

Surgery for ununited clavicular fracture

Twenty-four ununited, primarily conservatively treated clavicular fractures were treated operatively. The follow-up period averaged 3.5 years. In all cases, the primary displacement was at least equal to the clavicular thickness. The subjective outcome was good in 17 cases, satisfactory in six, and poor in one. In two cases, resection was performed. Our experience of rigid plate fixation and cancellous bone grafting was good with union in 20/22 cases. However, the operations are not uncomplicated and there is a risk of diminished muscle power and range of movement in the shoulder if the clavicle is shortened.

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Fracture of the clavicle is usually closed and heals well; the frequency of non-union is 0.1 to 5 per cent (Neer 1960, Rowe 1968, Koch et al. 1971, Zenni et al. 1981, Wilkins & Johnston 1983). We have studied the results of surgery for ununited clavicular fracture.

Patients and methods

Seventeen patients with ununited clavicular fractures were followed-up in our Department during 1970–1982, and seven more patients in Jorvi Hospital during 1976–1982. There were 16 males and 8 females. At operation, the mean age was 39 (22–79) years. The average follow-up time was 3 (1–12) years.

In 9 patients the fracture was sustained in falls, in 12 during sport and 3 in motor vehicle high energy accidents. The average time from the accident to operation was 24 (4–36) months. There was disabling pain in all patients. Six patients were unable to work. Eight patients had a limitation of shoulder movements. Ten patients had weakness of abduction. Brachial plexus injury was present in two patients.

Twenty-one cancellous bone-grafts were performed. In 18 of these rigid plate fixations was used and in one Kirschner pin fixation was used. In two cases, only bone-grafting was performed. In two patients only a part of the medial fragment of the clavicle was resected and in one case only rigid plate fixation was performed. For postoperative immobilization, arm slings were used for about 21 days. The osteosynthesis material was removed after an average of 17 months.

Four patients had complications. Two patients had superficial wound infections and one of them had loosening of the plate resulting in non-union. One patient had loosening of the plate without disturbance in healing. In one patient four different complications occurred at operation: pneumothorax, lesion of a subclavian vein, slight air embolism, and transient brachial plexus damage.

At follow-up, subjective outcome, local pain and pain radiating to the extremities were noted. The range of movement of the shoulder joint was measured. The radial pulse and the Adson test were performed. Radiographic examination of both clavicles was carried out. In four cases EMG examination was carried out to classify nerve damage and in one case a Doppler study was performed to study the circulation.

Results

The non-union united in 20/22 cases. In the one case, where no bone grafting was performed, the non-union did not unite. In 4 cases, the radiographic shortening was 5, 15, 20 and 30 mm, averaging 17 mm. A lengthening of 15 mm occurred in one case. There was no ectopic ossification or calcification in the coracoclavicular ligament. Osteolysis of the lateral end of the clavicle was observed in two cases. In one case, there was arthrosis of the acromioclavicular joint.

Seventeen patients were asymptomatic, six patients had slight pain on exercise or handicapping limitation of movement, and only one patient had worse symptoms.

Deformity of the clavicle was observed in six patients. Eight patients experienced pain on exercise. In two of these patients, the clavicle

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was non-united. Nine patients had subjective weakness of abduction. In four of these patients, radiographic examination revealed shortening of the clavicle, and one also had limitation of abduction. In five patients the radiographic and clinical findings were normal. The patient with established radiographic lengthening was symptomless. The nerve damage manifested at operation in one patient had healed. In one patient the Adson test gave a slightly abnormal result, but the Doppler examination was normal.

All patients returned to their previous occupation, but one patient was transferred to lighter work. The average period of incapacity was 86 (14–150) days. Three patients were pension recipients.

Discussion

Our patients with ununited clavicular fractures had initially had closed treatment. The primary displacement was at least the clavicular thickness in all of the cases. Because there were only four high energy injuries, the trauma mechanism alone did not explain the cause of the nonunion. In only six cases was the immobilization of the primary fractures less than 21 days.

The rigid plate fixation and cancellous bone-grafting led to union in all but one case; our experience confirms earlier observations (Schewior 1974, Edvardsson & Odegård 1977, Bronz et al. 1981, Rabenseifner 1981). The open treatment, however, is not without risk as we have seen in this series.

At the follow-up examination, shortening of

the clavicle was present in four patients. All of them has a subjective weakness of abduction. To our knowledge, this observation has not previously been presented. If it appears at operation, that the clavicle would be shortened, bone grafting, as described by Nicoll (1956), should be used.

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