FRACTURES OF THE SURGICAL NECK OF THE HUMERUS

A Study in Reduction

T. B. WHISTON, FALKIRK, STIRLINGSHIRE, SCOTLAND

Fractures of the surgical neck of the humerus are commonly grouped into adduction and abduction types, each the product of a definite mechanism, and each presenting a characteristic radiographic pattern. This simplifying of former modes of classification is advantageous not only in describing the displacement, but also in determining treatment. It is considered that a fall on the outstretched hand and the forcible adduction or abduction of the patient's arm following the moment of impact, according to the movement of the trunk, is the main sequence of events culminating in one or other type of fracture. The abduction variety is probably commoner in adults, whereas in children adduction deformity invariably occurs (Aitken 1936, Watson-Jones 1943).

The ordinary antero-posterior radiographs show the type of fracture, with or without impaction. Appearances in such films, however, can be deceptive, and in order to ascertain the full extent of the deformity, additional views should be taken—namely, the lateral or transaxillary projection with the tube directed into the axilla of the abducted arm and the cassette placed above the shoulder. If pain prevents the assumption of this position without anaesthesia, a transthoracic projection similarly will disclose the true nature of the lesion, and complete the radiographic evidence. In six of the seven cases referred to in this article, the fractures were characterised by marked rotation of the humeral head and anterior displacement of the shaft, such deformity being fully demonstrated only in transthoracic views, as the ordinary antero-posterior films gave little or no indication of its existence (Blackett and Healy 1937).

When such a displacement occurs reduction is difficult to achieve, because the surgeon is usually unable to control during manipulation the short, rotated, and abducted humeral head.

SURGICAL ANATOMY

The capsular ligament of the shoulder joint, essentially a cylindrical sleeve, is attached to the anatomical neck of the humerus superiorly, just medial to the greater and lesser tuberosities. It adheres closely to the articular margin, gradually falling away in front and behind, until on the infero-medial aspect it encroaches on the shaft half an inch from the articular surface of the head. The tendons of the supraspinatus superiorly, the infraspinatus and teres minor posteriorly, and the subscapularis anteriorly, although partly separated from the capsule by the subscapular bursa, blend with the ligament near their insertions, strengthening it and during contractions prevent its being nipped between the articular surfaces (Jamieson 1945, Cunningham 1951).

With certain fractures of the surgical neck of the humerus the proximal fragment, consisting of the humeral head, tends to assume an abducted and laterally rotated position from the selective pull of the supraspinatus and infraspinatus muscles; and in addition some degree of flexion results from contraction of the subscapularis. The distal fragment—that is, the shaft of the humerus—tends to be drawn and rotated medially; it is also displaced anteriorly in relation to the head by the action of the powerful muscles inserted into the bicipital groove—namely, the pectoralis major, latissimus dorsi, and teres major. Shortening is usually present.

FIG. 1

FIG. 2

Case 4—Man aged forty-three. Before reduction. Note rotation of humeral head in transthoracic view (Fig. 2).

FIG. 3

FIG. 4

Case 4—After reduction.

FIG. 5

FIG. 6

Case 4—Five months later. Good recovery of function after three months' mobilising exercises.

FIG. 7

FIG. 8

Case 7—Boy aged thirteen. Before reduction. Note marked rotation of humeral head and anterior displacement of shaft in transthoracic view.

FIG. 9

FIG. 10

Case 7—After reduction.

FIG. 11

FIG. 12

Case 7—Six weeks later. Full range of movements after three weeks' mobilising exercises.

The problem of reduction therefore arises from the relative immobility of the rotated humeral head, fixed by the scapulo-humeral muscles; and should attempts fail to coax the head into normal alignment with the shaft in the adducted position, then manipulation of the shaft into correct alignment with the head would seem logical. Furthermore the lateral rotary movement, imparted to the humerus during abduction by the action of the scapulo-humeral muscles, must be taken into account when manipulation is in progress. Traction on the abducted humerus is not sufficient. In addition it must be rotated laterally to restore the anatomical relationship of the head to the shaft, and incidentally to render the reduction stable (Lockhart 1930, Martin 1940, Cunningham 1951).

TECHNIQUE OF REDUCTION

The patient is anaesthetised and prepared for the application of a shoulder spica. A padded chest-piece is fitted before the manipulation is carried out. Alternatively manipulation may be performed first, the arm held in position, and a padded chest-piece then applied while films are being developed to check the reduction.

If the left humeral surgical neck is involved, the surgeon grasps the patient's left elbow with his left hand, taking the patient's left hand in his right, and flexing the patient's elbow to 90 degrees. He then applies steady and controlled traction to the abducted upper arm, and gently rotates the shaft of the humerus laterally, using the patient's forearm as a lever. Countertraction on the chest wall helps to steady the trunk and increase the pull. Two films, an antero-posterior and a lateral, are taken. It may be necessary to apply manual pressure to the shaft of the humerus to improve the position in one or other plane.

When satisfactory reduction has been obtained a padded arm-piece is completed, fitting closely around the shoulder and well moulded. Whenever possible without disturbing the position of the reduction, the final degree of abduction should be below 90 degrees with the upper arm flexed slightly to approach the plane of the scapula, but moderate lateral rotation must be maintained to ensure the stability of the reduction. Further films are taken and if the position is satisfactory a supporting strut may be added. Sometimes wedging may be required.

After about six weeks the arm-piece is bivalved and, if union is judged to be sufficiently advanced, active abduction and medial rotation exercises are begun. As soon as active abduction above 90 degrees is possible the spica is removed and the arm supported in a sling, with a large pad of wool in the axilla. At first adduction and medial rotation are necessarily limited, but with assiduous exercises rapid improvement in range should occur.

By this technique good reduction has been obtained in each of the seven cases in which it has been used. Illustrative radiographs are shown in Figures 1 to 12.

DISCUSSION

Certain fractures of the surgical neck of the humerus, characterised radiographically by marked rotation of the humeral head and anterior displacement of the shaft, are difficult to reduce. The full extent of the displacement is appreciated only when transthoracic views are taken in addition to antero-posterior films. The humeral head, fixed by the scapulo-humeral muscles in an abducted, laterally rotated, and slightly flexed position, usually resists manipulative attempts to restore normal alignment of the head to the shaft in the adducted position. Accurate reduction, verified radiologically, was obtained by using the technique described above.

It is suggested that in young and active patients exhibiting such fractures with typical gross displacement, in whom accurate reduction is desirable with a view to obtaining good recovery of function, this method should prove effective. A spica skilfully applied in the abducted and laterally rotated position is quite safe, and indeed soon relieves pain at the site of fracture.

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