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Closed treatment of fractures of the proximal humerus

The results of 42 patients with three- or four-part fractures of the proximal humerus treated by closed methods only were reviewed. In 34 three-part fractures, 24 cases were satisfactory and 10 cases unsatisfactory; the satisfactory results tended to be in an older age group. In four-part fractures all eight cases had unsatisfactory results. It is concluded that closed treatment can give satisfactory results in three-part fractures but not in four-part fractures.

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Fractures of the proximal humerus account for 4–5% of all fractures (Stimson 1947). Neer (1970a) has introduced a four-segment classification of these fractures. It is generally agreed that the minimally displaced type one fracture and the vast majority of two-part fractures can be treated by closed methods (Einarsson 1958, Neer & Rockwood 1975). There is more dispute in the management of three- and four-part fractures; in the three-part fracture the proximal humerus is fractured into head, shaft and single tuberosity fragments, while in the four-part fracture both tuberosities are separated from the humeral head which in turn is separated from the shaft.

Neer (1970b) claimed that closed treatment gives unsatisfactory results and recommends open reduction and internal fixation for three-part fractures and prosthetic replacement for four-part fractures. Mills (1974) indicated that closed treatment of comminuted humeral head fractures gave results which were comparable and occasionally superior to open methods. However, in this latter series comminuted fractures were not categorised and represented a rather mixed group of fractures ranging from two-part fractures to four-part fractures, and no distinction could be made between the results in three- and four-part fractures.

It is the purpose of this retrospective study to assess the outcome of 42 consecutive patients with three- and four-part fractures who were treated by uniform closed methods only, and to establish if there is any difference in results between the two fracture groups.

Patients and methods

The records and radiographs of patients with proximal humerus fractures treated closed at Cardiff Royal Infirmary in the period 1962 to 1980 were reviewed. A total of 480 records were reviewed and of these 42 fell into the three-part or four-part fracture category. During the same period, six cases of proximal humeral fractures had been treated by open reduction but no prosthetic replacement had been performed. Patients were reviewed at a follow-up clinic where results were analysed symptomatically, clinically and radiographically. The minimum post-fracture period was 2 years.

The results were assessed according to the scoring system of Neer (1970a) with a maximum of 100 units: 35 units for pain, 30 for function, 25 for motion and 10 for anatomy. Excellent is graded above 89 units, satisfactory above 80 units, unsatisfactory above 70 units and failure is graded below 70. The result in any patient with significant pain is graded a failure.

Two patients had sustained their fractures as a result of a road traffic accident; the remainder had been injured in a fall which in four patients had been heavy. There were 14 males and 28 females; the mean age was 65 (23–84) years.

There was an equal number of right and left shoulders, and one patient with a three-part fracture had sustained a two-part fracture of the opposite shoulder on a previous occasion. There were 34 three-part fractures and eight four-part fractures.

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The treatment consisted of rest in a broad arm sling for an average of 4 weeks, followed by physiotherapy for an average of 10 weeks. In three patients a hanging cast was used in addition to the sling.

Results

Three-part fractures (Table 1)

In three-part fractures (Figure 1A), 24 cases were satisfactory and 10 cases unsatisfactory. The patients with satisfactory results tended to be in an older age group than those with unsatisfactory results. The factor which influenced the results of treatment was physiotherapy. The earlier movements were commenced and the longer treatment was continued, the higher the score achieved. Associated with this early movement a certain degree of re-alignment and re-modelling of the humeral head was observed in some fractures (Figure 1B).

Four-part fractures (Table 2)

Closed treatment in the four-part fractures gave consistently unsatisfactory results. Pain, although present, was only slight in most cases and did not compromise activity. The factor which lowered the score was lack of movement. Flexion and extension at the shoulder were regained to a reasonable extent, but rotation and abduction were severely restricted. Necrosis

Table 1. Closed treatment of three-part fractures of the proximal humerus

A	B	C	D	E	F	G	H
01	23	F	6	6	3	72	Osteoarthrosis and persistent pain
02	39	M	6	10	20	82	Hanging cast used remodelling
03	39	M	12	12	8	21	Remodelling but very limited movement
04	45	F	6	4	11	63	Angulated humerus
05	47	M	4	8	6	86	Remodelling
06	49	F	4	4	4	70	Poor remodelling, persistent pain
07	50	F	3	12	7	97	Remodelling
08	53	M	1	8	9	93	Remodelling
09	53	F	6	6	13	75	Osteoarthrosis
10	53	M	3	12	11	86	Remodelling
11	57	M	3	8	19	66	Poor remodelling, persistent pain
12	59	F	5	8	5	68	Fair remodelling, persistent pain
13	60	F	3	12	8	76	Fair remodelling, persistent pain
14	64	M	4	12	12	82	Remodelling
15	65	M	5	8	10	87	Hanging cast, realignment
16	68	F	2	12	7	96	Hanging cast, remodelling
17	69	M	4	12	12	86	Remodelling
18	70	F	2	16	5	96	Remodelling
19	70	F	3	15	10	84	Remodelling
20	70	F	3	8	10	88	Remodelling
21	71	M	4	12	13	83	Remodelling
22	72	F	3	16	5	88	Remodelling
23	73	F	3	10	9	83	Remodelling
24	73	F	4	12	4	82	Remodelling
25	73	F	3	12	5	82	Remodelling
26	77	F	6	12	8	88	Remodelling
27	77	F	6	8	7	85	Remodelling
28	78	F	4	12	4	82	Remodelling
29	78	F	7	10	5	84	Remodelling
30	78	M	3	8	3	82	Remodelling
31	81	F	3	4	3	48	Poor remodelling, persistent pain
32	84	F	5	4	2	70	Poor remodelling, persistent pain
33	84	F	4	16	4	88	Remodelling
34	84	F	5	11	2	85	Remodelling

Key to data in Table: A – Case number; B – Age; C – Sex; D – Weeks in sling; E – Weeks of physiotherapy; F – Years of follow-up; G – Score at follow-up; H – Comments.
All cases had a fall, except case numbers 01, 02, 03, and 35 who had heavy falls and case numbers 11 and 38 who were involved in an RTA.

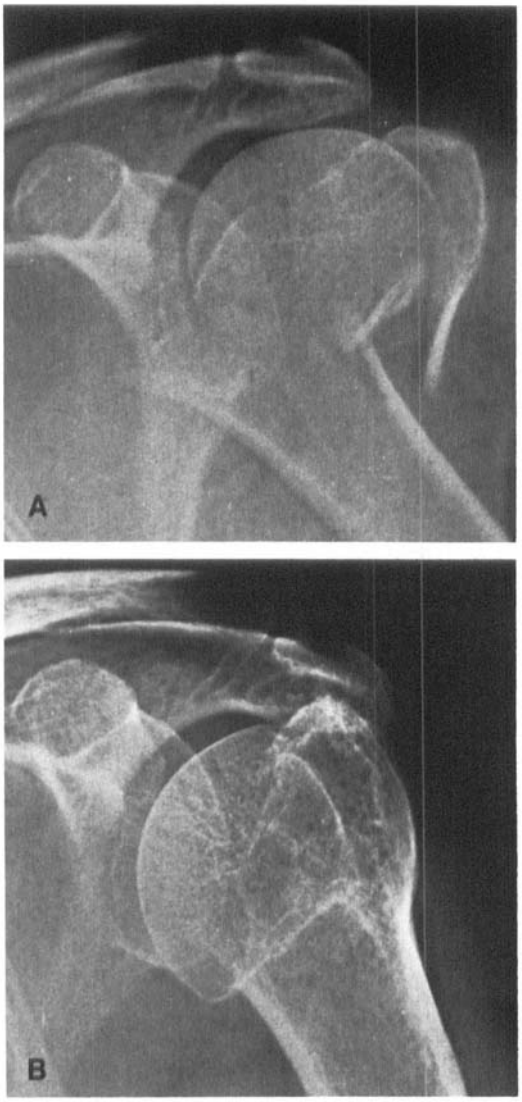

Figure 1. A. Three-part fracture in a 72-year-old patient, case number 22.

B. Five years post-injury with remodelling and re-alignment and a satisfactory score of 88.

with collapse of the head segment occurred in six of the eight cases (Figure 2).

Discussion

The ratio of three- to four-part fractures of 4 to 1 is comparable with the epidemiological study of Horak & Nilsson (1975). In three-part fractures this series indicates that satisfactory results can be achieved by simple closed methods. Even though accurate reduction of the fracture was not achieved, early mobilisation with continued physiotherapy usually allowed function to return. Neer (1970b) recommended open reduction and wire fixation for

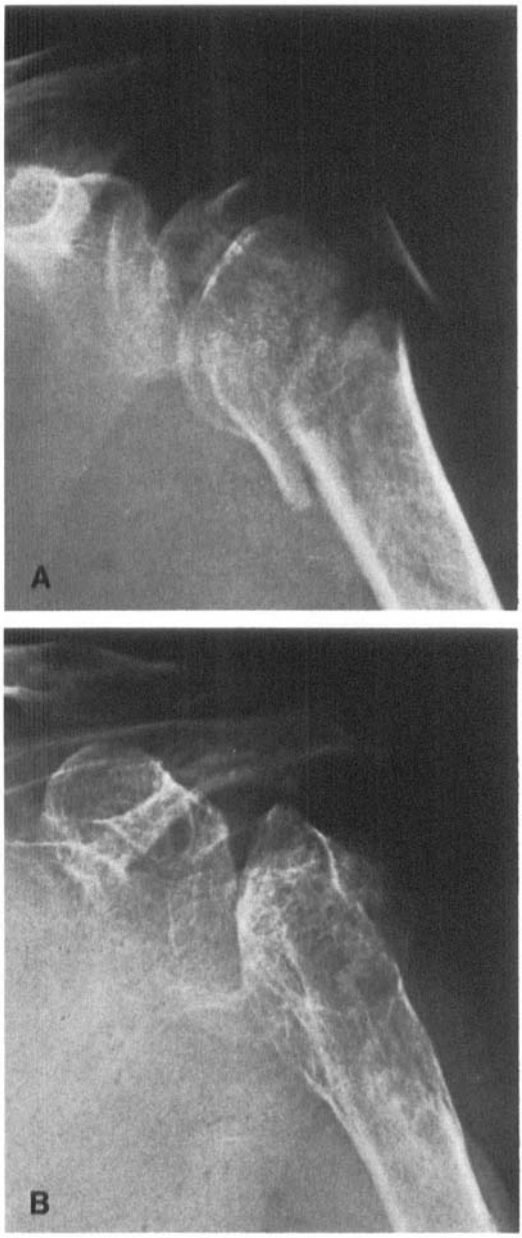

Figure 2. A. Four-part fracture in a 49-year-old patient, case number 35.

B. Three years post-injury with necrosis and collapse of the humeral head and an unsatisfactory score of 61.

Table 2. Closed treatment of four-part fractures of the proximal humerus

A	B	C	D	E	F	G	H
35	49	M	4	12	3	61	Necrosis
36	58	F	5	10	12	61	Osteoarthrosis
37	62	F	2	6	2	68	Necrosis
38	62	M	2	12	11	70	Necrosis
39	69	F	3	4	4	60	Necrosis
40	72	M	4	12	4	60	Angulated humerus
41	72	F	3	8	8	60	Necrosis
42	81	F	4	8	3	55	Necrosis

For key to data, see Table 1.

three-part fractures; the fixation must be sound enough to allow early shoulder movement (Mills 1974). The present series suggests that internal fixation is unnecessary. This was the conclusion of Mills (1974), and the present series confirms that older patients were easier to satisfy than younger patients.

The closed treatment of four-part fractures in this series was unsatisfactory; despite early mobilisation, poor motion resulted. There was a high incidence of necrosis, and the head segment did not remodel as in the three-part fracture. This supports Neer's (1970b) recommendation for prosthetic replacement of the humeral head in four-part fractures.

References

Einarsson, F. (1958) Fractures of the upper end of the humerus. Discussion based on the follow up of 302 cases. *Acta Orthop. Scand.* Suppl. **32**, 131–142.

Horak, J. & Nilsson, B. (1975) Epidemiology of fractures of the upper end of the humerus. *Clin. Orthop.* **112**, 250–253.

Mills, K. L. G. (1974) Severe injuries of the upper end of the humerus. *Injury* **6**, 13–21.

Neer, C. S. (1970a) Displaced proximal humeral fractures. Part 1. Classification and evaluation. *J. Bone Joint Surg.* **52**-A, 1077–1089.

Neer, C. S. (1970b) Displaced proximal humeral fractures. Part 2. Treatment of three-part and four-part displacement. *J. Bone Joint Surg.* **52**-A, 1090–1103.

Neer, C. S. & Rockwood, C. A. (1975) Fractures and dislocations of the shoulder. In (Ed. Rockwood C. A., Jr, and Green, D. P.) *Fractures,* Vol. 1, pp. 585–610. J. B. Lippencott, Philadelphia.

Stimson, B. B. (1947) *A manual of fractures and dislocations,* 2nd edn. Lea and Febiger, Philadelphia.