Until relatively recently, discussion of shoulder instability referred only to traumatic and recurrent dislocations. Better clinical diagnosis and improved methods of investigation have now led to the recognition of subtle clinical lesions which present with no true dislocation, and show the increasing requirements of patients and sportsmen. Shoulder instability has become a fully-fledged syndrome, but precise terminology and rigorous classification are essential to obviate confusion. Instability should be considered from the point of view of the patient’s description of symptoms of pain or subluxation.

Classification should be based on the frequency, degree, direction and presumed aetiology. Information is gained from an accurate history, which is essential, detailed clinical examination and the numerous tests to establish the distinction between instability and laxity. Standard radiographs and specific views may reveal pathognomonic bone lesions.

A purely clinical classification includes three groups: Dislocation. This is a total and permanent loss of contact between the joint surfaces leading to a chronically displaced position of the arm requiring reduction. Subluxation. This is a partial loss of contact, permanent or temporary, at the glenohumeral joint. There can be no precise anatomical definition; the limits of normal excursion of the humeral head remain undefined. The patient describes a feeling of instability and can achieve self-reduction without assistance. It is sometimes difficult to differentiate between dislocation and subluxation, but this has little importance since the anatomical lesions are identical. Pain in the shoulder after an undetected episode of instability. There is no sensation of instability and the patient does not report episodes which suggest dislocation or subluxation. Pain is the sole symptom; it increases during overhead activity of the arm. Various imaging techniques or arthroscopy may reveal typical lesions that confirm instability.

Each of these three types of instability can then be classified according to four clinical criteria: direction (anterior or posterior), frequency (acute, recurrent or chronic), aetiology (traumatic or atraumatic, voluntary or involuntary) and structural factors (inferior hyperlaxity) (Table I).

### Clinical Aspects

**Recurrent dislocation**

*Aetiology.* This occurs three times more often in men than in women, and the dominant extremity is involved in 60% of patients. Bilateral dislocations are rare and are suggestive of hyperlaxity. It occurs in all age groups but is more common in patients under 30 years old. Sport is an important factor: about 75% of first-time dislocations are sustained during sporting activities (Walch et al 1989).

*Clinical examination.* Careful history-taking and examination are essential when evaluating a first episode of dislocation, whether it is traumatic or atraumatic. Reduction may have been by a third party or a doctor, with or without general anaesthesia, and with or without subsequent immobilisation and rehabilitation.

A clear-cut distinction between traumatic and atraumatic episodes is essential, since all first-time atraumatic dislocation (such as during swimming) suggest some structural hyperlaxity. Several days or weeks may elapse before recurrence; this will depend on the duration of any immobilisation, rehabilitation, delay before resuming sporting activities, and the level and nature of the sport. The earlier the recurrence the shorter is the usual delay between the first episode and operative treatment.

**Recurrent subluxation.** The classification is purely clinical. These patients complain of acute pain with a feeling of slipping of the joint, or of jerking or locking, which can immediately be corrected by an autoreduction manoeuvre.
(sometimes unconscious) with the elbow close to the body. There has been no true dislocation. Blazina and Satzman first described anterior subluxation in 1969, but Trillat, Déjour and Roullet (1965) had reported identical observations which they described as the ‘glenoid labrum syndrome’. A review of these cases has shown that they were true recurrent subluxations, often associated with a glenoid fracture. Others also used the term subluxation, but not always with the same definition.

Rowe, Pierce and Clark (1973) included patients who had shoulder pain with arm fatigue associated with an overhead throwing motion and also the ‘dead-arm syndrome’. This may be attributed to subluxation, although the precise pathogenesis is uncertain. Subluxation may at first be atraumatic, but it is usually clearly traumatic in young male patients who practise contact sports such as rugby, judo, ski-ing, canoeing, or kayaking, all of which entail forced external rotatory abduction. Radiography may show signs of instability, such as humeral fracture impaction or a glenoid lesion (present in 97% of cases, according to Patte and Bernageau (1988)). A fracture-impaction of the humeral head (the Malgaigne or Hill-Sachs lesion) confirms that the humeral head has ridden over the anterior glenoid rim at least once. This is compatible with the above definition of subluxation, since this implies no limit to the subluxation of the humeral head, provided that no reduction manoeuvre is required.

Shoulder pain after occult episodes of instability. The syndrome was first mentioned by Patte and Bernageau (1988) to describe pain for which a careful history and examination had failed to demonstrate any definite feeling of instability. Clinical examination of such a patient always reveals pain with the arm at 90° abduction, with external rotation and retropulsion. The pain is usually recognised by patients as being ‘their’ pain. Systematic examination may reveal other painful manoeuvres, such as that due to a rotator-cuff syndrome, but the main symptom in such patients is pain during overhead activity.

This syndrome is seen in young top-level athletes in sports such as tennis, volley-ball or hand-ball, as well as weight-lifting, body-building, the butterfly stroke in swimming and baseball pitching. All complain that the pain inhibits overhead activity of the arm. A number of authors (Warren 1983; Rowe 1988; Neer 1990) relate this pain to repetitive stretching of the anterior capsular ligaments, leading to subluxation of the humeral head. Jobe et al (1990) go further; they consider that anterior subluxation by progressive stretching of the anterior structures leads to a secondary impingement with the coracoacromial arch.

We consider that pain in the shoulder during overhead movement can be related to instability only if radiography, arthrography or arthroscopy reveals the obvious lesions of anterior instability. The concepts of ‘progressive distention’ or ‘strain effect’ are not sustained by objective data.

**DIAGNOSIS**

**Clinical examination.** In a similar fashion to the knee, it is necessary to differentiate between the various tests that rely on patient ‘apprehension’ and examinations for laxity which establish the abnormal excursion of the humeral head on the glenoid in various positions of the arm.

**Apprehension test.** (Fig. 1) This is the main pathognomonic sign. The patient is seated, and the examiner stands behind him. With one hand he grasps the patient’s elbow and raises the arm to 90° abduction in external rotation. He then places his other hand on the involved shoulder, fingers to the front and thumb at the back. The test is carried out by slowly increasing the external rotation and retropulsion of the arm while the thumb of the other hand gently moves the humeral head forward. The patient may become so apprehensive that the examiner is unable to complete the test. Apprehension or fear is evidence of chronic anterior instability of the shoulder.

**Anterior drawer.** (Figs 2 and 3) This may be investigated by two techniques.

In the method of Rodineau, Courroy and Krzentowski (1980) the patient bends forward, arms hanging, completely relaxed. The examiner stands behind him, using one hand to stabilise the scapula and the other to test the anteroposterior mobility of the humeral head over the glenoid. Some posterior-drawer movement is physiological and normal. Anterior-drawer testing often causes grinding or clicking. The investigation is confirmed by testing the other shoulder.

In the method of Rockwood (1984), the subject is seated, with his forearms resting on his thighs and his shoulders...
relaxed. The examiner stands behind him, using one hand to stabilise the scapula and the clavicle and the other to grasp the humeral head to test anteroposterior mobility. Rockwood considered that a normal shoulder is soon locked by forward movement, with only slight translation. A thud or cracking sound during anterior translation or reduction suggests a tear of the labrum or a Bankart lesion.

These drawer tests have only relative value as regards anterior instability, since an apparent abnormality may be found in the opposite asymptomatic shoulder. A large, painless drawer movement is evidence of hyperlaxity but not of instability. Some authors suggest that these tests should be performed under general anaesthesia (Gerber and Ganz 1984; Cofield and Irving 1987; Gerber 1989).

**Inferior hyperlaxity.** (Fig. 4) The patient is seated, with the arm hanging at his side. The examiner exerts downward traction on the arm; the development of a sulcus under the acromion is evidence of inferior laxity. This test is essential: it detects those patients in whom a standard surgical repair may fail.

A positive test, however, is always bilateral even if the contralateral shoulder is totally asymptomatic. Bilateral hyperlaxity of the glenohumeral ligaments is not necessarily pathological.

The ever-present problem is the exact definition of the term ‘instability’: it has been loosely used to describe both laxity and instability, which are two entirely different concepts. Instability has a strong pathological connotation, which is not true of inferior hyperlaxity, since this can be detected in many asymptomatic shoulders. It is essential to draw this distinction between inferior hyperlaxity and anterior instability, even when the latter is confirmed, since surgical stabilisation of the shoulder will be more problematic and likely to fail (a surgeon cannot repair a histological anomaly!). For this reason, we recommend the use of the terms ‘inferior hyperlaxity’ or ‘multidirectional hyperlaxity’ rather than ‘inferior or multidirectional instability’ (Gerber 1989).

**Relocation test.** (Fig. 5) With the patient supine and the shoulder protruding slightly from the table, the arm is placed in abduction and external rotation and the examiner gently pushes the humeral head forwards. Pain or apprehension are always present in anterior instability. The test is then repeated by pushing the humeral head backwards to reduce anterior subluxation and relocate the head on the

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Fig. 2
The drawer test (Rodineau et al 1980).

Fig. 3
The drawer test (Rockwood 1984).

Fig. 4
Inferior hyperlaxity (the sulcus sign).
glenoid. According to Jobe et al (1990) patients with an isolated impingement syndrome will have pain, while those with anterior instability and secondary impingement can tolerate extreme external rotation when the humeral head is held in a relocated position. This test is useful in the diagnosis of a painful shoulder in the absence of instability. Jobe et al (1990) suggest that an impingement syndrome secondary to subluxation may be the cause of the pain. When the arm is brought into the extreme throwing position, anterior subluxation is reduced and the impingement disappears.

Radiography and scanning

Radiography. Patte et al (1980) advocate four views of both shoulders to allow comparative examination:
1) an AP view in neutral rotation to evaluate the lower rim of the glenoid;
2) an AP view in internal rotation (> 50°) to reveal a fracture-impaction of the humeral head (Malgaigne or Hill-Sachs lesion);
3) an axillary view in external rotation at 90°; and
4) a profile glenoid view to detect glenoid lesions such as minimal avulsion of bone, bony defect or fracture (Bernageau et al 1976). This view is important, and has been reported widely.

Lesions of the glenoid are seen in more than 90% of cases of recurrent traumatic dislocation and subluxation, and the diagnosis is confirmed by the presence of a fracture-impaction of the humeral head or a lesion of the anterosuperior glenoid rim, however slight. There is then no need for CT or CT arthrography, unless this is required for a specific scientific investigation.

Computerised tomography. This gives excellent information on bony lesions, but minor humeral fracture and very inferior glenoid lesions may not always be seen. The use of CT is justified if anterior instability cannot be confirmed by standard radiological assessment. In such cases lesions of the anterior soft tissues (labrum and capsuloligamentous complexes) rather than bony lesions need investigation, and arthroscopy is more relevant.

CT arthrography. This should be used only after a thorough but negative plain radiological examination. Lesions of the bone and principally of the anterior soft tissues are investigated, but interpretation at the level of the superior and middle part of the joint is difficult because of possible anatomical variations of the labrum and middle gleno-humeral ligament. Anomalies are more easily demonstrated in the lower third of the joint (Trillat et al 1965). A small or absent image of the labrum is not of diagnostic value, and it is not possible to assess the volume of the anterior capsular pouch. Only a clearly hypertrophic or displaced labrum is diagnostic. Leakage of the contrast fluid between the labral anterior-ligament complex and the bone is evidence of a Bankart lesion.

Arthroscopy. For diagnosis, this investigation comes last, after negative clinical and imaging examinations have failed to confirm anterior instability. At arthroscopy, however, anatomical variation makes it difficult early in the learning curve to decide whether unusual appearances are pathological. Two areas need careful study. The first is the posterior and posterosuperior part of the humeral head. Note is made of chondral impaction or of bare bone, bearing in mind the physiological presence of a thick, cartilage-free bony band along the posterior insertion of the rotator cuff.

The second is the anteroposterior portion of the glenoid. Even a tiny disruption of the labrum and inferior gleno-humeral ligament through which a probe can be introduced is of diagnostic value. Absence of a labrum is of little importance but, conversely, the visualisation of a chondral lesion and especially of subchondral bone is pathognomonic. No emphasis need be placed on the more major lesions since they will inevitably have been demonstrated by radiography or CT arthrography.

SPECIFIC CLINICAL SYNDROMES

Chronic anterior instability with multidirectional hyperlaxity. Three out of four patients are women, usually under 20 years of age, who present with involuntary anterior dislocation or subluxation. This may at first be atraumatic during, for example, swimming or serving at tennis.
The patients may also experience more or less severe traumatic events. The rate, frequency and number of recurrences are much the same as those for classical chronic anterior instability.

Clinical examination shows a positive apprehension test and, more importantly, a positive sulcus test, with subacromial displacement when traction is applied along the axis of the arm. The same inferior hyperlaxity is observed in the contralateral shoulder. The other signs of ligamentous laxity, such as recurvatum at the knee and elbow, extension of the index finger, a positive thumb-to-wrist test, and flat feet, are not always found. Typical lesions of anterior instability are seldom detected by the various imaging techniques of radiology, CT arthrography and arthroscopy. Neer and Foster (1980) were the first to focus on this syndrome of ‘multidirectional instability of the shoulder’; they also underlined the severity of the clinical syndrome and warned surgeons against useless operations.

Despite this, some confusion has gradually arisen concerning the term ‘multidirectional instability’, which can lead to errors of default or excess. By default. If a patient presents with recurrent anterior dislocation or subluxation with no prior episode of posterior instability, any evidence of inferior hyperlaxity is soon forgotten and the patient undergoes a classical anterior shoulder reconstruction. This will probably fail. The term ‘multidirectional’ is responsible for the error; the symptoms were clearly anterior, but inferior hyperlaxity, which was not investigated or detected, was the determining factor. By excess. When a sulcus is observed in a patient who has a slightly painful shoulder, multidirectional instability is diagnosed, although inferior hyperlaxity is not pathological in itself, since it may be seen in symptom-free patients, and is always bilateral even in the absence of symptoms in the other shoulder. We prefer the term ‘inferior hyperlaxity’ or ‘multidirectional hyperlaxity’ as advocated by Gerber (1989). We acknowledge Neer’s work in first describing its existence and in warning against the hazards of surgery.

Primary treatment should include a minimum six-month period of intensive muscular rehabilitation of the shoulder. If the patient still complains of persistent instability, capsular shift surgery, as described by Neer (1990), should be considered. Good results are obtained when the postoperative conditions of a lengthy period of immobilisation and a prolonged rest period are scrupulously observed.

Voluntary chronic anterior instability. This is much less common than posterior instability. It is seen in young patients who can actively subluxate their humeral head either downwards and forwards under the influence of pectoralis major, or upwards by contraction of the deltoid. This always involves extensive multidirectional hyperlaxity of both shoulders and also specific psychiatric problems. The patients concerned should not undergo a surgical procedure.

Chronic anterior instability and rotator-cuff tear. In 1987, we reported a series of 24 patients who had undergone surgery for instability that developed after 40 years of age (Walch, Déjour and Trillat 1987). The group represented 5% of a total population operated on during the same period for chronic anterior instability. Our retrospective study stressed the frequency of associated cuff tears: 20% showed upward migration of the humeral head and 75% had indirect signs on preoperative radiographs. This is more frequent in men and the primary dislocation is always traumatic; 56% resulted from ski-ing accidents. All the patients had operations using the technique of Trillat; the rotator-cuff tear was not taken into account. At the ten-year follow-up, 63% of results were good and 88% of the patients were satisfied. We know of no other reports on the treatment of recurrent dislocations with rotator-cuff tears; at present we tend to repair the tear in patients under 60 years of age and use a single Trillat procedure for older patients (Walch et al 1987).

Postoperative re-dislocation. This is not an exceptional complication (Rowe, Zarins and Cuillo 1984; Walch et al 1986; McAuliffe, Pangayateslvant and Bayleye 1988); it poses the problems of analysis of the cause of failure and of the type of further treatment. There are two main reasons for failure. One is not repairing the anteroinferior Bankart lesion, either because the Bankart sutures were insecure or because the surgeon had overlooked this lesion during a Putti-Platt or Trillat procedure. The other is unidentified and uncorrected inferior hyperlaxity.

All cases of recurrent re-dislocation do not have the same prognosis. When this occurs within one year of the primary repair there will be further recurrences whatever technique of immobilisation and rehabilitation is applied, and further surgery will be required. When it occurs later than two years after repair it may be due to trauma; it should be treated as if it was a primary dislocation by reduction under anaesthesia, immobilisation and intensive rehabilitation.

GENERAL PRINCIPLES OF TREATMENT

Numerous publications on anterior instability of the shoulder and modern means of investigation have now clarified the causes of both instability and re-dislocation. We now recognise the importance of traumatic lesions of the inferior glenohumeral ligament (IGHL)-labrum complex, and the existence of congenital inferior hyperlaxity that can decompensate after minor trauma into true anterior instability. Three types of surgical procedure are available.

Coracoid bone block. This technique is derived from the operation of Latarjet and Bristow (Latarjet 1954; Helfet 1958); the most commonly used is the modified procedure of Patte et al (1980) called anteroinferior triple locking (Fig. 6). A multicentre study in France on 354 patients followed up for more than two years gave 76% excellent or good results, with 89% of the patients very satisfied or satisfied. The recurrence rate was 1%. The main features of
The Latarjet procedure modified by Patte et al (1980): A, site of fixation of the block on its side and alongside the anteroinferior neck of the glenoid; B, the block is the horizontal part of the coracoid process, retaining the conjoined coracobrachial tendon and part of the coracoacromial ligament. The incision through the subscapularis is between the middle and lower thirds of the tendon; C, the anteroinferior glenoid rim is exposed (capsuloligament or bone resection in cases of fracture) and decorticated; D, the bone block is secured bicortically by two malleolar screws with suture of the outer capsular flap to the remainder of the coracoacromial ligament; and E, repair of the subscapularis.

The Bankart procedure (Rowe and Zarins 1981): A, subscapularis section and dissection; B, capsule incision and exploration; C, drilling holes through the glenoid; D, replacing the capsular ligament; and E, suturing the subscapularis.
the procedure are longitudinal splitting of the subscapularis and fixation of the horizontal part of the coracoid at the edge of the glenoid or slightly more medially. It must never overhang the glenoid if early osteoarthritis is to be avoided. The most suitable fixation is an AO malleolar screw without a washer, and it should engage both cortices of the scapula. These technical details help to obviate complications such as pseudarthrosis, migration and fracture of the coracoid.

**Repair of the glenoid labrum and IGHL using the Bankart procedure.** This may be performed as an open operation or arthroscopically. The classic criticism that it produces excessive limitation of external rotation is no longer justified when the surgical technique has been performed correctly (Rowe and Zarins 1981) (Fig. 7). The results from these authors are the best that have been published to date, with 97% excellent and good results after six years and a recurrence rate of 3.3%.

An arthroscopic Bankart procedure attempts as anatomical a repair as possible by treating only the ligament lesions, but it is still at an experimental stage (Walch 1991) (Fig. 8). We reported a 20% recurrence rate, but with improved techniques and a better knowledge of the arthroscopic lesions, this procedure may eventually be a substitute for open stabilisation.

**‘Indirect’ interventions.** These have no direct action on the basic lesion of disinsertion of the lower glenohumeral ligament. Techniques such as humeral derotation osteotomy, subscapular plication or transfer of the subscapular tendon are still performed by some surgeons with results that are close to those obtained with the Latarjet or Bankart procedures.

Neer and Foster’s (1980) capsular shift is indicated when there is evidence of multidirectional hyperlaxity (Fig. 9). The inferior capsule is shifted superiorly to reduce the redundancy and the anterior capsuloligamentous volume. Postoperative requirements include prolonged immobilisation and the restriction of sporting activities for nine months.

A surgical procedure is indicated when a patient feels that he can no longer accept his functional handicap. The operation to be used depends on the surgeon; it has been established that identically good results can be obtained with different procedures. A different approach is required for multidirectional hyperlaxity. Once this has been diagnosed, an inferior capsular procedure is mandatory. Hyperlaxity generally becomes less evident and the instability can be repaired, but some laxity usually remains, with variable anatomical results.

**REFERENCES**


