Brace treatment of Colles´ fracture

Barry D. Ferris[1], Neil P. Thomas[2], Michael E. Dewar[3] and David A. Simpson[2]

Twenty patients with Colles´ fractures were treated with a functional brace that allows wrist motion. The result was compared with a similar group of patients treated with a plaster cast. Dorsal displacement of the fracture was less and wrist function was better in the brace group. Swelling of the hand during the early stages was observed in the brace group; and because this may necessitate brace adjustment, increased medical supervision is necessary for this period.

In the treatment of fractures of the distal radius, Colles (1814) recommended the use of anterior and posterior tin splints with a narrow wooden splint along the ulnar border of the forearm. In traditional Chinese medicine the treatment of Colles´ fracture is by bamboo splints similar to those originally described by Colles (Chow et al. 1964). We have developed a splint made of thermoplastic materials and compared it prospectively with conventional plaster of Paris in the treatment of Colles´ fractures.

Patients and methods

All the patients with a Colles´ fracture attending our hospitals during a period in 1982 and 1983 were randomly allocated to either plaster cast or brace treatment groups. Patients under 16 years of age and those unable to follow simple instructions were excluded. Radial shortening or dorsal angulation was reduced under regional anesthesia in both groups. In the plaster group a forearm backslab was applied with the forearm in pronation, which was converted to a complete forearm plaster at about 48 hours. In the other group a brace was applied that consists of four rigid, curved boards lined with Plastazote that incorporate raised pressure pads (Figure 1). The brace was applied with the wrist in supination, thus stabilizing the fracture (Figure 2).

With the brace applied correctly, approximately 45° of dorsiflexion and 30° of palmar flexion are possible. The patients were reviewed twice in the first week and at the second and fourth weeks in order to make brace adjustments. In both groups the splintage was removed after 5 weeks. Twenty patients were treated with the brace and 27 with a plaster cast. Two thirds were women, and the age of the patients was 60 (22–87) years, without difference between the two treatment groups. Thirteen patients were lost to fol-

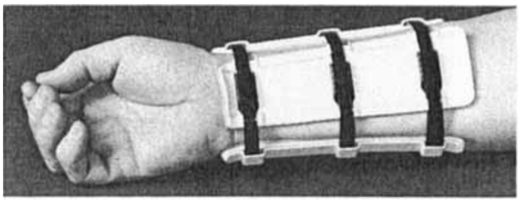

Figure 1. The position of the pressure pads applying the correct stabilizing forces. The narrow longitudinal pads on the dorsal and palmar boards lie between the radius and ulna, locating the brace and helping to prevent pronation. The transverse pads on these two boards apply pressure distal to the fracture dorsally and proximal to it on the palmar side; the pads on the radial and ulnar boards similarly stabilize the fracture against radial displacement.

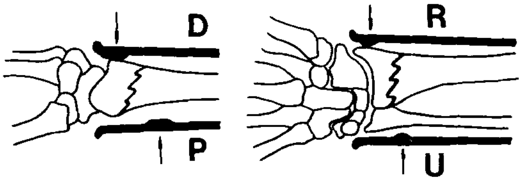

Figure 2. The Roehampton brace applied to a right forearm showing the disposition of the boards and the fastening straps. The brace is normally applied over layers of plaster wool and covered with a crepe bandage.

Departments of Orthopedics, Queen Mary´s[1] and Westminster[2] Hospitals, and Bioengineering Centre[3], University College, London, England

Correspondence: Mr. B. Ferris, 119 Green Lane, Edgware, Middlesex HA8 8EL, England

Table 1. Functional variables of brace and plaster cast groups expressed as a % of the nonfractured side. The value of *P* is derived from Student's-*t* test

	5 weeks postfracture			9 weeks postfracture		
	Brace (n 20)	Plaster (n 27)	*P*	Brace (n 18)	Plaster (n 21)	*P*
Range of movement	67	55	0.005	83	81	NS
Torque strength	67	57	0.01	83	79	NS
Grip strength	45	32	0.025	62	62	NS

Table 2. Radiographic assessment of brace and plaster cast groups. In each case the value is the mean (SD) for the group in degrees. The measurements in 1 and 2 are of the angular position, (nonfractured values would be 0° of dorsal angulation and approximately 30° of radial angulation). Measurement 3 is deviation from measurement 2. The value of *P* is derived from Student's-*t* test

	Brace (n 20)	Plaster cast (n 27)	*P*
1. Initial angular position			
Dorsal	20 (13.0)	14 (16.2)	NS
Radial	17 (6.3)	17 (6.2)	NS
2. Angular position after reduction[a]			
Dorsal	−1.0 (6.8)	2.2 (8.9)	NS
Radial	24 (5.5)	20 (4.9)	< .02
3. Angular displacement from reduced position[b]			
Dorsal	2.6 (7.2)	7.3 (8.6)	< .05
Radial	4.4 (6.0)	5.5 (7.6)	NS

[a] Measured at time of brace or plaster cast application.
[b] Measured at time of brace or plaster cast removal.

low-up, leaving 18 patients in the brace group and 21 in the plaster cast group (Tables 1 and 2).

Radiographic assessments of dorsal angulation and radial shortening were made at injury, when the brace or plaster cast was applied, and when it was removed at 5 weeks using the procedure described by Gartland and Werley (1951). Before reduction there was no difference between the two treatment groups. After reduction there was a difference in radial position, the brace group having greater displacement than the plaster cast group. Functional assessment of grip, torsional strength, and range of movement was carried out at 5 and 9 weeks after injury using the procedure described by Porter and Stockley (1984).

Results

At 5 weeks, function was better in the brace group than in the plaster cast group. At 9 weeks, there was no difference between the two treatment groups (Table 2). At the time of brace or plaster removal, radial displacement was the same in both groups, but dorsal displacement was less in the brace group. Four patients treated with a plaster cast and 1 patient treated with the brace required remanipulation.

Swelling of the fingers and hand was seen in the first week in all the patients treated with the brace, but this subsided in all the cases. One patient treated with the brace developed Sudek's atrophy, which responded to physiotherapy.

Discussion

Colles' fracture is associated with a substantial complication rate, sometimes as high as 31 percent (Cooney et al. 1980), and residual deformity is common (Gartland and Werley 1951, Pool 1973). Whereas Colles (1814), Cassebaum (1950), and Ross et al. (1984) suggested that accuracy of reduction is not critical as far as restoration of wrist function is concerned, others have stressed the importance of displacement at injury, the accuracy of reduction, and the final position at union (Bacorn and Kurtzke 1953, Rubinovitch and Renie 1984, Stewart et al. 1984). Sarmiento et al. (1980) and Ross et al. (1984) showed that early mobilization of the wrist joint after a Colles fracture leads to earlier recovery; Sarmiento (1965) stated that because the brachioradialis is attached to the distal fragment its action would be to increase the deformity in pronation, and suggested that the fracture should be treated with the forearm in supination. This technique has been widely used (Sarmiento et al. 1975, 1980, Van der Linden and Ericson 1981, Gibson and Bannister 1983, Stewart et al. 1984), although others have challenged this view (De Bruijn 1987).

In our study, fewer patients wearing the brace needed remanipulation of the fracture than did patients with a plaster cast. We conclude that the brace is at least as good as a plaster cast in maintaining bone position and that wrist function in terms of motion, strength, and grip strength was better at the time of brace removal than at plaster cast removal. The brace was well tolerated by patients because of its light weight and their ability to move their wrist and hand. The main drawback in the use of the brace was the swelling of the hand during treatment. Therefore, medical supervision must be more intense than in treatment with a plaster cast. It is important that patients cooperate with the regime of hand elevation and finger and wrist exercises. Patients unable to follow simple instructions should not be treated with the brace.

References

Bacorn J W, Kurtzke J F. Colles' fracture: a study of two thousand cases from the New York State Workmen's Compensation Board. J Bone Joint Surg (Am) 1953;35:643–58.

Cassebaum W H. Colle's fracture: a study of end results. JAMA 1950;143:963–5.

Chow Y C, Fang H C, Shang T Y. The integration of modern and traditional Chinese medicine in the treatment of fractures. IV. Treatment of Colles' fractures. Chin Med J 1964; 83:425–9.

Colles A. On the fracture of the carpal extremity of the radius. Edinb Med Surg J 1814;10:182–6.

Cooney W P, Dobyns J H, Linscheid R L. Complications of Colles' fractures. J Bone Joint Surg (Am) 1980;62(4): 613–9.

de Bruijn H P. Functional treatment of Colles' fracture. Acta Orthop Scand 1987;58(Suppl 223):1–95.

Gartland J J, Werley C W. Evaluation of healed Colles' fractures. J Bone Joint Surg (Am) 1951;33:895–907.

Gibson A G F, Bannister G C. Bracing or plaster for Colles' fractures: a randomised prospective controlled trial. J Bone Joint Surg (Br) 1983;65:221.

Pool C. Colles's fracture. A prospective study of treatment. J Bone Joint Surg (Br) 1973;55(3):540–4.

Porter M L, Stockley I. Functional index: a numerical expression of post-traumatic wrist function. Injury 1984;16(3): 188–92.

Ross R E, Gourevitch D, Lawton A. A prospective randomised trial of functional bracing in Colles' fractures. J Bone Joint Surg (Br) 1984;66:776–7.

Rubinovich R M, Renie W R. Colles' fractures: a comparison of functional and radiographic end results. J Bone Joint Surg (Br) 1984;66:295.

Sarmiento A. The brachioradialis as a defonning force in Colles' fractures. Clin Orthop 1965;38:86–92.

Sarmiento A, Pratt G W, Berry N C, Sinclair W F. Colles' fractures. Functional bracing in supination. J Bone Joint Surg (Am) 1975;57(3): 311–7.

Sarmiento A, Zagorski J B, Sinclair W F. Functional bracing of Colles' fractures: a prospective study of immobilization in supination vs. pronation. Clin Orthop 1980;(146): 175–83.

Stewart H D, Innes A R, Burke F D. Functional cast bracing for Colles' fractures. A comparison between cast bracing and conventional plaster casts. J Bone Joint Surg (Br) 1984;66(5):749–53.

van der Linden W, Ericson R. Colles' fracture. How should its displacement be measured and how should it be immobilized?. J Bone Joint Surg (Am) 1981;63(8):1285–8.

Acknowledgements

We would like to thank Mr. D. L. Evans, Mr. B. G. Andrews, Mr. P. M. Aichroth, Mr. P. R. E. Baird, and Mr. J. Scott for allowing us to study their patients. The design of the brace was initially supervised by Dr. D. Wang of the Third Teaching Hospital, Beijing, China, at the Bioengineering Centre, London University College.