

Surgery of the rheumatoid shoulder

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The patient with rheumatoid disease who has an affected shoulder joint complex will have restriction of movements and will usually complain of pain. Not infrequently the pain is attributed to a flare in disease activity, the arm is rested by the side with the forearm across the trunk, and the resolution of the pain is associated with permanent restriction of motion. As a result of this many patients may not present with shoulder complaints until they cannot cope with many of the activities of daily living and have pain even at rest. On occasion it is the deterioration in lower limb joint function and the consequent need to use walking aids that highlights the state of the shoulder joint. As at least two thirds of adult rheumatoid patients have shoulder pain,^{1 2} and the shoulder is affected in 90% of hospital patients with rheumatoid arthritis,³ it is important to have an

understanding of the natural history of the problems so that rational treatment can be planned.

Patterns of joint disease

Rheumatoid polyarthritis can, by definition, affect any or all of the components of the shoulder joint complex. Disease of the sternoclavicular joint is not uncommon but only rarely requires specific treatment. It is the acromioclavicular and the glenohumeral joints, together with the subacromial region, which require most attention. Dijkstra, Dijkstra, and Klundert in a radiological study of the rheumatoid shoulder emphasised that changes in the acromioclavicular and the glenohumeral joints do not follow the same course either in time or in the severity of joint destruction.⁴ Radiological

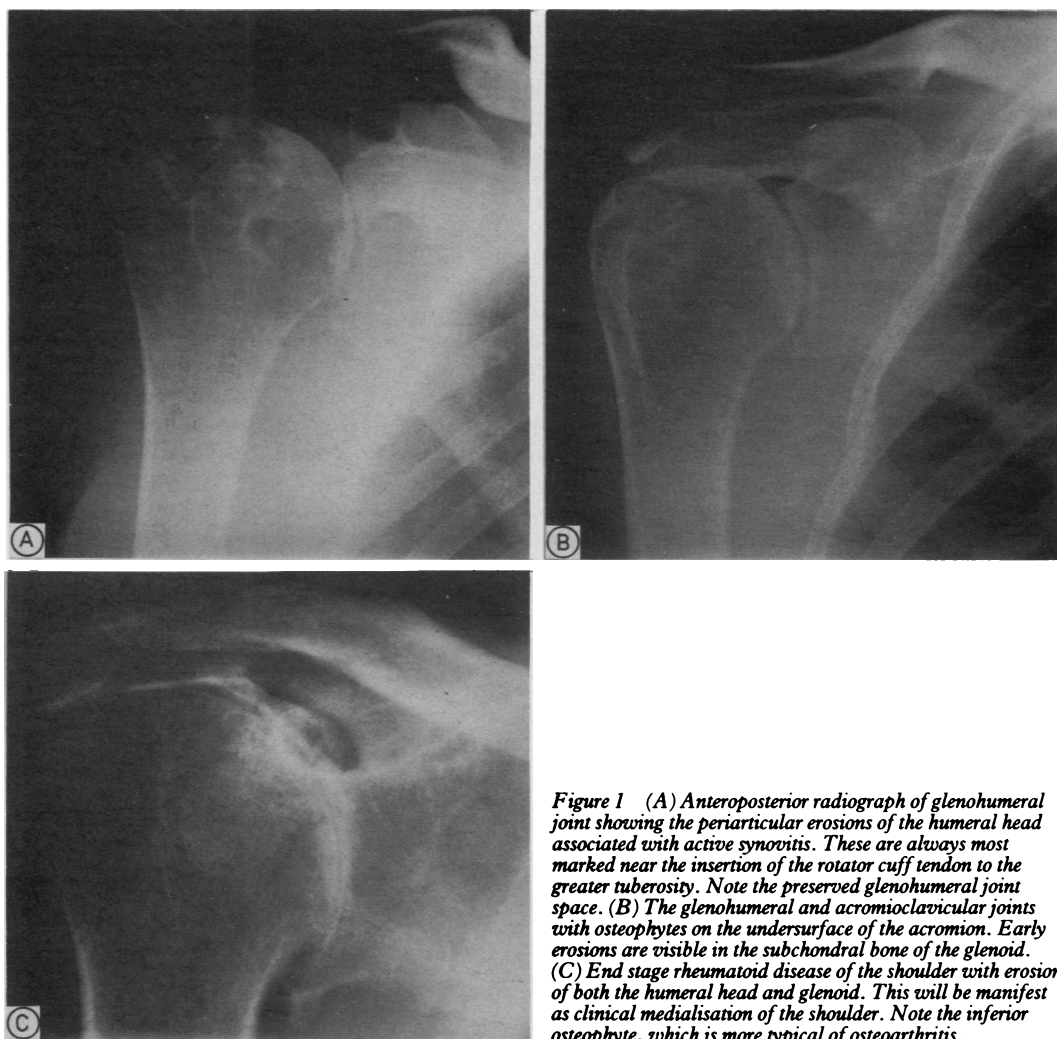


Figure 1 (A) Anteroposterior radiograph of glenohumeral joint showing the periarticular erosions of the humeral head associated with active synovitis. These are always most marked near the insertion of the rotator cuff tendon to the greater tuberosity. Note the preserved glenohumeral joint space. (B) The glenohumeral and acromioclavicular joints with osteophytes on the undersurface of the acromion. Early erosions are visible in the subchondral bone of the glenoid. (C) End stage rheumatoid disease of the shoulder with erosion of both the humeral head and glenoid. This will be manifest as clinical medialisation of the shoulder. Note the inferior osteophyte, which is more typical of osteoarthritis.

changes in the acromioclavicular joint commonly predominate in the early stages. My own observations suggest three patterns of disease. Firstly, there is the least common group in which the glenohumeral synovitis is active and produces large erosions at the margins of the humeral head (fig 1A). The glenoid bone stock is usually preserved and there is a high incidence of rotator cuff rupture. In the second group, although there may be radiological changes in the glenohumeral joint, these are usually no more than joint space loss or narrowing, and radiological changes in the acromioclavicular joint and the underside of the acromion predominate (fig 1B). These patients have rotator cuff impingement and may have small defects in the supraspinatus tendon. The third group is encountered about as often as the second and comprises severe erosion of the acromioclavicular and glenohumeral joints with significant loss of glenoid bone stock (fig 1C) and clinical medialisation of the shoulder. The rotator cuff may be thinned but is intact in at least 80% of these patients. Patients in the first group rarely seem to progress towards the changes in the third group, but progression between the second and third groups is not infrequently seen.

Radiology

To localise the changes occurring in the rheumatoid shoulder joint good radiographic views are required. The glenohumeral joint lies at an angle of 30° to the coronal plane with the glenoid cavity facing anteriorly. To assess the joint space it is therefore necessary to direct the x ray beam across the trunk. A second view is desirable to assess glenoid bone stock and the state of the humeral head. The axillary view (fig 2) gives the best image but may not be possible in patients with very limited shoulder movements. In these patients an apical projection such as the apical oblique projection of Garth, Slapney, and Ochs⁵ (fig 3) is of great value. The plane of the acromioclavicular joint is variable but is more nearly sagittal. A 10–15° cephalic tilt of the x ray beam will avoid image overlap.



Figure 2 Axillary view of the shoulder showing loss of the glenohumeral joint space and the amount of remaining glenoid bone stock. The acromioclavicular joint can be visualised through the humeral head.



Figure 3 The apical oblique view of a rheumatoid shoulder indicating reduced glenoid bone stock with a posterior osteophyte.

The radiographic changes in the rheumatoid shoulder have been classified in several ways. For the glenohumeral joint the five stage classification of Larsen, Dale, and Eek⁶ (fig 4) is probably the best known among rheumatologists. As most patients coming to surgery will be in grades IV or V this system is of limited value to surgeons. Jonsson, Rydholm, and Lidgren have introduced a system validated by operative and arthroscopic findings, which has three stages corresponding to loss of cartilage, humeral head erosions, and severe destruction of the humeral head.⁷ Petersson has clarified the Larsen classification of the changes which occur in the acromioclavicular joint (fig 5), emphasising the loss of bone which occurs,⁸ but to date very few communications have made any attempt to describe the changes in this joint at all. Crossan and Vallance considered the radiographic changes in the acromioclavicular and glenohumeral joints together with the subacromial region and related them to the patient's function.⁹ They found that loss of sphericity of the humeral head and decreasing width of the subacromial space correlated with deterioration in function. Unfortunately, because of the variable effects of pain, function often does not mirror radiographic changes, and this potentially useful approach to classification has not been widely adopted.

When planning surgery the radiological appearances are of value in so far as they show the extent of the bone destruction. Changes in the soft tissues may be implied from the bony changes but are more usually deduced from clinical examination. My own study of 75 consecutive rheumatoid shoulders has shown that the radiological staging of the glenohumeral and acromioclavicular joints fails to correlate well with the pattern of the patient's pain or the patient's functional status.

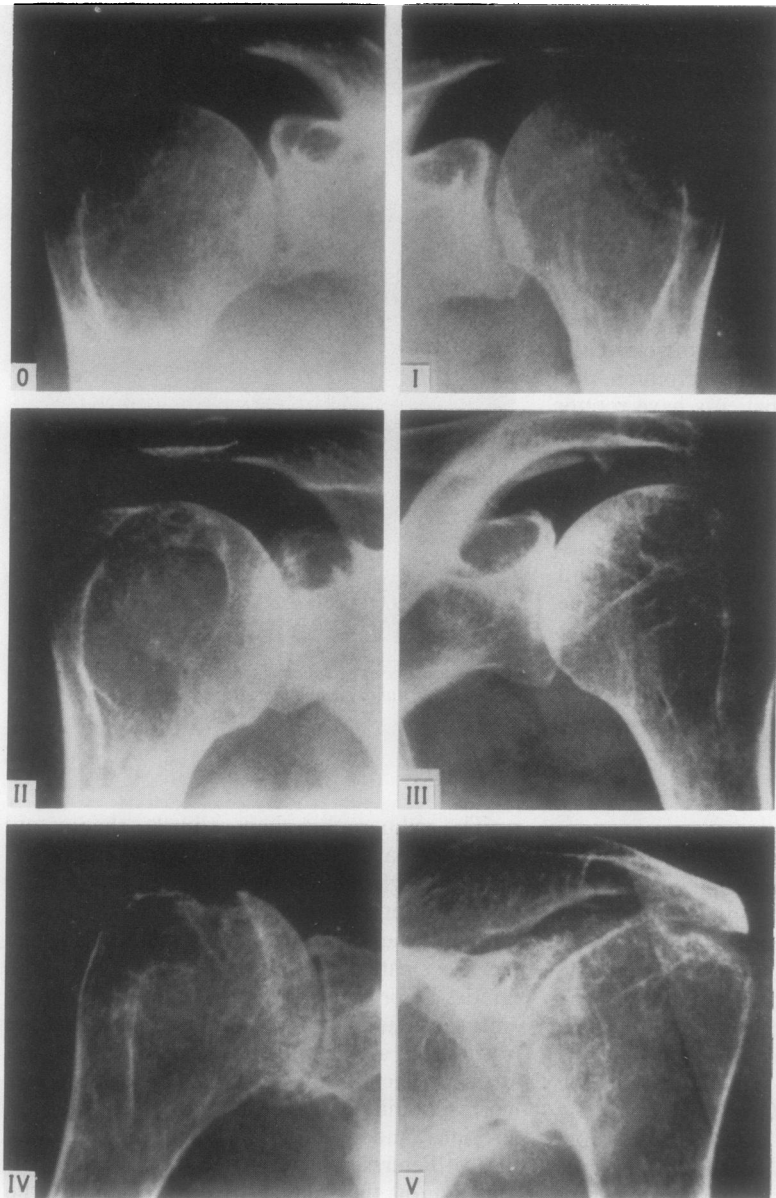


Figure 4 The Larsen, Dale, and Eek⁶ grading system for the rheumatoid glenohumeral joint.

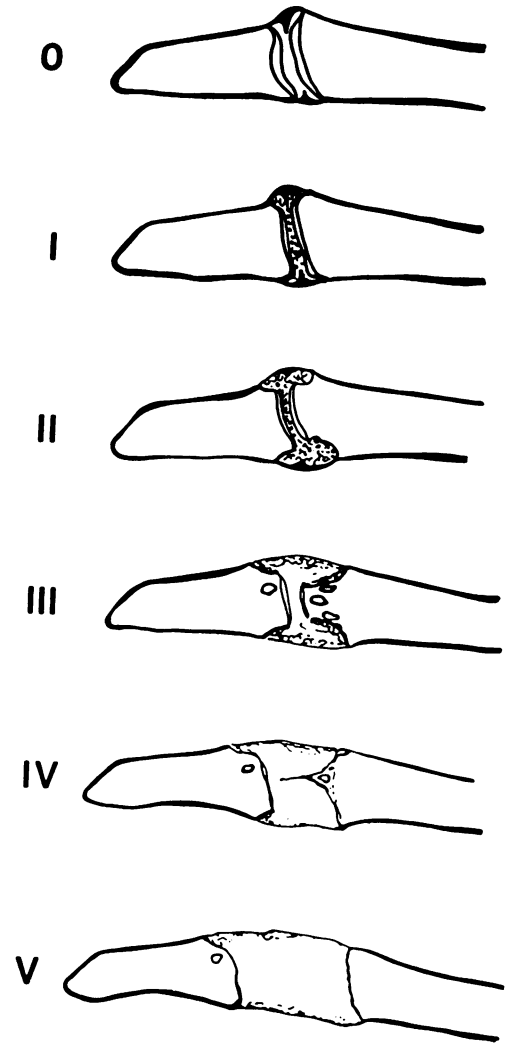


Figure 5 The Larsen, Dale, and Eek⁶ system for the acromioclavicular joint with diagrammatic illustrations from Peterson.⁸ Note the increasing erosion of bone with progression of the disease. Reproduced with permission of J B Lippincott Co from Clin Orthop 1987; 223: 86-93.

Site of pain

The aim of surgical treatment must be to provide pain relief and to restore function. As several regions may be affected the surgeon must identify the site(s) of the pain. The site of pain indicated by the patient has been said to be the best guide to its origin. My own study, however, has shown that most rheumatoid patients complain of pain over the epaulette region of the shoulder radiating anteriorly and towards the deltoid insertion (fig 6), irrespective of the degree of radiological change. Rest pain was also common. Therefore, in these patients the pattern of the pain is so non-specific that it is no guide to its origin.

Because the patient's history and the radiographs are poor determinants of the site of pain other methods must be used. Kessel and Watson described the use of small injections (1 ml) 1% lignocaine into different parts of the rotator cuff to localise the site of impingement.¹⁰ I have used the same technique to study the site of pain in 75 rheumatoid shoulders. In most

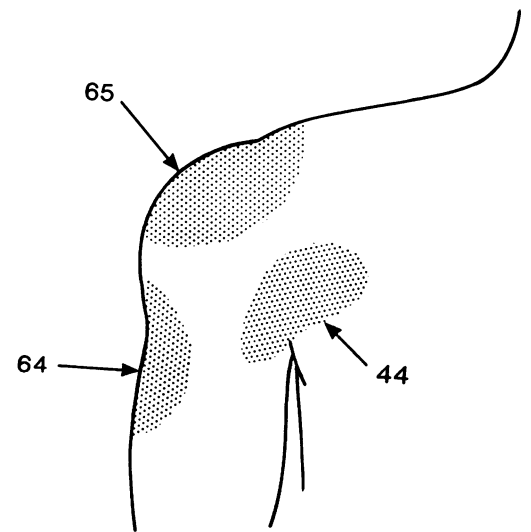
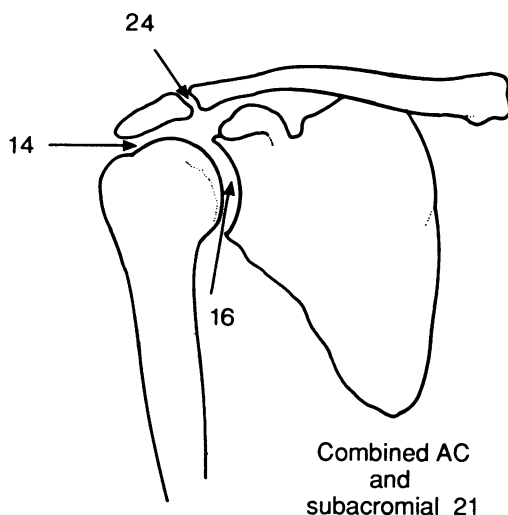


Figure 6 The site of pain indicated by the patient in 75 rheumatoid shoulders.

cases the pain emanated from the acromioclavicular joint, the subacromial region, or a combination of these two sites (fig 7). The glenohumeral joint was identified as a site of pain infrequently and then only when the

Figure 7 The sites at which injection of 1 ml 1% lignocaine produced complete pain relief in 75 shoulders. In 21 shoulders injections were required at both the acromioclavicular (AC) and subacromial sites.



sphericity of the humeral head had been lost. Thus, even with advanced radiological changes in the glenohumeral joint, the source of the pain was often elsewhere in the shoulder joint complex.

Once the site of the pain has been identified by injection and the functional status has been acquired from the patient's history an informed decision can be made about treatment.

Operative treatment

ACROMIOCLAVICULAR JOINT AND THE SUBACROMIAL REGION

If the acromioclavicular joint is implicated by injection studies and fails to respond to local steroid injection, excision of the outer end of the clavicle can be a very effective procedure. If the subacromial region is also affected the excision arthroplasty can be combined with excision of the coracoacromial ligament and anterior acromioplasty, thus decompressing the rotator cuff tendons. I have performed this procedure in 22 rheumatoid patients over the past three years with very encouraging early results, though its durability must remain in doubt. One patient who failed to regain external rotation and had lost the sphericity of the humeral head did not respond and subsequently underwent total shoulder replacement. The results of this procedure, commonly used in impingement syndromes,^{11 12} have not previously been reported in rheumatoid arthritis and although Benjamin and Helal suggested

that excision of the acromioclavicular joint was only rarely indicated in this condition,¹³ Petersson reported good results for this in 13 patients when it was combined with bursectomy and synovectomy of the glenohumeral joint.⁸

Occasionally, the disease is confined to the subacromial bursa and the patient presents with pain and a visible swelling (fig 8). This condition often responds to subacromial intrabursal injection of steroid but, if refractory, excision of the bursa gives good results.¹⁴

GLENOHUMERAL JOINT

'It is our concentration on this large joint which so often obscures the true pathology in a patient with rheumatoid arthritis.'¹⁵ The truth of this statement can be attested to by any surgeon treating the rheumatoid shoulder, but if the glenohumeral joint can be clearly identified as the source of pain and limited function, several well evaluated surgical procedures are available.

Synovectomy

For this seemingly logical procedure to be successful synovium must be completely removed before there has been significant damage to the articular cartilage. Complete synovectomy is difficult in the glenohumeral joint and many patients have lost their joint space by the time of presentation. Pahle and Kvarnes, however, have reported good results in 54 patients followed up for between one and 16 years.² Pain relief was gratifying and ranges of motion were improved. No patient showed greater than Larsen grade III radiological changes. They emphasised that the decision to carry out synovectomy rather than arthroplasty depended upon the joint surfaces being smooth and congruous at arthrotomy. My own indication for this procedure is the unusual combination of pain located in the glenohumeral joint combined with the retention of humeral head sphericity.

Arthrodesis

Arthrodesis of the glenohumeral joint in rheumatoid arthritis has been condemned by many authors on the grounds that the prolonged immobilisation necessary for fusion may prejudice the function of other diseased upper limb joints. It is also felt that the restriction of rotation will impose a significant functional penalty. Despite this Rybka and his colleagues in Finland have reported successful results in 39 patients with rheumatoid arthritis.¹⁶ After operation each patient was managed in a light thoracobrachial splint, which permitted early mobilisation of the ipsilateral elbow and wrist. Fusion was achieved in 90% and pain relief was good even in those with fibrous unions. All patients could attend to their perineal care.

This last finding is in contrast with that of the study of Cofield and Briggs,¹⁷ in which only 44 of 70 patients undergoing arthrodesis for a variety of diagnoses could attend to their personal hygiene. The difference is almost

Figure 8 Large subacromial bursa.



certainly due to the position used for the fusion. Rybka used 20° each of abduction, flexion, and internal rotation, which the studies of Jonsson and his colleagues¹⁸ have shown to be the most desirable position. The more abduction present in the fusion the less likely is the patient to be able to reach the perineum.

Despite the success of Rybka the loss of rotation associated with arthrodesis makes it potentially inferior to arthroplasty.

Arthroplasty

Glenohumeral arthroplasty is now a well established procedure, but care should be taken to separate the results achieved in rheumatoid arthritis from those in other diagnostic categories. Very few papers deal exclusively with rheumatoid arthritis,¹⁹⁻²² and even fewer give any indication of the stage at which arthroplasty has been performed. Most surgeons now use a non-constrained type of arthroplasty such as that introduced by Neer²³ (fig 9), and its success is dependent upon the state of the deltoid muscle and the rotator cuff—both of which may be impaired in rheumatoid arthritis.

Relief of pain is a conspicuous feature of arthroplasty, but improvement in ranges of movement is usually much less dramatic. This is especially true of movements against gravity, such as flexion or abduction, where most authors report gains of between 14 and 24°. ^{20 21 24} Internal and external rotation together with extension show much greater improvements and as these movements are of much more functional significance (external rotation is needed for the hand to reach the side or the back of the head) most patients show major

Figure 9 Radiograph of Neer II total shoulder replacement in a rheumatoid shoulder. The glenoid component is polyethylene and has a metal wire marker. It is fixed with polymethyl methacrylate bone cement. In this patient the humeral component has been inserted without cement.



Figure 10 Clinical picture of advanced rheumatoid disease of the glenohumeral joint. It corresponds with fig 1C.

functional gains after operation. These movements are only obtained by intensive physiotherapy lasting for at least three months, most of which is carried out by the patient at home. Improvement can be seen for up to two years after operation.

The deltoid muscle is often thin but very often the medialisation of the glenohumeral joint which occurs with erosion of the humeral head or glenoid, or both, gives a false impression of the amount of wasting (fig 10). In most patients with rheumatoid arthritis the rotator cuff is intact despite advanced joint destruction.²¹ If the cuff is torn and irreparable a non-constrained arthroplasty will not do well. Several methods of tackling this problem have been tried but none has been very successful. The use of a constrained arthroplasty is not a solution because loosening, especially of the scapular fixation, is common and occurs early.²⁵

Erosion of the glenoid bone may be very severe in rheumatoid arthritis (fig 1C),²⁶ and this may prejudice the fixation of the glenoid component. In non-constrained arthroplasties radiolucent lines between the glenoid cement and bone (fig 11) have been reported in 80% of patients,^{21 24 27} though revision of glenoid components is only infrequently reported. It is possible to manage these shoulders without resurfacing the glenoid—indeed on occasion

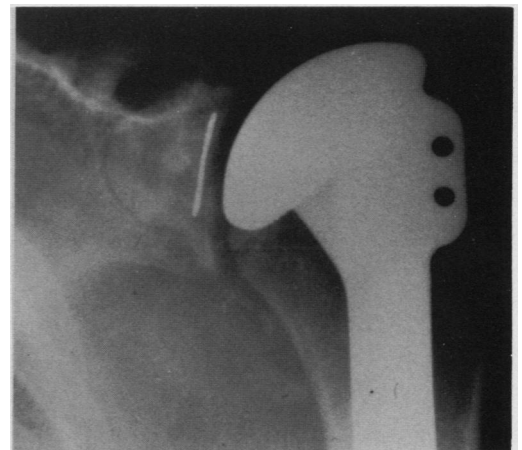


Figure 11 Radiolucent lines between the bone and bone cement. These changes were apparent within two years of surgery, but the patient remains asymptomatic six years later.

there may be insufficient bone stock for the glenoid component. Marmor reported encouraging results in 10 rheumatoid patients with only humeral head replacement,²⁸ but Clayton and his colleagues reported inferior results of the hemiarthroplasty in comparison with total joint replacement.¹⁹ Gschwend reported that only 32% of rheumatoid patients felt themselves to be 'much improved' after hemiarthroplasty as opposed to 82% after total joint replacement.²⁹

Resurfacing of the humeral head has been used in rheumatoid arthritis. In 1980 Varian reported the use of a silastic cup covering the humeral head in a series of 30 patients, 28 of whom had rheumatoid arthritis.³⁰ Pain relief was good initially, but recovery of the motion depended almost entirely upon the improved range of scapulothoracic motion, and longer follow up has highlighted the problems of subluxation of the prosthesis and fragmentation of the silastic cup with a consequent serious tissue reaction. Jonsson and coworkers have reported the use of a cemented stainless steel cup to cover the humeral head in 24 end stage rheumatoid shoulders with very encouraging results at two years.³¹ More recent studies by Jonsson³² suggest that the results are durable. This technique is not suitable, however, where there has been extensive destruction of the humeral head.

Although failure of shoulder arthroplasty is uncommon it can be managed by either revision arthroplasty, excision arthroplasty, or arthrodesis.^{21 33}

Other procedures

Shoulder arthroplasty is contraindicated by the presence of infection or deltoid paralysis and, as already mentioned, absence of the rotator cuff or gross glenoid bone loss can make arthroplasty inappropriate. In these situations useful pain relief and functional improvement can be obtained by the use of a double osteotomy.³⁴ This procedure entails incomplete osteotomy of the surgical neck of the humerus and the glenoid neck. Pain relief is often dramatic and it is apparently this which permits an increase in the range of movement of the shoulder girdle. The related procedure of glenoidectomy, although giving good results,^{35 36} can no longer be recommended for routine use as removal of the glenoid will prevent the later performance of an arthroplasty. It may still have a role as a salvage procedure, however.

Conclusion

Careful assessment of the rheumatoid patient with shoulder pain will permit the most appropriate form of management to be selected. With proper selection it is possible to achieve a high degree of success with excellent pain relief and restoration of useful function.

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