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Poor function after nonoperative treatment of Kienböck's disease

Twenty-five wrist joints treated with immobilization for Kienböck's disease were reexamined after 8 (1–11) years. Six patients had no pain, but 14 had daily problems with the wrist, and of these, 7 had to change their occupation. Five wrist joints were arthrodesed during the follow-up period. We conclude that nonoperative treatment of Kienböck's disease is ineffective.

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In 1910, Kienböck described lunatomalacia, which he assumed had a vascular traumatic etiology. The loss of blood supply to the lunate bone has been attributed to primary circulatory problems, to traumatic interference with circulation, to ligamentous injury, and to fracture.

Treatment has changed from immobilization of the wrist joint to various surgical procedures, such as lengthening of the ulna, shortening of the radius, silicone rubber replacement of the lunate bone, or arthrodesis of the wrist joint.

We present a retrospective study of the long-term results of nonoperative treatment of Kienböck's disease.

Patients

Twenty-five wrist joints in 24 patients treated nonoperatively for lunatomalacia between 1972 and 1983 were reexamined. There were 18 men and 6 women with a mean age of 36 (19–62) years. In 17 cases the dominant hand was affected. All the patients were heavy manual workers. Only 4 patients reported previous trauma. The most frequent complaints were pain and reduced range of motion of the wrist.

Before treatment and at reexamination, all the patients had a radiographic examination, and at follow-up they were classified according to Lichtman et al. (1977):

Stage I. Normal architecture with evidence of a linear or compression fracture.

Stage II. Normal outline, but definite density changes within the lunate.

Stage III. Collapse or fragmentation of the lunate and proximal migration of the capitate.

Stage IV. Generalized degenerative changes within the carpus.

The primary treatment was immobilization of the wrist in a plexidur splint for 6 (1–24) months. The follow-up time was 8 (1–11) years.

Results

Because of persistent pain, 5 of 25 wrists were arthrodesed. Six of the remaining 20 patients had no pain, 9 had pain during light work, 5 had pain during heavy work. Ten patients complained of palpatory tenderness. The average loss of extension compared with the contralateral wrist was 22°; palmar flexion, 28°; ulnar-radial deviation, 5°; and prosupination and supination, 20°. Grip strength was good in nine hands, medium in seven, and weak in nine.

Radiographically, the hands deteriorated (Tables I and II). We found in 19 cases ulna-minus variation averaging 2 (1–4) mm. Eighteen of the 25 wrists were Stage IV at follow up; the arthrodesed patients were initially Stage III–IV.

All but 1 patient had daily problems. After treatment, 16 patients could return to their previous occupation, 7 had changed to lighter work, and 1 could not return to work.

Discussion

The cause(s) of lunatomalacia is unknown. Ulna-minus variation results in compression strains of the lunate, especially in dorsiflexion of the wrist

Table 1. The radiographic evaluation before and after treatment of 24 patients (25 wrists) with Kienböck's disease. Arthrodesed wrists in parentheses

	Increased density	Collapse	Fragmentation	Arthrosis	Arthrodesis
Before	25	22 (4 slight)	18	5	0
After	7	18 (5)	7	13 (2)	5

Table 2. Distribution of the radiographic stage before and after nonoperative treatment of Kienböck's disease

Stage	Before	After
Normal	0	1
I	0	0
II	7	3
III	13	3
IV	5	13
Arthrodesed	0	5

(Hultén 1928, Brolin 1964). This may explain why lunatomalacia appears more frequently in patients with ulna-minus variants. The work of Lee (1963) has shown a variable blood supply to the lunate; vascular injury would cause necrosis because of lack of anastomosing vessels. Possible ways that vessels become damayed compression fractures of the lunate or repeated trauma to the bone and its ligaments.

In the early stage of Kienböck's disease, radiographs of the painful wrist are normal. Later, small cysts or a translucent line appears in the proximal portion of the lunate, followed by increased density, collapse, and fragmentation of the bone (Figure 1). Eventually, healing of the necrosis may occur, but the lunate remains deformed. Often, secondary arthrosis appears in the radiocarpal joint.

Prolonged immobilization of the wrist in Kienböck's disease is regarded as obsolete by most authors; only Ståhl (1947) concluded that immobilization was the treatment of choice. In our study of the long-term results of nonoperative treatment of lunatomalacia, only 6 of the 24 patients were free of pain. Fourteen patients had daily problems, and 7 of these had to change to another occupation. The majority showed radiographic deterioration.

Some authors have reported good results following simple excision of the lunate (Dornan 1949, Gillespie 1961). Several authors have reported good results after operative lengthening of the ulna (Debeyre et al. 1973, Armisted et al. 1982). Shortening of the radius by osteotomy is simpler, and the results are equal to those of lengthening of the ulna (Axelsson 1973, Ovesen 1981, Almquist 1982). Recently (Almquist 1986), capitate-hamate fusion has been proposed in the early stages to allow revascularization of the lunate by relieving the compression forces.

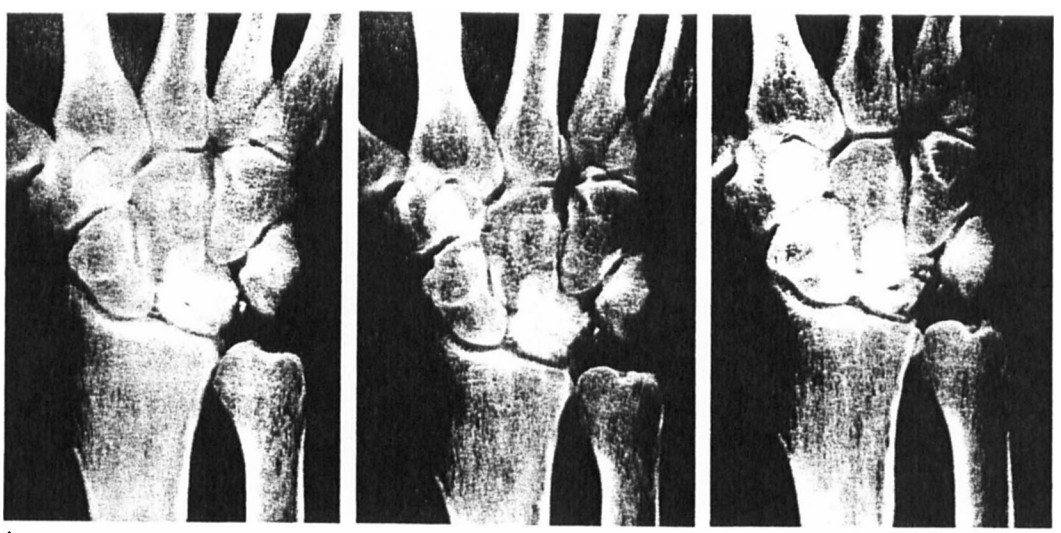

Figure 1. A 53-year-old man with Kienböck's disease.
A. At diagnosis, increased density. B. After 6 months, fragmentation and collapse. C. After 3 years, collapse and healing.

In 1949, Lippman & McDermott implanted an artificial prosthesis with little success; but in 1970, Swanson introduced the silicone-rubber prosthesis, and good results have been reported (Lichtman et al. 1977, Berlini et al. 1982). However, foreign-body, giant-cell reactions to the silicone-rubber implants have been observed (Gordon & Bullough 1982). After revascularization of the damaged lunate, Hori et al. (1979) found substantial osseous remodulation in 8 of 9 patients. Arthrodesis of the wrist may be performed in advanced cases.

We conclude that the results of immobilization are not satisfactory and probably reflect the natural course of the disease.

References

Almquist, E. E. & Burns, J. F. Jr. (1982) Radial shortening for the treatment of Kienböck's disease – a 5- to 10-year follow-up *J. Hand Surg.* **7**, 348–352.

Armiestead, R. B., Linscheid, R. L., Dobyns, J. H. & Beckenbaugh, R. D. (1982) Ulnar lengthening in the treatment of Kienböck's disease. *J. Bone Joint Surg.* **64-A**, 170–178.

Axelsson, R. (1973) Niveauoperationen bei Mondbeinnekrose. *Handchirurgie* **5**, 187.

Brolin, I. (1964) Post-traumatic lesions of the lunate bone. *Acta Orthop. Scand.* **34**, 167–182.

Bertini, S., Capanna, R. & Vitale, C. (1982) Use of the Swanson prosthesis in Kienböck's disease. *Ital. J. Orthop. Traumatol.* **8**, 33–41.

Debeyre, J., Kenesi, C. & Rennes, P. (1973) L'allongement du cubitus dans le traitement de la maladie de Kienboeck. *Rev. Chir. Orthop.* **59**, Suppl. 1., 151–155.

Dornan, A. (1949) The results of treatment in Kienböck's disease. *J. Bone Joint Surg.* **31-B**, 245–249.

Gillespie, H. S. (1961) Excision of the lunate bone in Kienböck's disease. *J. Bone Joint Surg.* **43-B**, 245–249.

Gordon, M. & Bullough, P. G. (1982) Synovial and osseous inflammation in failed silicone-rubber prosthesis. *J. Bone Joint Surg.* **64-A**, 574–580.

Hori, Y., Tamai, S., Okuda, H., Sakamoto, H., Takita, T. & Masuhara, K. (1979) Blood vessel transplantation to bone. *J. Hand. Surg.* **4**, 23–33.

Hultén O. (1928) Über anatomische Variationen der Handgelenkknochen. Ein Betrag zur Kenntnis der Genese zwei verschiedener Mondbeinveränderungen. *Acta Radiol.* **9**, 155–168.

Kienböck, R. (1910) Über traumatische Malazie des Mondbeins und ihre Folgezustände: Entartungsformen und Kompressionsfrakturen. *Fortschr. Roentgenstrahlen* **16**, 78–103.

Lee, M. L. H. (1963) The intraosseus arterial pattern of the carpal lunate bone and its relation to avascular necrosis. *Acta Orthop. Scand.* **33**, 43–55.

Lichtman, D. M., Mack, G. R., MacDonald, R. I., Gunther, S. F. & Wilson, J. N. (1977) Kienböck's disease: the role of silicone replacement arthroplasty. *J. Bone and Joint Surg.* **59-A**, 899–908.

Lippman, E. M. & McDermott, L. J. (1949) Vitallium replacement of lunate in Kienböck's disease. *Milit. Surg.* **105**, 482–484.

Ovesen, J. (1981) Shortening of the radius in the treatment of lunatomalacia. *J. Bone Joint Surg.* **63-B**, 231–232.

Ståhl, F. (1947) On lunatomalacia (Kienböck's disease): Clinical and roentgenological study, especially on its pathogenesis and late results of immobilization treatment. *Acta Chir. Scand.* Suppl. 126, 1–133.

Swanson, A. B. (1970) Silicone rubber implants for the replacement of the carpal scaphoid and lunate bones. *Orthop. Clin. North Am.* **1**, 299–309.