax and also its ball & socket joint with the humerus. Ranges of motion at these articulations and also the quality of movement patterns performed are of major importance.

Symptoms may be produced by the method of interplay of a patient's anatomy with the environment via their movement patterns (see diagram). Many patients are unable or unwilling to cease their activities, be these sports, hobbies or employment. Surgery will often alter the patient's normal anatomy (eg. a re-attached subscapularis being tighter than before), and often causes pain and muscular inhibition. All these factors can destroy quality of movement and limit rehabilitation. Therefore attention to movement patterns is an essential part of successful rehabilitation.



It should be noted that scapular dyskinesia is not uncommon in the asymptomatic population, and even minor trauma (including surgery) may be sufficient to precipitate symptoms, particularly in those with heavy or repetitive upper limb activity.

In the case of trauma surgery, such as to the rotator cuff, Bankart or fracture repair, it can be difficult or impossible for the surgeon to restore normal anatomy of the glenohumeral joint. Consequent loss of movement can generate scapular dyskinesia as the patient compensates whilst continuing to use their shoulder. If the rotator cuff has been injured or inhibited by pain, this can magnify the problem, leading to the familiar "hitching" of the shoulder girdle as an unopposed deltoid draws the humeral head up beneath the acromion.

With regard to elective treatment, scapular dyskinesia may be present prior to surgery. Pathologic anatomical features such as a hooked acromion, spurs, osteophytes, loss of articular cartilage or rotator cuff tears may disrupt normal movement at the glenohumeral joint, with consequent attempts to compensate at the scapulothoracic articulation. In extreme cases, scapulohumeral rhythm is lost entirely and abnormal scapular movement is responsible for positioning the humerus in space. Prolonged adaptation to these abnormal movement patterns can make them particularly difficult to rehabilitate. For example, after a total shoulder replacement, a patient may be unable to recover glenohumeral movement as they have lost the ability to dissociate.

Treatment strategy should therefore concentrate upon two inter-related areas, the scapulothoracic articulation and the glenohumeral joint.

Pain should be minimised by all available techniques, including choice of surgical approach, analgesia and other modalities.

Range of motion should be regained as soon as possible, allowing for limitations due to the surgical procedure. This may involve an absolute restriction on range, or a temporal restriction on accessing a certain range. Good communication between the surgical and rehabilitation teams is of paramount importance in this respect.

Movement patterns at the scapulothoracic articulation and the glenohumeral joint should be optimal -especially in their combined movements. Specifically, this implies good control over the full available range of motion.

To summarise, it is essential to ensure optimal scapulothoracic and scapulohumeral movement patterns. This requires sufficient range of motion with control and also the strength (ie. ability to do once) and stamina (ie. ability to do many times) at the patient's required level for function.

22 RELIABILITY OF A CLASSIFICATION PROTOCOL FOR THE ASSESSMENT OF SCAPULAR MOTION IN PATIENTS WITH SHOULDER PATHOLOGY

Johnson MP, van den Heuvel VA, Savers EL: *Department of Physical Therapy, University of the Sciences, Philadelphia, PA, USA, and Department of Sports Health Care, Arizona School of Health Sciences, Mesa, AZ, USA*

Objective: Dyskinetic scapular motion is frequently cited as a primary or secondary source of shoulder pathology. A dynamic scapular classification protocol to assess the quality of scapular motion has been developed to assist the clinician in accurately classifying normal and abnormal scapular kinematics. The specific aim of this study was to determine the intra- and inter-rater reliability of the dynamic scapular classification protocol for classifying normal and abnormal scapular motion using athletes and non-athletes with active shoulder pathology.

Methods: A convenience sample of 27 subjects with active shoulder pathology were videotaped during the performance of six test maneuvers; raising and lowering both arms overhead in the frontal and sagittal planes (weighted and un-weighted), push-ups off a table, and resisted isometric glenohumeral external rotation. Scapular motion in both shoulders of each subject was assessed by two examiners and classified dichotomously as either (1) normal or (2) abnormal for each of the six tests. The percent agreement and kappa statistic were utilized to determine the intra- and inter-rater reliability for each of the six test maneuvers and the combination of these six maneuvers for assessing scapular motion abnormalities.

Design: A methodological research design was utilized to evaluate the intra- and inter-rater reliability of the dynamic scapular classification protocol for the assessment of scapular motion in patients with shoulder pathology.

Results: The intra-rater reliability for the six test maneuvers ranged from poor to excellent (Right shoulder = 77 - 96% agreement, $k = 0.25 - 0.74$; Left shoulder = 81 - 96% agreement, $k = 0.18 - 0.87$). The intra-rater reliability for the combination of all six tests was substantial for the right shoulder (89% agreement, $k = 0.66$) and fair for the left shoulder (73% agreement, $k = 0.39$). The inter-rater reliability for the six test maneuvers ranged from poor to substantial (Right shoulder = 81 - 96% agreement, $k = -0.1 - 0.74$; Left shoulder = 70 - 93% agreement, $k = 0.0 - 0.76$). The inter-rater reliability for the combination of all six tests was fair for both the right (85% agreement, $k = 0.51$) and left (81% agreement, $k = 0.59$) shoulders.

Conclusions: In general, abnormal scapular motion was more reliably detected under loaded conditions. In addition, patients with clinical evidence of shoulder impingement and shoulder instability had a higher frequency of observable abnormal scapular motion. Future studies are necessary to further explore the clinical value of scapular classification protocols in patients with more clearly defined shoulder pathologies.

23 THE SCAPULA IN MDI - TREATMENT STRATEGY

Ann C. Mackie: *BA MCSP SRP Clinical Specialist Physiotherapist Shoulder & Elbow Unit, Physiotherapy Dept., Nottingham City Hospital Trust, Nottingham, England, UK e-mail: annmackie2@yahoo.com*

Assistant Professor Rolf Norlin gave the definition of laxity, hyperlaxity and multidirectional instability (MDI) (Ref : SECEC 99 Esse pso) which forms the basis for the physiotherapy practices used in the Nottingham Shoulder & Elbow Unit.

MDI-Treatment Strategy

The first principle of treatment of MDI is to teach the patient and carer a simple synopsis of the anatomy and the biomechanics of the shoulder girdle and then teach awareness of keeping the shoulder in joint in all movements.

The anterior/posterior tilt of the scapula, the flattening of the medial border of the scapula against the thorax with the flattening and the rotation of the inferior angle of the scapula together with the centralising of the humeral head in the glenoid is the "key" to a successful treatment strategy.

To avoid pain or feelings of instability patients often adopt abnormal movement patterns (scapular dyskinesis)

The patient is taught to dissociate between gleno-humeral movement, scapular-thoracic movement and spinal movement.

Once the patient can control the gleno-humeral joint separately from the scapular-thoracic joint then scapular/humeral rhythm is taught using mirrors.

Since patients are learning new movement patterns proprioceptive taping is used to maintain the new movement pattern. Exercises are given to build up the strength and stamina of the muscles which stabilise the scapula in addition to building up the rotator cuff muscles.

Following Ben Kibler's philosophy of incorporating whole body movement, exercises are given to regain core stability. Most patients enjoy some form of sporting activity, and encouragement of this can be used to both increase confidence and motivate the patient.

The emphasis so far has been on dynamic movement but resting positions/postures are also important. This includes sleeping positions as many patients dislocate when relaxed.

The most difficult group of patients are voluntary dislocators. The behaviour of these patients can often be recognised and some kind of "counselling" may be the most appropriate way forward before an exercise regime can be attempted.

24 DYNAMIC CONTROL OF THE SHOULDER FOLLOWING A PARTIAL SCAPULECTOMY: A CASE STUDY

Seitz AL; *Massachusetts General Hospital, Boston MA, USA*

A case study demonstrating alterations in anatomy and the implications on dynamic control of the shoulder and function is presented.

History: A 37 year old female treated conservatively for two years for rotator cuff tendonitis, was subsequently diagnosed with a left shoulder synovial cell sarcoma. She presents to physical therapy for post operative rehabilitation. The medical management including radiological series imaging pre and post operative is reviewed. The physician's surgical resection of the tumor is anatomically reviewed and briefly included partial scapulectomy including the upper two thirds of the scapula with the entire acromion sparing the glenoid and glenohumeral joint. Anatomical alterations in all associated shoulder musculature due to the surgery, functional implications, and rehabilitation considerations are thoroughly discussed. Post operative physical therapy subjective complaints were initially decreased function of non-dominant left upper extremity with inability to use arm away from side impacting grooming, and activities of daily living including caring for her 3 young children. Goals were to maximize function of her involved left upper extremity to improve ability to perform functions with arm away from side while attempting to minimize future complications that may include scapular ptosis and superior clavicle migration.

Physical Examination: Figures are used to describe posture and general positioning. Active and Passive Range of Motion of the left glenohumeral joint, cervical spine, and scapula with significant limitations are given. Strength tests of the shoulder and upper extremity in modified positions are shown. Overall assessment of clinical presentation with physical therapy impairment and functional goals are defined.

Clinical Course: Treatment that included education in activity modification, proper positioning education, a combination of man-

ual therapy and a progressive guided therapeutic home exercise program is outlined for the five month duration of her formal rehabilitation. A medical complication of a superior migration and upward rotation of the distal end of the partially excised clavicle could not be avoided and resulted in supraclavicular skin breakthrough approximately eleven months after surgery. This event required further surgical intervention with further distal clavicle excision requiring a subsequent physical therapy re-evaluation of the patient's impairments and function at the one year post operative date.

Outcome: Minimal improvement in impairments of active range of the motion of the shoulder and strength of the shoulder was obtained due to the dynamic scapular soft tissue and bony structure involved. However, there was a significant improvement in function with modifications in technique of many activities of daily living including grooming to allow use of involved upper extremity away from side by utilizing gravity or external support. The balance between allowing maximal function with discouraging use with lifting and carrying to avoid further medical complications with further scapular ptosis is presented.

25 QUESTIONNAIRES FOR SHOULDER FUNCTIONAL LOSS AND DISABILITY: CLINICAL USE

Michener LA, Department of Physical Therapy; Virginia Commonwealth University - Medical College of Virginia Campus, Richmond, VA 23298

Topic area: When an injury occurs, the patient / athlete is concerned with how this will affect their ability to perform their daily activities and work / sport. Therefore, it is imperative that we assess function as accurately and comprehensively as possible. There are two methods to assess function: observation and self-report by the patient/athlete. Observation methods are time-consuming, while self-report methods are time efficient and can be just as or more predictive of a patient's/athlete's ability to return to their previous level of function. Additionally, self-report questionnaires have demonstrated responsiveness or the ability to detect clinical change when change has occurred.

Objectives: This presentation will introduce the shoulder scales in the literature with established measurement properties. Clinicians will be qualified to implement self-report shoulder function and disability scales into daily clinical practice.

Evidence: Evidence indicates that these self-report scales of shoulder function are reliable, valid and responsive measures.

Conclusions: Numerous scales aimed at assessing shoulder function and disabilities have been developed. Only those with established measurement properties should be used to assess shoulder function and disability.

26 CONSTRUCT VALIDITY AND RELIABILITY OF SCAPULAR MUSCLE ASSESSMENT IN PATIENTS WITH SHOULDER PAIN AND FUNCTIONAL LOSS

Michener LA, Boardman ND, Pidcoe PE, Frith AM. Department of Physical Therapy; Virginia Commonwealth University - Medical College of Virginia Campus, Richmond, VA 23298

Objective: Muscle performance is a commonly used outcome measure. Muscle testing using a hand held dynamometer (HHD) of scapular muscles has exhibited fair to excellent test-retest reliability in healthy individuals. The purpose of this study was to determine the construct validity and test retest reliability of four scapular muscle tests in patients with shoulder pain and functional loss.

Methods: Subjects were recruited with shoulder pain and functional loss (n=40). The affected shoulder was tested with a HHD to measure the kilograms applied during the muscle tests for the lower trapezius, upper trapezius, middle trapezius, and serratus anterior. Simultaneously, surface electromyography (sEMG) was collected on the four muscles. The same procedures were performed 24-72 hours after the initial testing by the same tester. On both days each muscle test was performed three times, and averaged for data analysis.

Design: Correlational design.

Results: Construct validity assessment comparing sEMG of each individual muscle across the four muscle tests revealed that for the upper trapezius and lower trapezius muscles, the sEMG was statistically significantly highest during its' respective test. Conversely, the middle trapezius and serratus anterior muscle's activity was not highest during their respective tests. Intra-tester reliability coefficients [ICC (two-way random)] for HHD measures ranged from 0.89 to 0.96. The standard error of measurement (90% CI) ranged from 2.5 kg to 4.9 kg; and the minimal detectable change (90% CI) ranged from 3.5 kg to 6.9 kg.

Conclusions: In patients with shoulder pain and functional loss, the use of a HHD for assessment of scapular muscle performance using the investigated tests can be reliably performed. Error values calculated can be used to make decisions regarding individual patients. However, only the lower trapezius and upper trapezius muscle tests demonstrated construct validity.

27 EFFECTIVENESS OF REHABILITATION FOR PATIENTS WITH SUBACROMIAL IMPINGEMENT SYNDROME: A SYSTEMATIC REVIEW

Michener LA, Walsworth MK, Burnet EN: Department of Physical Therapy; Virginia Commonwealth University - Medical College of Virginia Campus, Richmond, VA 23298

Objective: Prior systematic reviews of rehabilitation for nondescript shoulder pain have not yielded clinically applicable results for those patients with subacromial impingement syndrome (SAIS). The purpose of this study was to examine the evidence for rehabilitation interventions for SAIS.

Methods: Data Source. The computerized bibliographic databases of MEDLINE, CINAHL and Cochrane Database of Systematic Reviews were searched from 1966 up to and including October, 2003. Keywords used were "shoulder", "shoulder impingement syndrome", "bursitis" and "rotator cuff" combined with "rehabilitation", "physical therapy", "electrotherapy", "ultrasound", "acupuncture" and "exercise"; limited to clinical trials.

Study Selection: Randomized clinical trials that investigated physical interventions used in the rehabilitation of patients with SAIS with clinically relevant outcome measures of pain and quality of life were selected.

Data Extraction: Search resulted in 635 potential studies, 12 meeting inclusion criteria.

Design: Systematic review.

Results: All 12 trials were graded with a quality checklist by two independent reviewers, averaged for a final quality score. The mean quality score for 12 trials was 37.6 out of a possible 69 points. Various treatments were evaluated; exercise in six trials, joint mobilizations in two trials, laser in three trials, ultrasound in two trials and acupuncture in two trials.

Conclusions: The limited evidence currently available suggests that exercise and joint mobilizations are efficacious for patients with SAIS. Laser therapy appears to be of benefit only when used in isolation, not in combination with therapeutic exercise. Ultrasound is of no benefit, and acupuncture presents with equivocal evidence. The low to mediocre methodological quality, small sample sizes and general lack of long-term follow up limits these findings for the development of useful clinical practice guidelines. Further trials are needed to investigate these rehabilitation interventions, the superiority of one intervention over another and the long-term outcomes of rehabilitation. Moreover, it is imperative that clinical guidelines are developed to indicate those patients that respond to rehabilitation.

28 IDENTIFYING PATTERNS OF SCAPULAR DYSKINESIS

Anju Jaggi Bsc (Hons) MCSP SRP Clinical Specialist Upper Limb Unit RNOHT Correspondence: Physiotherapy Dept., RNOHT, Brockley Hill, Stanmore, Middx HA7 4LP, Email: pphysio@rnoh.nhs.uk

Scapular dyskinesia is an alteration in the normal position or motion of the scapula during coupled scapulohumeral movements

(Kibler 2003). There is no specific pattern of dyskinesia to specific shoulder diagnosis and it can occur as a primary or secondary cause to shoulder pathology. Gaining scapula control and correcting these movement faults will help to gain optimum function of the bony constraints and the rotator cuff.

Alterations in scapula position and patterns of movement can occur from altered postural alignment, bony fractures, muscle inhibition and inflexibility or contractures. Most importantly shoulder pathology will result in pain and this could further lead to altered movement faults either from muscle inhibition or compensatory mechanisms adopted by the patient to try and maintain their shoulder function.

Observation of the scapula is best done from the posterior aspect. It is important to observe its resting position both from the normal and comparison to the patient's asymptomatic side. One can observe whether the scapula sits high or low on the rib cage, adducted (IR) or abducted (ER) as well as any winging of the scapula borders. Kibler describes 3 types of scapula winging which can be observed easily in the clinical setting with good interrater reliability. Motion and position of the scapula should then be examined both in elevation and in descent. Muscle weakness and scapular dyskinesia are more commonly seen in the lowering phase of arm movement. The examiner may note loss of smooth control juddery movement as the arm comes down (Warner 1992).

If scapula winging is observed on resisted ER and or abduction this can indicate weakness in the scapula stabilisers namely lower trapezius and serratus anterior. Wall push-ups or a kneeling position where weight is being placed through the forearms are useful tests to evaluate the strength in serratus anterior. Abnormalities may be seen immediately or on several push-ups with the effect of fatigue.

The Lateral Scapular Slide Measurement (Kibler 1998) is a quantitative measure to assess asymmetries of the scapula and note weakness of the scapula stabilisers. Measurements are taken in three positions where the inferomedial angles are marked and the nearest spinous process acts as the reference point. Position three where the arms are at 90 degrees abduction proves the most challenging to the scapula stabilising muscles and when measured in this way, may show asymmetries. Skin surface palpation of the scapula is indicated as a valid means of assessing scapular position and is useful in the clinical setting (Lewis et al 2002). The scapula assistance test (Kibler 1998) is a useful test to differentiate a dynamic or structural cause to shoulder impingement. Clearly if impingement or instability symptoms are eliminated by restoring scapula position there is an indication the problem is of dynamic stability and rehabilitation of the postural and scapula muscles must be sought.

Observation of the scapula is an integral part to the examination of the shoulder and its role must be acknowledged within the wide spectrum of shoulder pathologies. Objective analysis of scapula dyskinesia may have to involve expensive equipment and can be impractical for the clinical setting. Simple observation and the use of tests listed above can still be useful adjuncts to shoulder assessment and allow the examiner to appreciate a non-structural element to shoulder pathology.

References:

- Kibler W. B., McMullen J., Scapular Dyskinesia and its relation to shoulder pain. *Journal of the American Academy of Orthopaedic Surgeons*. Vol. 11, No 2, 143-151 (2003)
- Kibler W. B., Uhl T. L., Maddux J. W. Q., Brooks P. V., Zeller B., McMullen J., Qualitative clinical evaluation of scapular dysfunction: a reliability study. *J Shoulder Elbow Surg* Vol 11, No 6, 550-565 (2002)
- Kibler W. B.: Evaluation and Diagnosis of Scapulothoracic Problems in the Athlete. *Sports Medicine and Arthroscopy Review*. 8: 192-202 (2000).
- Kibler W. B.: The Role of the Scapula in Athletic Shoulder Function. *The American Journal of Sports Medicine*, Vol 26, No.2 : 325-337 (1998).

Warner J. P., Micheli L. J., Arslanian L. E., Kennedy J., Kennedy R.: Scapulothoracic Motion in Normal Shoulders and Shoulders with Glenohumeral Instability and Impingement Syndrome A Study Using Moire Topographic Analysis. *Clinical Orthopaedics and related research*. 285: 191-199 (1992).

Lewis J., Green A., Reichard Z., Wright C.: Scapular position: the validity of skin surface palpation. *Manual Therapy* 7(1): 26-30 (2002).

29 RANGE OF MOTION, STRENGTH, AND FUNCTION FOLLOWING ROTATOR CUFF REPAIR

Leggin BG, Kelley MJ, Ramsey ML, Glaser DA, Williams GR. *University of Pennsylvania Medical Center - Presbyterian, Philadelphia, PA*

Introduction: Little data exists regarding range of motion, muscle force, pain, and function during the initial twelve weeks after a rotator cuff repair.

Purpose: To describe the rehabilitation program and results of pain, range of motion, muscle force, and function measures at specific intervals during the initial twelve weeks after rotator cuff repair.

Method: Sixteen women (mean age = 51.8) and fifteen men (mean age = 53.1) underwent rotator cuff repair. The surgeon determined the size of the tear at time of surgery. There were thirteen small tears, eleven medium tears, and seven large/massive tears. Patients were seen at one, six, and 12 weeks post-op. The patients completed the Penn Shoulder Score (PSS) self-report measure of pain, satisfaction, and function at each visit. At the first visit, passive range of motion (PROM) forward elevation (FE) and external rotation (ER) were measured. At six and twelve weeks post-op, PROM was measured for FE, ER at the side and at 90° abduction, and internal rotation (IR) up the back. AROM was also measured in the same planes as for PROM. Muscle force was measured with a hand-held dynamometer for ER and IR with the arm at the side and for FE at 45° in the plane of the scapula. All patients began passive FE and ER at one week post-op. All patients were progressed to active assisted ROM for extension, internal rotation, and cross body adduction as well as rotator cuff strengthening at six weeks post-op. Additional exercises and amount of supervised therapy sessions varied by individual.

Results: Average PROM measurements for FE and ER at one, six, and twelve weeks were as follows: FE = 99.7°, 141.6°, & 150.8°; ER = 25.2°, 53.1°, & 64.8°. Average PROM measurements for ER at 90° and IR at six and twelve weeks were: ER at 90° = 66.2° & 87.6°; IR = L2 & T10. AROM measurements for all planes at six and twelve weeks were: FE = 95.8° & 138.8°, ER at 0° = 43.1° & 56.0°, ER at 90° = 40.1° & 71.5°, IR = L3 & T11. Muscle force measurements at six and twelve weeks were as follows: ER = 9.4 # & 15.5 #, IR = 16.5 # & 23.0 #, FE = 12.6 # & 23.5 #. Penn shoulder score at each measurement session averaged the following: one-week = 14.1, six weeks = 38.4, and twelve weeks = 54.9.

Conclusions: Range of motion, muscle force, and function demonstrated clinically significant improvement during the initial twelve weeks following rotator cuff repair. Clinicians can use this data to benchmark progress of similar patients. Future research should focus on similar measures over a longer time period. In additions, the effect of the amount of therapist intervention and the patient's compliance with a home exercise program on outcome should be studied.