The Herbert screw for fractures of the scaphoid

In 1954, Harrison McLaughlin of the Columbia-Presbyterian Hospital in New York City published a paper in the American volume of this journal in which he described the use of a screw to fix fractures of the scaphoid. He had used vitallium lag screws in 19 patients over nine years, and distinguished between stable fractures, which were easy to fix, and unstable ones which were difficult and needed preliminary stabilisation with a Kirschner wire. In 1969, he and Parkes classified scaphoid fractures into three groups based on their operative findings. These were an unstable group and two types of stable fracture: in the first there was an intact cartilaginous shell around the fractured bone, the "peanut" fracture. In the second the articular cartilage was also broken, but not through its entire circumference; these could sometimes "open and close like a book when the wrist was moved."

These ideas were taken up enthusiastically by a young English orthopaedic registrar, Mr T. J. Herbert, who, in 1974, read a paper to the Orthopaedic Section of the Royal Society of Medicine differentiating between stable and unstable fractures of the scaphoid and advocating internal fixation of the unstable ones. As a result he was asked to do these operations. Finding them difficult, he set about designing a jig in the laboratory at the Rowley Bristow Orthopaedic Hospital where he was Senior Registrar to Mr Alan Apley. A jig which could accommodate the rather bulky screws then available was too large for the scaphoid, and he therefore decided to make a smaller screw. While thinking about it, he hit upon the original idea of a screw with two threaded sections of different pitches which would automatically provide some compression. The screw had no head so that its trailing end could be buried beneath the surface of the scaphotrapezial joint. The final version of his jig was similar to one designed by an American surgeon called Huene.

In 1975, Tim Herbert became Senior Lecturer to Professor Ron Huckstep at the University of New South Wales, and continued to work on his double-threaded screw. Its manufacture presented difficulties, but he collaborated with a young engineer called Fisher who made the first 100 Herbert screws in his garage from Steinmann pins. After 18 months of experimental work, the first screws were implanted in 1977. A multicentre clinical trial in Australia led to further refinement and the screws became commercially available in 1981. The early results were reported by Herbert and Fisher in 1984. Fisher is now Head of the Department of Biomechanical Engineering at the Royal North Shore Hospital, Sydney.

Tim Herbert remained in Sydney and has continued to build up his experience which has made him the leading authority on the operative treatment of scaphoid fractures. With Filan he has now reviewed his results and presents them in this issue of the Journal (p. 519).

Filan and Herbert set out to answer four questions:

- **Does their method provide adequate fixation for early postoperative use of the wrist without external splintage?** They have made a convincing case that, if the fixation at operation appears satisfactory, the patient does not require plaster. This is a definite advantage to many patients, who may be able to resume driving and work sooner.

- **Does rigid fixation accelerate fracture healing, the recovery of wrist function, and does it improve the prognosis?** As regards healing, it has been found for other fractures that rigid fixation does not actually accelerate repair, but helps to reduce the factors which may delay healing. This may also apply to acute fractures of the scaphoid, but we have no accurate method of assessing the rate of healing. With established nonunion, there is no natural healing process and any comparison must be made with other operative techniques. The radiological results of Herbert screw fixation in conjunction with wedge grafting (he insists on the graft) for nonunion of the scaphoid are at least as good and probably better than those of any other method, while the function is superior. None of us can match Herbert’s number of patients but, also in this issue of the Journal, Daly et al (p. 530) report an even higher rate of union in 26 patients treated by this method; this is especially impressive since 11 of their patients had previously had unsuccessful operations. Their minimum follow-up was only six months and their criteria for union were less strict than those of Filan and Herbert, requiring “trabeculae traversing the graft from the proximal to the distal pole on at least two of the four standard views”, whereas Filan and Herbert (who also have a minimum follow-up of six months) expect union on all four views. Daly et al also successfully dispensed with external fixation in their later cases. As regards long-term prognosis, Filan and Herbert conclude that “the progress of osteoarthritis is reduced”. Their figures (presented in Table V) do not really justify that conclusion, since this depends on the length of follow-
up. The mean follow-up of their series was only 34 months, and large numbers of patients with osteoarthritis would not be expected after such a short period. Even so there was an increase after operation in the numbers with mild and severe degenerative changes. The large study by Shinya and Herbert (1994), not yet published in full, should shed more light on this.

Which scaphoid fractures and nonunions should be treated surgically? Their answer to this appears to be all, except those in asymptomatic patients with nonunion who are over 45 years of age. This is a reasonable attitude to established nonunion, but acute fractures are a different matter. It is increasingly said that since scaphoid fractures are intracapsular, like subcapital fractures of the femur, they should be operated on for the same reasons. This is a false analogy: most subcapital fractures treated conservatively will not unite, but most scaphoid fractures will. A more powerful argument is Filan and Herbert’s surprising and interesting finding that about one in three acute fractures had soft tissue interposed in the fracture, even when there was little displacement or deformity on the radiograph.

To operate on most scaphoid fractures would severely strain the resources of most orthopaedic departments in the National Health Service, but here the comparison with hip fractures seems legitimate. If the results of operation can be shown to be better, then we should obtain the necessary resources. The results, however, have not been shown to be better. Filan and Herbert report union in 88% of acute scaphoid fractures treated surgically, while Dias, Brenkel and Finlay (1989) showed that if they are treated in plaster the union rate is 87.6%. Filan and Herbert try to evade this awkward finding by saying that the 25% of the cases which Dias et al describe as ‘probable union’ would, by Filan and Herbert’s criteria, all be classified as nonunion. This is not consistent with what Dias et al reported; their ‘probable union’ group consisted mainly of patients in whom the site of the fracture was still visible on radiographs although it appeared united. The caption to their illustration of ‘probable union’ reads that the fracture “appeared to have united in all five views” which would be classified by Filan and Herbert as union. Even more important, Filan and Herbert’s minimum follow-up was six months, whereas that of Dias et al was over 18 months by which time nonunion should be clearly visible on radiographs.

Filan and Herbert have not proved that operation gives better results than plaster. It is an advantage not to have a plaster cast, but this must be set against the possible complications of surgery and anaesthesia. Most patients have an imperfect appreciation of these; many surgeons will be unhappy that the indications for surgery included “if the patient requested internal fixation”.

Are there significant complications? There are bound to be some complications, especially in the hands of less skilled surgeons, since this is a difficult technique (Herbert, Fisher and Leicester 1992; Compson and Heatley 1993). Filan and Herbert now recommend the use of intraoperative screening to help to ensure accurate placement of the screw.

Infections were uncommon and easily cured. Hypertrophic scars were surprisingly frequent: Herbert now recommends a zig-zag incision. Four patients developed dystrophic changes; I have not encountered this distressing complication, but I have not done as many operations.

One concern is that this operation, which transgresses the scaphotrapezial joint by levering it open and impaling it with the two small spikes on the jig, may actually induce osteoarthritis in a previously normal joint. Filan and Herbert’s figures, although not specifying this joint, indicate that severe degeneration is seldom a problem, but their mean follow-up is under three years (the maximum is not stated). Their patients were, on average, 26 years old; we should be concerned as to whether they will have osteoarthritis at the age of 46 years and this we do not know.

Tim Herbert’s ingenious screw appears to be the best device for fixing the scaphoid. It has been criticised for providing little compression, but most of the compression is meant to be supplied by the jig. For nonunion, in conjunction with a wedge graft, the radiological and functional results suggest that it is the method of choice, especially in cases of DISI (dorsal intercalated scaphoid instability). For acute fractures, internal fixation is indicated if there is displacement or distraction and when there are other fractures around the wrist or an associated dislocation has rendered the wrist unstable. It may also be indicated for certain types of fracture known to have a bad prognosis, such as those of the proximal pole and the vertical-oblique and the radial-wedge types, but not in most cases.

We should be grateful to Tim Herbert for his unique contribution to our methods of treatment and for the years which he has devoted to the study of this awkward but important little bone.

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REFERENCES


