

CLINICAL NOTES

MINOR SHOULDER INSTABILITIES

by Gisela Lauterbach

Chronic minor shoulder instabilities are commonly found with high-velocity activities such as throwing and the tennis serve, and in swimming. It refers to chronic micro-trauma involving the stabilising mechanisms of the glenohumeral joint, leading to subluxation of the humeral head during sporting activity. It has also been described as occult instability, occult recurring glenohumeral subluxation or functional instability.

Signs and symptoms are often vague and present with an impingement-like condition which seems to be resistant to therapy. Diagnosis and the treatment of this condition therefore offers a great challenge to the therapist!

This condition may result from

- Disorder of the passive stabilisers of the joint, eg hyper-elasticity of the capsule, labral tears.
- Loss of functional stability of the joint, due to weakness, loss of endurance or lack of coordination of the muscles of the shoulder girdle.

To appreciate the presentation and approach to treatment of this condition, the biomechanics and muscle firing pattern of throwing must be understood, in order that the principles can be applied to other sporting activities, such as the tennis serve and swimming. Throwing can be divided into four stages:

1. Wind-up, which consists of shoulder flexion;
2. Cocking, with abduction, followed by horizontal extension and full lateral rotation;
3. Acceleration until the ball leaves the hand;
4. Follow-through with forward flexion and medial rotation of the shoulder.

Wind-up: The rotator cuff contracts to stabilise the head in the glenoid. Supraspinatus is most active between 80 and 110° of abduction, whereas infraspinatus and teres minor activity increase steadily towards full elevation. It is this contraction that is most important for centralisation of the head. To elevate and abduct the shoulder, the scapula must rotate laterally and elevate. Scapular rotation requires a "force couple" composed of the upper trapezius, lower trapezius, levator scapulae and serratus anterior. Without this stabilisation about the ST joint, the glenoid will lose its optimal upward directed position, predisposing to subacromial impingement. The effective weight of the upper limb will increase, placing abnormal stresses on the rotator cuff. This will lead to weakness and fatigue of the supraspi-

natus, with further loss of stabilisation. Full trunk extension/rotation and pelvic rotation contribute to the stage of wind-up.

Cocking consisting of horizontal extension (30°) and lateral rotation (160-180°). Throughout this stage the rotator cuff centralises the head. Full external rotation is achieved by the posterior deltoid and the lateral rotators, while the middle trapezius and the rhomboids adduct the scapula. Serratus anterior stabilises the scapula against the thoracic wall. Eccentric contractions of the subscapularis decelerates the movement, while teres major, latissimus dorsi, and pectoralis major control the last degrees of lateral rotation and prevent excessive anterior translation of the humerus in the glenoid. Coordination and correct activation of these muscles therefore is important to minimise overstrain on the anterior part of the joint.

Acceleration: Pectoralis major, subscapularis, latissimus dorsi and teres major act concentrically as medial rotators. Lower and upper trapezius and serratus anterior contract concentrically to hold the scapula rotated and to move it laterally.

Follow-through consists of forward flexion and medial rotation of the shoulder joint. Eccentric activity in posterior deltoid, supraspinatus, infraspinatus and teres minor control the medial rotation. Eccentric contractions of the middle trapezius, rhomboids, pectoralis major and latissimus dorsi provide the decelerating force.

With instability there appears to be a compensatory increase in activity of the biceps and the supraspinatus muscles. Diminished activity of serratus anterior occurs, which diminishes protraction of the shoulder, therefore placing more stress on the anterior restraints. Diminished levels of activity of pectoralis major, subscapularis, latissimus dorsi and of infraspinatus has also been found. This imbalance, whether it is part of the primary pathological process or secondary to it, adds to the anterior instability and must be addressed specifically during rehabilitation.

Clinical presentation:

- Pain with overhead activities, either during late cocking/acceleration or during follow-through. They are often vague and difficult to localise to any specific position of the joint.
- Complaint of weakness, especially in the position of late cocking. Difference between minor instability and impingement syndrome are therefore very subtle.
- Apprehension associated with certain movement, but frequently unable to tell whether this is true apprehension or

anticipation of pain.

- Painful catches, painful intra-articular clicking or "dead arm" syndrome may be present in the late cocking phase.
- The history seldom reveals a specific injury, but moving pain sites in various seasons of play, which have been resistant to therapy.

On examination:

- The patient may present with full or excessive range of physiological movements, with pain at limit, particularly abduction and lateral rotation or horizontal flexion and medial rotation. Lateral rotation may be limited by spasm, especially in abduction, or may be excessive.
- Endfeel is often loose, less of a ligamentous tightening.
- Resisted contraction of rotator cuff muscles are painfree.
- Stability tests may be negative.
- Differentiation between lesions of the subacromial structures and of instability can be determined by adding compression or distraction to full elevation, as described by Maitland.
- Loss of proprioception, as with any injury of a joint.
- Muscle strength: A common mistake is to test strength only. Muscle control and endurance are functionally more important. On assessment of muscular control a normal scapulohumeral rhythm may be evident on active elevation and abduction. However, after repetition of movement, or elevation under a load, uncontrolled scapular patterns may be revealed. This may be more evident during lowering when the scapular stabilisers function eccentrically. Careful repetition and analysis of the sporting activity may be necessary to reproduce the symptoms and muscular control should be assessed in various functional positions.

Rehabilitation:

The goal of rehabilitation is to return the individual to pre-injury status, namely full movement, strength, endurance, coordination and speed.

Principles of treatment:

- Inflammation and pain must be treated locally.
- Re-educate synchrony of movement. It is important not to start strengthening exercises until synchrony of motion of the shoulder girdle complex through a normal range have been achieved! The first aim is to improve the static stability of the scapula, for examples during co-contraction exercises of the rotator cuff, PNF patterns of the scapula, and seated pushup. Middle fibres of trapezius are exercised in the prone position, initially with limited lateral rotation. Strengthening for the serratus anterior is very important for reasons mentioned ear-

lier. Examples are pushups, initially against the wall, progressing towards the floor, moving past the normal movement into protraction of the scapula.

- Improve dynamic control about the shoulder joint. Exercises are initiated in a neutral position where control of the movement is retained. Short lever exercises are used, for example bilateral shoulder flexion, with the elbows in 90° flexion. These are progressed towards the position of instability, and towards the movement of the sporting activity. As control improves, the rotator cuff muscles are exercised concentrically and eccentrically against resistance, for example with surgical tubing or weights. Strengthening only the lateral rotators for posterior instability and the medial rotators for anterior instability fails to recognise the entire function of the cuff.
- Increase muscle strength and endurance. Only when full control of movement is achieved, can resistance be increased. Weight training is included using low weights at high repetitions to

emphasise endurance. Isokinetic exercises, concentrating on the rotators, are instituted initially in the neutral position. High speed, 180-240° are used, again to emphasise the control and endurance. From the neutral position these exercises are progressed towards 90° of abduction.

- Re-educate proprioception. By improving muscular control, joint and muscle afferents are stimulated, thereby eliciting reflex activity and improving muscular control, joint and muscle afferents are stimulated, thereby eliciting reflex activity and improving proprioception. Additional exercises, with wobble board and ball are included.
- Improve flexibility. Optimal control requires a proper balance of muscle length between agonists and antagonists to prevent further stress on glenohumeral and subacromial structures.
- Introduce the sporting activity. The specific movements are included into the rehabilitation program within limits of pain. Initially emphasis is on fluidity and control of movement. Start with small range movements for short

periods gradually progressing range and time, concentrating on accuracy and control.

Progression of exercise is always determined by the control of movement, presence of pain or related symptoms, and never by time! If the patient can throw at previous performance levels without discomfort, he/she may return to competition. Never forget to include lower extremity and trunk strength work into the training program.

Rehabilitation of the minor shoulder instability can be very complex. However, with careful analysis of the muscle firing pattern, and correction thereof starting proximally with the scapula control, good results can be achieved. It must be kept in mind, that conservative treatment is not sufficient if disorders of the passive stabilisers are present. Post-operatively the same principles of treatment are followed, with close liaison between the patient, surgeon and therapist.

This paper was presented at the Congress of the South African Sports Medicine Association, Cape Town, March 1993.

IN MEMORIAM – KATHLEEN OLIVE SWEET Née HARRIS, MCSP

Died suddenly in Fish Hoek on 30 August 1993.

She trained at Manchester Royal Infirmary, qualifying as a Chartered Physiotherapist in 1952. Shortly afterwards she came to South Africa and settled in the Cape.

She joined the Cape Provincial Administration in 1961 and worked her way through the ranks, becoming a grade 1 physiotherapist in 1967, and a principal in 1974. From 1969 she was based at the South Peninsula Group of Hospitals, and was eventually responsible for physiotherapy services within the group, until she retired.

It was through her efforts that the Neuro Rehabilitation Centre, now based at the Lady Michaelis Hospital, was established.

As a person she was quiet, charming, and courteous, and her staff and colleagues found her ever helpful, caring, ready to listen, and dependable. Although generally self-effacing she was always able to offer sound, constructive advice, and what she said was worth listening to. She was noted for her steady persistence in the face of (sometimes strong) opposition until she had achieved her objectives. She held her profession in high esteem and served on many committees aimed at enhancing patient care.

She had an incredible zest for life, and her interests were wide ranging. She was a member of International Training for Communication (ITC), and was very involved with Community Projects, particularly those aimed at young people. At the time of her death she was actively involved in teaching English to underprivileged children. She loved the outdoors, and the Western Cape mountains were very special to her. She enjoyed hiking, and following adventure trails. Two of her latter exploits were: Rafting down the Orange River with her two grandchildren, and exploring Bushmanland on a Camel!

She was an avid reader, good with her hands, and an active member of the Historic Club of Simonstown. She was a devoted wife, mother and grandmother.

Her sudden and untimely death has come as a great shock to those of us who were privileged to know her, and we extend our heartfelt condolences to Leonard, Alison and Hennie, grandchildren Hannes and Nicky, and to all members of her wider family circle.

Thanks HPI for giving me the opportunity to work in the States for a year. I loved my job and I couldn't have done it without you.

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