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FRACTURE OF THE CAPITULUM HUMERI

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Fractures of the capitulum humeri are rare and the recommendations for treatment differ. Some authors recommend open reduction of the capitular fragment, while others advocate excising it.

Twelve patients with anterior shearing fractures of the capitulum humeri were treated as inpatients in the Departments of Orthopaedic Surgery, Gothenburg, during the years 1973–1977. Ten patients, all treated with open reduction and internal fixation of the capitular fragment, were re-examined. The functional result was estimated as good in nine and poor in one.

Key words: capitellum; capitulum humeri; distal humerus; fractures; humeral fractures

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Isolated anterior shearing fracture of the capitulum humeri is rare and there are very few reports on the management of this injury in the literature. Opinions concerning the treatment of these fractures have differed. Hahn in 1853 was the first to report the capitulum humeri fracture on the basis of an autopsy finding and Kocher in 1896 provided the first clinical observation (Kleiger & Joseph 1964). Case reports that followed (Darrach 1916, Lee & Summey 1934) advised that the fractured fragment should be excised. In 1933 Speed & Macey reported good results after open reduction and internal fixation of the fragment with a wire nail.

In subsequent reports (Table 1) there has been some controversy about how to treat the fracture when there is a large capitular fragment. Some recommend excision of the fragment (Decoulx et al. 1964, Fowles & Kassab 1974, Alvarez et al. 1975) while others advocate open reduction with or without internal fixation (Bush & McClain 1959, Anderson 1971, Collert 1977).

Table 1. Reported results after excision and open reduction of the capitular fragment

		No. of patients	Treatment			
			Excision		Open reduction	
			Good	Poor	Good	Poor
MacDonald & McGoey	1959	9	4	–	4	1
Decoulx et al.	1964	8	6	1	1	–
Fowles & Kassab	1974	6	4	2	–	–
Alvarez et al.	1975	11	8	2	–	1
Collert	1977	20	5	3	10	2

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Types of capitular fractures and mechanism of injury

Fracture of the capitulum humeri is occasionally confused with fracture of the lateral humeral condyle. The two injuries and their treatments are different. A fracture of the capitulum humeri is entirely intra-articular and does not include the epicondyle or the metaphysis. The posterior part of the lateral condyle remains intact (Figures 1 and 2).

Fractures of the capitulum humeri have been divided into two types:

Type I, the Kocher-Lorenz-fracture (Kocher 1896, Lorenz 1905), involves only the shell of articular cartilage of the capitulum humeri with a thin layer of subchrondral bone.

Type II, the Hahn-Steinthal-fracture (Hahn 1853, Steinthal 1898), includes the entire articular eminence of the capitulum humeri. The fracture line runs in the frontal plane and the lateral humeral condyle is intact. The fracture fragment, which varies in size and frequently contains the lateral third of the trochlea as well, is often displaced in an antero-superior direction into the radial fossa (Figure 1).

Most authors suspect that the fracture is caused by a fall on the outstretched hand with the elbow in extension or in slight flexion. The impact against the hand creates a force transmitted through the forearm to the radial head, which acts like a piston shearing off the capitulum (Keon-Cohen 1966). Since the fracture is caused by the radial head striking the capitulum, associated fractures of the radial head would be expected to occur and Palmer in 1961 reported a frequency of 31 per cent of concomitant fractures of this type.

CLINICAL MATERIAL

During the period 1973–1977, 64 adult patients with distal intra-articular humeral fractures were treated in the Departments of Orthopaedic Surgery, Sahlgren Hospital, Gothenburg.

Fifty-two patients had unicondylar or intercondylar T- or Y-fractures (Lansinger & Måre 1980) and 12 patients had anterior shearing fractures of the capitulum humeri, all classified as type II. There were nine women and three men. Ten of the patients were over 50 years of age at the time of the accident (Table 2).

Three patients had an associated fracture of the radial head and two had posterior dislocation in the elbow joint. No patient was able to describe the accident in detail but all stated that there had been a fall and a trauma to the arm.

Treatment

Ten patients were treated by open reduction and fixation of the fragment. Various types of operative fixation were employed (pin(s) in seven patients, screw in one, staple in one, and bone sutures in one). All operations were performed within 2 days after the accident. The reduction of the capitular fragment was estimated as good in eight patients and poor in two.

Two patients were treated conservatively; one of these patients had an undisplaced fracture and one had an advanced rheumatoid arthritis.

All elbows were immobilized in a plaster splint for 2–8 weeks (mean 3½).

Follow-up

Ten patients, all treated surgically, were re-examined clinically and radiologically after 2–6 years with a mean follow-up time of 4 years.

Of the two patients treated conservatively, one had died and one answered a written questionnaire.

RESULTS

In judging the clinical result, motion, stability and pain were analysed (Table 2).

For the evaluation of *motion* we used the international SFTR system in which the angular value 0 is full extension of the elbow. The result was considered to be good if the range of movement was at least 30° to 115° and poor if the flexion capacity did not exceed 115° or if the extension defect amounted to more than 30° (Johansson & Olerud 1971).

In nine patients the motion was good and in one it was poor. All three patients with associated fractures of the radial head and both patients with associated posterior dislocation of the elbow had good results.

In two patients where the degree of reduction of the fragment was considered to be poor, the result was good in one and poor in the other.

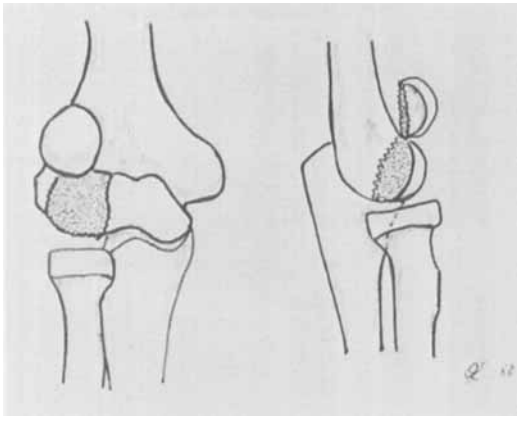

Figure 1. Schematic illustration of an anterior shearing fracture of the capitulum humeri (Type II). Frontal and lateral view.

Figure 2. Case No. 1. Fracture of the capitulum humeri type II with typical dislocation of the fragment. A and B: Radiograph at time of injury. Anteroposterior view (A) and lateral view (B). C: Radiograph at follow-up 5 years after injury. Lateral view. The fragment was fixed with two pins. The patient had a good functional result and no pain.

Table 2. Clinical results after open reduction and internal fixation in 10 patients with fracture of the capitulum humeri

Patient	Age	Sex	Associated elbow injury	Period of immobilization (weeks)	Result			Comment
					Range of motion Extension/flexion (degrees)	Objective assessment	Patients' own assessment	
1	57	F	–	8	10–135	Good	Good	
2	75	F	–	3	15–130	Good	Good	
3	72	F	–	4	15–140	Good	Good	
4	60	F	Posterior dislocation in the elbow joint	3	15–140	Good	Good	
5	63	F	Fracture of the radial head	4	20–145	Good	Good	
6	26	F	Fracture of the radial head	4	20–140	Good	Acceptable	Pseudarthrosis and necrosis of the capitular fragment
7	63	F	Fracture of the radial head	2	30–145	Good	Acceptable	Slight discomfort from the extension defect
8	72	M	–	4	20–115	Good	Acceptable	
9	24	M	Posterior dislocation in the elbow joint	6	30–130	Good	Acceptable	Slight discomfort from the extension defect
10	59	F	–	3	65– 95	Poor	Poor	Pain and discomfort

Two patients had a decreased pronation-supination. One of these patients had an associated fracture of the radial head (case 7) and the other had a posterior dislocation in the elbow combined with a distal radial fracture (case 9). In eight patients there was no difference in pronation-supination between the injured and uninjured arm.

The medial and lateral elbow *stability* was tested and no instability could be found in any patient.

All nine patients with good motion did not experience *pain* during their normal range of daily activities. The one patient with poor motion complained of pain and discomfort during and after work.

The patients' own opinion: five patients considered the result as good, five as acceptable (including the one patient answering a written questionnaire) and one as poor.

Radiological examination showed a necrosis of the capitulum humeri in one patient. This patient had good motion and no pain. No signs of loose intra-articular bodies or secondary osteoarthrosis were observed in any patient.

DISCUSSION

Fracture of the capitulum humeri is often referred to as Mouchet's fracture but Hahn published the first description of it in 1853 (Decoulx et al. 1964).

Most authors emphasize the rarity of the lesion but nevertheless proceed to describe the treatment in an authoritative fashion.

Many agree that excision of the fragment is the best treatment for patients in which the fragment involves merely a thin segment of cartilage, or a small segment of cartilage and its underlying subchondral bone, or when there is a comminuted fracture with several small fragments. However, there is a diversity of opinion as to the treatment of fractures with a large fragment comprising the entire capitulum with or without part of the lateral tip of the trochlea.

Some advocate early excision of the capitular fragment in all patients (Decoulx et al. 1964, Fowles & Kassab 1974, Alvarez et al. 1975), while others recommend open reduction with or without internal fixation (Bush & McClain 1959, Anderson 1971, Collert 1977).

In the textbooks (DePalma 1970, Watson-Jones 1976) it is recommended that manipulative reduction under general anaesthesia should always be tried before open reduction is undertaken. To obtain perfect reduction by closed means is, however, very difficult and most authors have abandoned this method because of consistent failure (MacDonald & McGoey 1959, Knight 1957, Keon-Cohen 1966, Alvarez et al. 1975, Collert 1977).

The advocates of early excision of the fragment claim that even open reduction is technically difficult and that a perfect reduction is mandatory. They point to the advantages of excision, it being a simple and definite procedure with a short postoperative immobilization period.

Those who favour open reduction argue that only by reduction of the capitular fragment can one avoid valgus deformity and lateral instability in the elbow joint. Watson-Jones (1976) stated that excision of the fragment leaves a raw bone surface which increases the risk of developing capsular adhesions and restricted mobility.

It has been postulated by Judet & Raynal (1957) that reduction of the fragment may result in avascular necrosis of the fragment. We found this complication in one patient who nevertheless had a good functional result.

CONCLUSION

From this study and a review of the literature the following general conclusions can be drawn:

The results of non-operative treatment and of late excision of the fragment are generally poor. When the fragment is small, when there is a comminution of the fracture or when satisfactory reduction of the fractured fragment is impossible, the fragment(s) should be removed. When, however, the fragment is large it seems that a satisfactory result can be achieved irrespective of whether the fragment is excised or reduced and fixed. In this material open reduction and internal fixation yielded a good result in nine out of ten

patients. Irrespective of the method of primary treatment the aftercare must be supervised carefully. Plaster immobilization should be limited to cover the short period necessary for soft tissue healing after excision; a slightly longer period is required when open reduction and internal fixation have been performed.

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