We diagnosed 50 patients (58 shoulders) with a mean age at presentation of 17.3 years, as having involuntary positional instability of the shoulder. They were managed by a programme consisting of a careful explanation, analysis of abnormal muscle couples and then muscle retraining carried out by a specialist physiotherapist. The mean follow-up was two years. Six shoulders had a poor result, but 52 were graded as good to excellent. Nine patients (12 shoulders) relapsed and required further episodes of retraining.

In our experience, involuntary positional instability of the shoulder causes symptoms which interfere with normal activities; these can be controlled by a treatment plan of retraining of the muscle pattern with functional benefit. Only 19 of the patients were referred with a diagnosis of positional instability. There should be more awareness of this rather uncommon condition. Surgery is not indicated in these patients.

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Although voluntary dislocation of the shoulder had been previously described, Rowe, Pierce and Clarks¹ were the first to analyse the condition in depth. They noted that dislocation could be produced by suppression of one element of one of the muscle force-couples responsible for normal movement of the shoulder. They described the condition as voluntary dislocation of the shoulder and stated that most patients responded well to muscle-strengthening exercises. They also observed that some may have psychiatric abnormalities and that they respond poorly unless these problems are addressed. If surgical treatment is to be undertaken then a combination of procedures is necessary. Huber and Gerber,² in a retrospective long-term study, reported the natural history of what they described as voluntary (habitual) subluxation of the shoulder. Their patients fell into the category which we have called involuntary positional instability. This can be defined as an instability caused by an abnormal unbalanced muscle action which is involuntary and ingrained. The head of the humerus subluxes or dislocates every time the shoulder passes through a particular phase of movement. The condition is relatively uncommon and the aetiology is often not apparent. The usual patient is an adolescent and the direction of the instability posterior.

Huber and Gerber² found that the final outcome was favourable without any treatment. What is not known is whether involuntary positional instability causes symptoms sufficient to interfere with function and whether the symptoms, if any, can be influenced by treatment. Our aim was to answer these questions, to report our experience of the management of this condition and to justify the use of the term involuntary positional instability to describe it.

Patients and Methods

Between January 1990 and December 1996, we studied 50 patients with involuntary positional instability of the shoulder. There were 29 women and 21 men with a mean age of 17.3 years (9 to 32). The dominant side was affected in 38 patients, the non-dominant side in four and both shoulders in eight making a total of 58 shoulders. The mean duration of symptoms was two years and four months (4 months to 14 years). Five patients had had symptoms for more than five years.

The diagnosis was made clinically. The patient was observed to sublux or dislocate the shoulder, usually posteriorly, every time it passed through a particular phase of movement. An abnormal involuntary pattern of muscle contraction was seen. There was no history of any injury which would have been expected to dislocate a structurally normal shoulder. Sixteen patients reported some minor injury before the onset of symptoms. A voluntary component was noted in 22 patients in that they could sublux or dislocate the shoulder deliberately to command, but this was not essential to the diagnosis. In 39 patients the direction of instability was posterior.
Most of the patients (36) had been referred from other orthopaedic surgeons although ten had been sent by their general practitioner and three by physiotherapists. The correct diagnosis had been made before referral in 19 and 24 had received no treatment. The other 26 patients had been treated by physiotherapy, without benefit. In addition, four had had a period of immobilisation, four had had local injections of steroids, two a manipulation under anaesthesia and two an operation.

We developed a protocol of treatment which has three phases. The first is diagnosis and explanation by an orthopaedic surgeon. The second is the identification of the abnormal pattern of movement and the muscle groups involved. The third is the teaching of the patient to recognise the inappropriate patterns and re-education with use of a tactile biofeedback technique so that a normal pattern of muscle activity and shoulder stability can be restored. Phases two and three were carried out by a physiotherapist with a background of treatment of children in which the understanding of the abnormal pattern of movement and its correction is paramount.

Details of the treatment. The first of the two phases of the physiotherapist’s programme of management consists of a visual analysis of the abnormal muscle patterns. Careful observation of the resting posture and the movement which occurs as elevation of the shoulder is initiated will often reveal the primary inappropriate pattern, rather than the more obvious secondary one; it is the former to which retraining must be addressed. Although almost any abnormal pattern can occur, many patients with the more common posterior subluxation demonstrate underactivity of the external rotators and posterior deltoid, with the medial rotators, anterior deltoid and latissimus dorsi being over-active. In addition, the patients medially rotate the glenohumeral joint, hold it in this position and then initiate movement of the shoulder with a reversed scapular action so that the inferior angle ‘wings’ out and the scapula is prevented from protracting forwards and upwards in the usual smooth fashion. This is most obvious when the arm is moving under the influence of gravity. These patients have difficulty in actively moving the scapula in a controlled fashion. Thus, when asked to shrug their shoulders and then relax, the scapula elevates and descends with a visible ‘jerky’ pattern of movement.

In the second of the physiotherapist’s phases, independent scapular movements are regained; these are elevation and depression and protraction and retraction. The muscles responsible for these movements are worked both concentrically and eccentrically so that the scapula moves smoothly both with and against gravity. This is achieved by working on each individual movement before attempting to combine them. It is often helpful if the physiotherapist initially places a hand on the scapula or holds the inferior angle gently between thumb and forefinger, and then lightly pushes or guides the scapula in the appropriate direction. This gives the patient the sensation of the correct pattern of movement as distinct from an isolated muscle contraction. We have termed this ‘tactile biofeedback’. Once the patient understands the movement they must practise it continually until the fluidity and control are established. It is important to regain active control of the scapula so that the glenoid remains correctly aligned with the head of the humerus during shoulder elevation. Once control has been achieved attention is turned to the glenohumeral joint. At rest, the head of the humerus usually appears to be centred, but as movement is initiated it often moves into an eccentric position; this can be posterior, anterior, inferior or a combination of these. The initial assessment will have determined which is the primary pattern in any individual. The patient then works on the movement which opposes the primary abnormal one. In the most common pattern, in which the initial movement is an excessive internal rotation of the glenohumeral joint, the patient is taught by the physiotherapist to work on active external rotation of the humeral head. By working on active movements of the underactive muscles it is intended to produce reciprocal inhibition of the overactive group responsible for the primary abnormal pattern. Initially, the patient works with the shoulder in neutral abduction. At the same time the therapist observes the scapular activity to ensure that there is no reversion to the abnormal pattern. If this occurs the patient goes back to working on scapular control. Once this and the primary glenohumeral pattern of movement have been established, the patient then begins to elevate the arm both in the scapular plane and in true abduction, with the therapist checking that no reversion to abnormal patterns occurs. In the example of the patient who presents with abnormal medial rotation as elevation is initiated, it may be necessary to teach them actively to rotate the glenohumeral joint externally before raising the arm. The patient then progresses to work the shoulder in patterns of movement of increasing complexity. Activities are done with the shoulder flexed forward and abducted to 90°. As control is established functional activities are introduced with the shoulder being challenged in all positions. Resisted weights such as lateral pull-downs, push-ups and any activities which work the posterior muscle groups are introduced, once control has been regained.

The only activities which are discouraged in the first few weeks are those which increase the activity of the pectorals and the anterior deltoid muscles. The use of resisted weights is designed to increase the performance of the underactive muscle groups; it therefore requires high repetition with low resistance rather than large weights which increase strength. In this condition the muscles are not weak, but working in the wrong sequence. If the weights are increased the patient tends to revert to the abnormal patterns of movement in an attempt to overcome the resistance. It is important to emphasise that at first the movements will feel odd. As the new pattern is established this feeling resolves.

Once the patient has an understanding of the problem,
established a normal pattern of movement and can ‘feel the difference’, they are discharged. They continue to practise the patterns of movement on a daily basis. They are encouraged to use the shoulder and challenge its stability, but in a controlled fashion. For example, a swimmer may be told to practise strokes, but not to attempt anything competitive. The patients are reviewed at three weeks. If there has been any return to abnormal patterns of movement it is corrected at this stage. If all is well no further appointments are made, but an open access system is offered so that patients can telephone for advice or review as necessary.

Early in the series a biofeedback machine was used in 14 shoulders; this provided an auditory feedback to the patient when the correct muscle group was contracting. It was found with experience, however, that the tactile stimulus of the physiotherapist’s fingers on the relevant muscle group was better. The patient and the physiotherapist can feel when the muscle contracts, hence the term tactile biofeedback.

Since the process is essentially a retraining exercise, frequent reinforcement of the newly learned pattern is initially required. Three to four sessions of treatment are needed on each of the first two days. To achieve this, particularly when the patient lives some distance away from the hospital, it is necessary to admit them to the minimum care unit. A total of 40 patients was treated on this basis. Ten, who lived sufficiently close to the hospital, attended as outpatients spending most of the first two days in the physiotherapy department. Hydrotherapy was used as a supplement in seven patients.

No patient was lost to follow-up. We analysed the records of both the clinician and the physiotherapist. An independent observer (VJT) who was not involved with the diagnosis or treatment contacted the patients and carried out the assessment. All patients were given a questionnaire. They were asked to score their shoulder on a visual analogue scale from 0 to 10, in which zero was as bad as could be possibly imagined and ten entirely normal. The questionnaire asked about present symptoms and functional activities of daily living including sports and hobbies. The mean follow-up was for two years (4 months to 5.5 years).

We graded the functional outcome into three groups: excellent, in which the patients were free from symptoms and had no restriction of activity; good, if they continued to have some degree of symptoms, but no restriction of activity; and poor in which there was restriction of activity even if there had been some benefit from the treatment.

Results

One patient was asymptomatic with involuntary positional instability of the shoulder identified as an incidental finding during treatment for neck pain. The other 49 patients had troublesome symptoms, mainly pain, which interfered with their activities at school, sports or work (Table I).

The mean time to establish a normal pattern of muscle action and to control the involuntary positional component was 2.7 days (0.5 to 10). Most of the 22 inpatients required one night in the minimum care unit and 1.4 follow-up visits. Those treated as outpatients required 4.5 visits of approximately 30 minutes’ duration. The patients who benefited from the treatment took a mean of ten weeks to become asymptomatic after regaining control of the shoulder.

Nine patients (12 shoulders) relapsed after the initial period of treatment and required a further course of biofeedback at a mean of nine months after the initial treatment. All subsequently regained and maintained control of their shoulders.

Figure 1 shows how the 50 patients scored their shoulders before and after treatment. We graded 31 shoulders as excellent, 21 as good and six as poor. None became worse after treatment.

Discussion

Classification of instability of the shoulder can be confusing. Terms to describe direction such as anterior and posterior are precise, as are words used to identify temporal relationships such as acute, recurrent and chronic. There is a clear understanding of subluxation as compared with dislocation. The distinction between a traumatic and an atraumatic aetiology can be made although there may be debate as to whether the initial episode was caused by a force sufficient to justify placing it in the traumatic category. When terms such as voluntary, involuntary and habitual are used there is potential for confusion. Rowe et al. used the term voluntary and indicated that all their patients had acquired the ability to dislocate one or both shoulders voluntarily by a deliberate muscle action. A number of their patients had episodes of instability which were not deliberate acts, but occurred spontaneously. They divided their patients into two groups; those with and those without psychiatric disturbance. The former were resistant to the usual therapies, whereas the latter largely responded to a muscle-strengthening regime. While we would argue with the concept of strengthening we agree that such patients respond to a retraining programme. Huber and Gerber used the term ‘voluntary’ to describe the subluxation in their patients and qualified it with the word ‘habitual’ in parentheses. It is clear that their patients included those whose instability did not always occur with a deliberate voluntary act. Others have used the term voluntary as

<table>
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<th>Symptoms</th>
<th>Number of patients</th>
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<tbody>
<tr>
<td>None</td>
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</tr>
<tr>
<td>Pain</td>
<td>46</td>
</tr>
<tr>
<td>Dysfunction</td>
<td>47</td>
</tr>
<tr>
<td>Clicking</td>
<td>20</td>
</tr>
<tr>
<td>Locking</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>11</td>
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</table>

Table I. Details of the various symptoms reported by the 50 patients

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being synonymous with habitual. We think that it is important to distinguish between those who displace their shoulder as a result of a deliberate voluntary act from those in whom it displaces frequently and involuntarily in some positions and with certain movements. In both groups the subluxation or dislocation is caused by unbalanced muscle action. In the first group there may well be a psychiatric disturbance, which requires attention, while in the latter an abnormal psychological profile is unusual. It is true that a proportion of the patients in our series could also voluntarily displace the shoulder to command, but their main problem was that they had lost control so that the displacement occurred involuntarily, often with every movement. We think that the term ‘involuntary positional instability’ describes this situation well and avoids the confusion associated with the term ‘habitual’ which has tended to be used in the past to include these patients.

There is no large series in the literature of a homogeneous group of patients with involuntary positional instability. Huber and Gerber, in their long-term follow-up of 25 children with the condition which they described as voluntary subluxation, concluded that judicious neglect with no restriction of activity and no physiotherapy was better than any form of operative treatment. 

The involuntary positional condition is essentially a disorder of movement due to abnormal and poorly synchronised muscle activity. Our patients were offered a plan of treatment based on the principles of careful explanation, a visual analysis of the abnormal muscle couple and then a programme of retraining of the muscle pattern carried out by the same physiotherapist. Explanation was given by the clinician rather than the physiotherapist, so that he was able to stress to the patients how their condition differed from that of traumatic dislocation and to emphasise that any surgical management was inappropriate. Furthermore, he could inform the patient, independent of the physiotherapist, as to why the treatment was different from that which the patient had already received. It was explained that they had lost muscle control over their shoulder at a subconscious level and that they needed to regain this themselves.

The value of a therapist with background training in paediatric orthopaedics lies in the ability to recognise abnormal motor patterns and to use the described tactile method to correct them. Williams and Warwick state that movement, and not individual muscles, are represented in the cerebral cortex. The principle of treatment which is consistent with that view, is to educate the patient to regain a normal pattern of muscle activity at a subconscious level. The stages of the treatment are to control abnormal primary movement and inhibit the overacting muscles by reinforcing the antagonists. Reinforcement is always easier than inhibition. Once control is gained in the full range under supervision the patient can return to graduated functional activities.

There is a perception that this condition does not cause troublesome symptoms. All except one of our patients had problems at school, at work or with sporting activities. In most the treatment appeared to produce a rapid resolution of symptoms, but the nature of the study is such that we cannot state whether they would have resolved spontaneously. The fact that the patients had had symptoms for a long time and that these became resolved at a mean of ten weeks after treatment, implies that there was benefit from the regime.

In 31 patients, the condition had not been recognised before referral. This may be explained by its relative rarity in comparison with other forms of shoulder instability, but indicates that there should be increased awareness of the condition. Appropriate management is impossible without the correct diagnosis.

Our study could be criticised for the subjective nature of assessment at review. The symptoms are largely subjective and success from the patient’s perspective is the ability to return to all normal activities free from symptoms. We have used strict criteria in that even patients who improved were
placed in the poor category unless there was no restriction of activity.

It may also be said that the benefit of treatment was largely due to the attention given to the patient by the individual therapist rather than the specific programme of muscle re-education. Although we cannot totally refute the argument it is relevant that half the patients had had previous treatment and had not responded. The follow-up period is relatively short and we cannot be certain about the longer-term outcome. These patients will continue to be reviewed. Nevertheless, to date, 82% of our patients have gained freedom from symptoms without relapse for two years. We think that this is a worthwhile gain from a relatively simple and inexpensive regime.

References


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