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EXTERNAL COMPRESSION ARTHRODESIS OF THE SHOULDER JOINT

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Compression arthrodesis of the shoulder was carried out in 16 patients. One case of postoperative infection healed by conservative treatment, and all but one had primary fusion. With a median of 12 years follow-up, 12 patients were examined clinically and radiologically; one patient was lost to follow-up and three patients were dead. The result was rated as good by 10 patients and as improved by two patients. External compression arthrodesis was found to be a safe and easy way to achieve solid fusion of the shoulder joint. Arthroplasty and arthrodesis of the shoulder joint are complementary operations, applicable in different clinical situations.

Key words: arthrodesis; external compression; shoulder

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During the last decade the progress in total shoulder replacement has limited the indications for arthrodesis of the shoulder. Elderly and middle-aged patients with otherwise intractable pain in the shoulder due to rheumatoid or osteoarthritis can now be successfully treated with a total shoulder replacement (Lettin et al. 1982, Kessel 1982). However, arthrodesis of the shoulder is still indicated in a number of clinical conditions such as: younger patients; patients with a flail shoulder caused by lesions of the brachial plexus; infectious disease (Kessel 1982, Cofield & Briggs 1979). The position of an arthrodesis of the shoulder is usually maintained by internal fixation together with a thoraco-brachial splint for 8–12 weeks (Mosely 1961, May 1962, Cofield & Briggs 1979, Rybka et al. 1979).

Compression arthrodesis of the shoulder by external fixation has been the subject of a very limited number of studies (Charnley 1953, Charnley & Houston 1964). The purpose of the present study was to evaluate the long-term results after arthrodesis of the shoulder by this method.

PATIENTS AND METHODS

From 1957 to 1980 16 patients were treated by a compression arthrodesis of the shoulder using Charnley's (1953) original technique. Twelve patients had intractable pain in the shoulder joint, and four patients had a flail shoulder due to either a lesion of the brachial plexus or poliomyelitis.

The shoulder was exposed by a sabre-cut incision. The humeral head and glenoid as well as the under surface of the acromion were carefully denuded. The great tuberosity was split off in the proximal end and the top of the humeral head excised. The head of the humerus was subluxated upwards making contact with the glenoid and acromion, engaging the tip of the acromion in the split between the great tuberosity and the humeral head. The position was held by two parallel Steinmann pins, one through the clavicle and the scapular spine and the other through the proximal end of the humerus, held together by two compression clamps. After the operation a plaster of Paris shoulder spica was applied. Due to major bone loss in the humeral head an iliac crest bone graft was used in Cases 8 and 10. The compression device was left in place for a median of 5.5 (4–15) weeks and the shoulder spica was used for 12 (8–20) weeks. When the plaster was removed, the patient began active exercises.

At the follow-up examination at 12 (2–25) years three patients were dead, all of them more than 2 years

Table 1. Diagnosis and clinical data for 12 shoulder fusions

Case	Age	Sex	Diagnosis	Follow-up in years	Patient's assessment
1	62	F	Rheumatoid arthritis	2	Good
2	42	F	Rheumatoid arthritis	4	Good
3	16	M	Tuberculosis	25	Good
4	38	F	Tuberculosis	12	Improved
5	45	F	Poliomyelitis	18	Good
6	43	M	Charcot arthropathia	10	Good
7	42	F	Brachial plexus	17	Good
8	24	F	Recurrent dislocations (3 former operations)	7	Improved
9	66	M	Unreduced dislocation	3	Good
10	23	F	Osteoarthritis after epiphysiolysis	12	Good
11	31	M	Fracture-dislocation and axillary nerve injury	14	Good
12	24	M	Scapular fracture and axillary nerve injury	25	Good

At follow-up of the 16 patients, three were dead and one was lost for other reasons. Case 8 was reoperated at 7 months for non-union of the gleno-humeral joint.

after surgery. Prior to death all three had uncomplicated and solid union. One patient was lost to follow-up. No post-operative radiographs of this patient were available, but clinically the arthrodesis had united 3 months after surgery.

RESULTS

Radiographically confirmed solid bone fusion (Figure 1) was achieved in all patients but one. In this one patient only the acromion had fused to the humerus, whereas a non-union of the gleno-humeral joint was evident. The patient was re-operated 7 months later using an iliac crest bone graft and union occurred.

The patients' own assessment of the result was *good* in 10 cases and *improved* in two cases. Two patients complained of mild intermittent pain around the shoulder after work, and 10 patients had no residual pain. The function of the fused shoulder was assessed by the patients' stated ability to perform six daily activities. Of the 12 limbs with a fused shoulder, nine could be used to dress; eight to eat using knife, fork or spoon; seven to perform personal hygiene, and 10 to tie shoes. Only four of the hands on the fused side could be used to comb hair, whereas six patients could work with the hand above shoulder level.

At the operation we aimed at a position of the arthrodesis of 45 degrees each of abduction, flexion and internal rotation. At the follow-up the median of abduction, flexion and internal rotation was 28, 28, and 43 degrees, respectively.

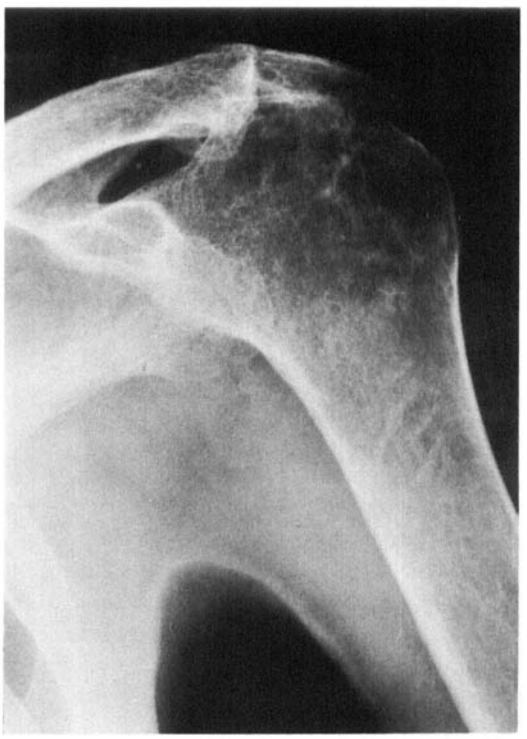

Figure 1. Antero-posterior radiograph confirming solid fusion of the shoulder joint in Case 1.

Only three patients could sleep on the side with the fused shoulder, but this was not related to the degree of abduction in the fused shoulder.

One patient with tuberculous arthritis developed a postoperative infection, which healed by conservative therapy (Case 3). Another patient had an infectious discharge along the pins. It disappeared when the compression device was removed 8 weeks after surgery (Case 1).

DISCUSSION

Healing of a shoulder arthrodesis can be achieved in more than 90 per cent of cases both by internal fixation (Cofield & Briggs 1979, May 1962, Rybka et al. 1979) and by external fixation (Charnley & Houston 1964, the present study). In these studies cancellous bone chips or iliac crest bone graft have only been used in a few cases, mainly to fill major defects in the humeral head. Both internal and external fixation have required a long period of postoperative immobilization by a thoraco-brachial splint or a plaster of Paris shoulder spica for 8–12 weeks. However, in a consecutive series of 11 fused shoulders, Beltran et al. (1975) reduced the postoperative immobilization to 4 weeks by using a specially constructed compression screw together with a fibular graft. A disadvantage of internal fixation was stressed by Cofield & Briggs (1979), who had to remove the appliance in one fourth of their cases because of local complications like tenderness and prominence of the heads of the screws and pins.

The results showed a median position of the arthrodeses of 28 degrees of abduction and flexion. This is close to the position recommended by Rowe (1971) and Kessel (1982), who suggested the abduction diminished to about 25 degrees. The forward flexion should be 25–30 degrees and the internal rotation 45 degrees, so the hand can be brought to the midline of the body both at the face and at the back. However, in their series of 71 shoulder arthrodeses Cofield & Briggs (1979) found that the position of the fusion was not a very important determinant of success or failure, and they could not recommend an ideal position for shoulder arthrodesis. This is supported by Barton (1972), who found no correlation between the position of fusion and the amount of residual pain or with the patients' assessment of the result of the operation.

The function of a successful total shoulder replacement is evidently superior to the function of a shoulder arthrodesis (Lettin et al. 1982). However, according to Neer et al. (1982) and Lettin et al. (1982), total shoulder replacement was followed by complications in 9 per cent and 24 per cent of the cases, respectively. In one series, the prosthesis had to be removed in 18 per cent of the cases (Lettin et al. 1982). Furthermore, long-term observations of total shoulder joint replacements are not yet available.

Total shoulder replacement should not be attempted in young patients suffering from rheumatoid arthritis, osteoarthritis after trauma and primary osteoarthritis, nor in patients with acute or previous local infection, paralysis of the shoulder, substantial loss of scapular bone stock or Charcot arthropathia (Lettin et al. 1982, Fenlin 1975, Post et al. 1980, Neer et al. 1982). Most of these patients would benefit from a shoulder fusion. This implies that total shoulder replacement and arthrodesis of the shoulder joint should be considered complementary. External compression arthrodesis, as used in this study, is a safe and easy way to achieve a solid fusion of the shoulder joint.

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