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MANAGEMENT OF FRACTURED SCAPHOID BONE

A Prospective Study of 100 Fractures

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Among the injuries of the carpal bones, the fracture of the scaphoid bone still presents a most interesting and demanding problem of management. The frequency of non-union after this relatively frequent fracture remains at the 4 per cent level even in well-controlled series (Böhler et al. 1954). Many of the non-unions are painful and prevent the patients from doing heavy manual work. The risk of non-union has led to long immobilisation times. According to Sir Reginald Watson-Jones (1955) "nearly all fractures of this bone unite if the period of immobilisation is suitably prolonged." Verdan (1954) advocated an above-elbow plaster cast to avoid the shearing effects of pronation and supination on the fracture. Razemon (1972) recommended early operative treatment for fractures of the middle third of the scaphoid.

The aim of the present prospective study was to compare the two types of casts and to define the indications for operative treatment.

CLINICAL MATERIAL

The series consisted of 99 patients who were treated for 100 fractured carpal scaphoid bones between 1st January 1971 and 27th November 1972. Thirty patients with fractured tubercle of scaphoid, two patients who had Colles' fracture of the same wrist and one with perilunar transscaphoidal dislocation treated during the same period were excluded from the study. Eighty-four patients of the series were male and 15 were female. The age range was 16 to 71 years (mean 31 years). The location, type and displacement of the fractures are shown in Figures 1 and 2.

METHODS OF TREATMENT

By prior randomisation, 53 fractures were immobilised in a plaster cast from below the elbow to the interphalangeal joint of the thumb (Figure 3); 47 fractures were

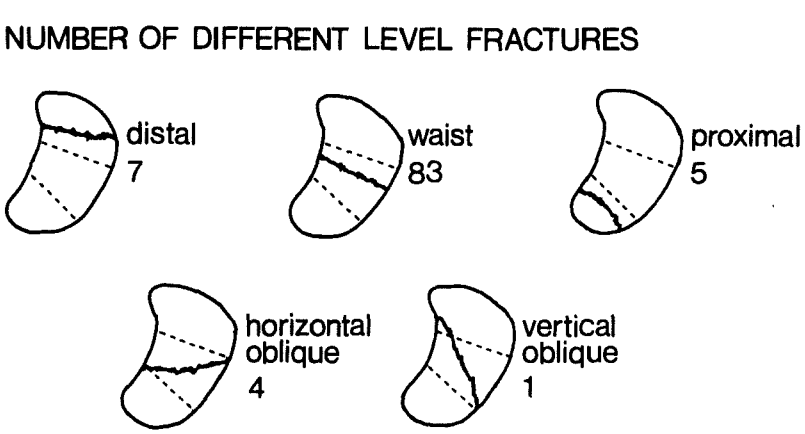

Figure 1. Location of 100 scaphoid fractures.

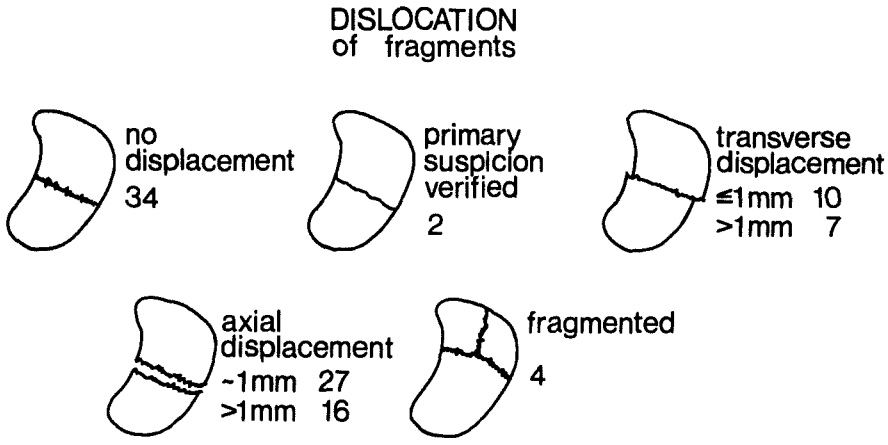

Figure 2. Dislocation of fragments in 100 scaphoid fractures.

immobilised in an above-elbow cast, preventing pronation and supination but allowing extension and flexion of the elbow to some extent (Figure 4). To prevent elbow stiffness, immobilisation in the above-elbow plaster was changed to a below-elbow type at 6 weeks when required (Verdan 1954).

The types and locations of the fractures in the two groups are presented in Table 1. The age distributions of the patients in the groups were similar. Primary treatment was given by the registrars on duty. Later, the authors followed the patients until the end of management. Every 2 weeks the cast was removed to clinically and radiographically check on the consolidation. The patients were followed until they were symptomless or a steady state was achieved.

The radiographic control used three exposures routinely; when required, three to six additional projections were taken. Proceeding bony union was determined by

Figure 3. The below-elbow cast.

obscure fracture line in all projections. Tomography and magnification films were found to be unnecessary. Disappearance of tenderness in the snuff-box appeared to be an important sign in corroborating the radiographic findings. For the determination of complete bony union, the radiograms were scrutinised retrospectively without knowing the type of treatment.

Figure 4. The above-elbow cast.

Table 1. Type and location of the scaphoid fracture in two treatment groups.

Type or location	Below-elbow cast	Above-elbow cast
No displacement	18	18
Transverse displacement	10	7
Axial displacement	23	20
Fragmented	2	2
Distal	3	4
Middle	42	41
Oblique	4	1
Proximal	4	1

If consolidation was not achieved in 3 months, osteosynthesis was performed using the technique of Gasser (1965). If necessary, the osteosynthesis was followed by immobilisation in a plaster slab for up to 6 weeks.

RESULTS

Ninety-two fractures united within 3 months, 41 fractures with the above-elbow plaster and 51 with the below-elbow plaster. The average times of immobilisation and complete bony union are shown in Table 2. There were no statistically significant differences between the two treatment groups. No differences were found between the two groups in achieving mobility after removal of the cast.

Table 2. Average immobilisation and consolidation times in non-operatively treated fractures.

	Below-elbow cast	Above-elbow cast
Immobilisation time	48 days	49 days
Complete radiographic consolidation	58 days	56 days

As a sign of poor vascularisation, a relative density of the proximal fragment was observed in 24 cases (Figures 5, 6 and 7). Eighteen of them were among the 92 non-operatively treated fractures (19.6 per cent) and six among the eight cases treated with osteosynthesis (75 per cent).

The time of consolidation was longest in the proximal fractures (76 ± 32 days, mean ± s.d.). A horizontal oblique fracture, a transverse

Figure 5. Relative density of the proximal fragment after 4 weeks' immobilisation.

Figure 6. As a sign of the beginning vascularisation, the rarefaction is spreading into the proximal fragment (at 9 weeks).

Figure 7. Increasing rarefaction at 14 weeks; bony union is obvious.

displacement and a gap between the fragments also resulted in long immobilisation times (62 ± 24 days).

Among the non-operatively treated patients, the mobility of the elbow joint was practically normal 2 weeks after the end of immobilisation. Radial deviation of the wrist averaged 67 per cent of normal after 2 weeks' mobilisation, while the other movements had returned to the 80 per cent level. After 4 weeks' mobilisation, 29 patients had some

restriction of wrist movements. The fist strength of the hand averaged more than 75 per cent of normal 25 days after the cast had been removed.

Bony union did not occur within 3 months in eight cases whereafter an osteosynthesis was performed (two after the below-elbow cast and six after the above-elbow cast). In four cases no post-operative immobilisation was used. The screw was removed in six cases due to slight continuous pain.

DISCUSSION AND CONCLUSIONS

Non-operative treatment of the carpal scaphoid results in a certain frequency of non-unions which cannot be totally prevented even with a 6-month immobilisation time. Based on cadaver studies, Verdan (1954) proposed an above-elbow plaster to diminish the rotational stresses upon the fracture. Theoretically, the fixed elbow may even increase the shearing forces at the fracture site when the hand meets some obstacle and is passively rotated.

We planned our study to determine whether longer casts really improve bony union. Wearing a below-elbow cast, the patients are able to continue many activities not requiring strength, while the above-elbow cast makes life inconvenient. In our study of 100 fractured scaphoids, 92 per cent of the fractures united within 7 weeks and no difference was found between the two plaster groups. The limit of delayed union was set at 3 months. Eight fractures, which were not united at that time, were fixed with a screw (Gasser 1965). After this procedure, these fractures united.

It may be advisable to try to foresee the fractures which will not unite within a reasonable time. In accordance with Maudsley & Chen (1972) we have begun to operate primarily on the fractures with severe dislocation. One might also consider an early operation in the case of a fracture with a small, relatively dense proximal fragment. On the basis of eight cases we do not suggest that the screw fixation totally solves the problem of non-union.

In conclusion, the traditional below-elbow cast gives adequate immobilisation for the scaphoid fracture. Long immobilisation times, over 3 months, may be prevented by osteosynthesis.

SUMMARY

One hundred fractured carpal scaphoids were immobilised alternatively in above-elbow and below-elbow casts. Preventing the pronation and supination of the forearm did not reduce the immobilisation time, which, with either type of cast, averaged 7 weeks, after exclusion of the fractures with delayed union. These eight fractures, which did not unite in 3 months, were operated on using a lag screw fixation, whereafter consolidation was achieved.

REFERENCES

Böhler, L., Trojan, E. & Jahna, H. (1954) Behandlungsergebnisse von 734 frischen einfachen Brüchen des Kahnbeinkörpers der Hand. *Wiederherstellungschir. u. Traumatol.* **2**, 86–112.

Gasser, H. (1965) Delayed union and pseudarthrosis of the carpal navicular: Treatment by compression-screw osteosynthesis. *J. Bone Jt Surg.* **47**-A, 249–266.

Maudsley, R. H. & Chen, S. C. (1972) Screw fixation in the management of the fractured carpal scaphoid. *J. Bone Jt Surg.* **54**-B, 432–441.

Razemon, J. P. (1972) Les indications du vissage du scaphoïde carpien dans les fractures récentes. *Rev. Chir. orthop.* **58**, 673–677.

Verdan, Claude (1954) Le rôle du ligament antérieur radio-carpien dans les fractures du scaphoïde. Déductions thérapeutiques. *Z. Unfallmed. Berufskr.* **47**/4, 294–297.

Watson-Jones, Reginald (1955) *Fractures and joint injuries*, 4th ed., p. 611. E. & S. Livingstone Ltd., Edinburgh and London.

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