Kienböck's disease

CONSERVATIVE MANAGEMENT *VERSUS* RADIAL SHORTENING

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Avascular necrosis of the lunate, first described by Kienböck, can be treated either conservatively or by various surgical procedures. We compared the results of 18 conservatively treated patients, all of whom had stage-2 or stage-3 disease, with those of 15 who underwent a radial shortening procedure. We evaluated pain, range of movement, grip strength and functional disability, and determined the progression of the disease by assessing radiologically carpal height, the width and flattening of the lunate, the radioscapoid angle, the pattern of the fracture and sclerosis and cysts. The mean follow-up was for 3.6 years (1.5 to 9).

Patients treated by radial shortening had less pain and better grip strength than those managed conservatively. In some patients with stage-3 disease treated conservatively there was rapid deterioration to carpal collapse. Although radial shortening did not reverse or prevent carpal collapse, it slowed down the process in patients with stage-3 disease.

We recommend a radial shortening procedure for patients with severe pain and radiological signs of progressive carpal collapse.

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The aetiology of avascular necrosis of the lunate, first described by Kienböck in 1910, remains unclear. Ståhl¹ followed the progression of the disease, and a refinement of the system which he proposed is used to grade the condition.²

Treatment of Kienböck's disease ranges from conservative measures, usually confined to immobilisation during the acute phase, to such operations as joint levelling³ by

radial shortening or ulnar lengthening, intercarpal fusion,⁴ silastic arthroplasty⁵ and vascularised bone grafts.⁶ To our knowledge, no study directly comparing one form of treatment with another has previously been undertaken. We therefore compared the results of patients treated by a radial shortening procedure with those managed conservatively.

Patients and Methods

Between 1988 and 1996 we treated 33 patients at three centres in north-west England. Three senior surgeons at Wrightington Hospital for Joint Disease and Broad Green Hospital, Merseyside, carried out the radial shortening procedures. Patients in the group managed conservatively were seen also at Wigan Royal Infirmary.

There were 11 men and four women in the group treated by radial shortening. At the time of diagnosis four (27%) had stage-2 disease and 11 (73%) stage-3 disease.⁷ (Table I). All patients were reviewed radiologically, but only 14 were examined clinically. Their mean age was 29 years (19 to 50). Before developing symptoms, five patients (33%) had done manual work.

There were 18 patients in the group treated conservatively. At the time of diagnosis five (28%) had stage-2 disease and 13 (72%) stage-3 disease (Table I). All were reviewed radiologically, but only 15 were examined clinically. The mean age of these seven men and eight women was 33 years (21 to 70). Before developing symptoms, seven patients (47%) had done manual work.

For both groups, the mean time of follow-up was 3.6 years (1.5 to 9).

We used the Harvard pain score (0 to 10) when recording pain at rest and after manual activity, and a functional scorecard designed at Wrightington Hospital to assess disability of the wrist. During the clinical examination we assessed synovitis. We measured dorsiflexion, palmar flexion, ulnar deviation, radial deviation, pronation and supination. We used the Jamar dynamometer to assess grip strength, taking the average of three attempts.

Using the technique described by Palmer, Glisson and Werner,⁸ we determined ulnar variance on radiographs taken at the time of diagnosis. The mean ulnar variance was -1.7 mm (1.0 to -3.0) in the group treated conservatively

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Fig. 1

Diagram showing radiological staging of Kienböck's disease.

Fig. 2

Diagram of measurement of carpal height.

and -2.5 mm (0 to -4.5) in those treated surgically. Comparing these radiographs with those taken at review, we assessed the progression of Kienböck's disease, noting sclerosis, fractures and flattening of the lunate, carpal collapse, the presence of cysts and osteoarthritic changes in the midcarpal or radiocarpal joints (Fig. 1). Radiological measurements included the carpal height⁹ (Fig. 2), the radioscapoid angle and the width of the lunate, as seen on lateral radiographs.

Results

At review, the mean score for pain at rest was 0.5 (0 to 4.0) in patients treated surgically and 2.8 (0 to 6.5) in those treated conservatively. For pain at its worst, the mean score was 3.0 (0 to 8.0) in patients who had surgery and 7.6 (4.0 to 10.0) in those managed conservatively.

Pronation and supination of the wrist were normal in both groups. We found that wrists treated surgically achieved 73% of the range of movement of the contralateral wrist, while those managed conservatively achieved 61.5%. The relative grip strength of these latter patients was 61%, compared with 75% in patients treated surgically.

In Table I, patients are grouped according to the radiological stage of the disease at the times of diagnosis and review. In the conservatively managed group, the disease progressed rapidly over six to 18 months in six patients, including one who deteriorated from stage 2 to stage 3b in a year. Although in none of the patients treated surgically did the disease progress rapidly, there was slow deterioration in many. Of the conservatively treated patients with stage-2 disease, one showed both clinical and radiological improvement with less sclerosis over a year, and three had no deterioration over three years. All patients with stage-3 disease deteriorated, but the rate of degenerative change was slower in those treated by radial shortening.

Of the radiological measurements used to assess the progression of Kienböck's disease (Table II), the most useful was the width of the lunate, from which we could determine the extent of flattening. The mean increase was 2.0 mm in the conservatively treated group and 2.4 mm in

Table I. The radiological stages of the 33 patients' with Kienböck's disease

	At diagnosis	At review
Conservative management		
Stage 2	5	4
3a	10	2
3b	3	11
4	—	1
Total	18	18
Radial shortening procedure		
Stage 2	4	2
3a	3	3
3b	8	10
4	—	—
Total	15	15

Table II. Radiological assessment of the progression of Kienböck's disease in the 18 patients treated conservatively and the 15 who underwent radial shortening (figures represent change and are not absolute values)

	Conservative management	Radial shortening procedure
Carpal height (mm; range)	0.7 (0 to 3)	0.7 (0 to 3)
Lunate width (mm; range)	2.0 (0 to 5)	2.4 (0 to 4)
Radioscaphoid angle (degrees; range)	5.4 (0 to 21)	2.1 (0 to 5)

those treated surgically. Carpal height changed little, even with severe carpal collapse. The mean increase in the radioscaphoid angle was three times greater in patients managed conservatively. Lunate sclerosis, however, often made it difficult to determine the true axis of the scaphoid.

We examined the changes associated with stage-3 disease on anteroposterior (AP) and lateral radiographs, and graded them as worse, unchanged or improved. In the 12 patients in the conservatively managed group the pattern of the fracture became worse in eight (67%), remained unchanged in three (25%), and improved in one (8%). In the 11 patients treated surgically it improved in three (27%), remained unchanged in five (45%) and grew worse in three (27%). Flattening of the lunate increased in ten patients (83%) managed conservatively and in seven (64%) of those treated surgically. Flattening remained unchanged in the remaining patients. The extent of carpal collapse grew worse in nine (75%) of the patients who had conservative treatment, but remained unchanged in eight (73%) of those who had a radial shortening procedure.

One patient treated by radial shortening developed chronic reflex sympathetic dystrophy. An arthroscopy six months later revealed marked radiolunate arthritis. The patient subsequently underwent arthrodesis of the wrist. Arthroscopies carried out on two conservatively managed patients, one with stage-3a and one with stage-3b disease, revealed that both had lost articular cartilage in the lunate fossa. The patient with stage-3b disease had also lost cartilage from the articular surfaces of the capitate and hamate. Degenerative changes were not radiologically evident in any of these three patients.

Discussion

Since little has been published about the treatment of Kienböck's disease, there are no standards against which results can be compared. Tillberg,¹⁰ who followed up the results of ulnar lengthening in ten wrists for a mean of 13.5 years, reported that all patients were satisfied and that there was no evidence of osteoarthritis (OA). Razemon¹¹ reported good results after 28 radial shortening procedures, 12 of which were followed up for more than ten years. He also followed up, for between 18 and 26 years, a series of 22 joint-leveling procedures, five of them ulnar lengthening. The results of three of the ulnar lengthening and 12 of the radial shortening procedures were moderate to good. Alm-

quist and Burns¹² reported satisfactory results when following up radial shortening procedures for five to ten years. Vitek and Schonbauer¹³ also reported good long-term results with radial shortening. In all cases, the joint-leveling procedures were accompanied by drilling of the lunate and spongioplasty.

Beckenbaugh et al¹⁴ found little difference between the long-term results of patients managed conservatively and those treated by other modalities. Tajima¹⁵ had previously published similar findings. Other authors^{16,17} have found conservative treatment either to be ineffective or suitable only for the acute phase of the disease.

In our study, patients treated by radial shortening had better results than those managed conservatively, particularly with regard to pain and grip strength. Furthermore, the disease progressed more slowly in patients treated surgically.

One patient treated surgically and two treated conservatively were found on arthroscopic examination to have osteoarthritis, although there were no radiological signs. This raises the need for awareness that insidious degenerative changes may develop earlier than expected.

Among the conservatively managed patients with stage-2 disease, the condition of three remained unchanged and improved in one. The number of cases is too small for us to draw a clear conclusion, but we believe that this suggests that patients with stage-2 disease at the time of diagnosis should initially be treated conservatively.

Although radial shortening does not reverse or halt Kienböck's disease, it slows down the rate of degenerative change. We believe that it is an effective way of treatment in patients with severe pain and radiological signs of progressive carpal collapse.

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