

Treatment of Advanced Kienbock's Disease (Lichtman Stage IIIB with Carpal Collapse) by a Shortening Osteotomy of the Radius: 21 Cases

J. C. Botelho, MD¹ Silvia Silverio, MD² Ana Luísa Neto, MD²

¹Department of Orthopaedics, Hospital dos Lusiadas, Lisbon, Portugal

²Department of Orthopaedics, Hospital de Sant'Ana, Parede, Portugal

Address for correspondence Ana Luísa Neto, MD, Department of Orthopaedics, Hospital de Sant'Ana, Parede 2779-501, Portugal (e-mail: analuisaneto.s@gmail.com).

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Abstract

Purpose To review the results of shortening osteotomies of the radius in our stage IIIB Kienbock's disease patients.

Materials and Methods In the past 30 years, we treated 52 cases of Kienbock's disease by a shortening osteotomy of the radius, of which 21 already had carpal collapse. All patient charts and X-rays were reviewed, but only the cases already with carpal collapse (stage IIIB) are presented here.

Results All patients improved after surgery. Pain, on a scale of 0 to 3, generally 2 or 3 before surgery (median: 2.3), was normally 1 or 0 afterward (median: 0.9); median flexion–extension of the wrist improved from 77 to 99 degrees; and grip strength of the other hand improved from 26 to 76%. The last clinical and radiological review was performed 1 to 23 years after surgery (median: 8 years).

Conclusion Advanced Kienbock's disease with carpal collapse is not a contraindication for carpal-sparing surgery radial shortening osteotomy.

Keywords

- Kienbock's disease
- carpal collapse
- radial osteotomy

Kienbock's disease, also known as avascular necrosis of the lunate, was described in 1910 and classified into progressive radiological stages by Stahl and Decoulx.¹ In Decoulx stages I and II, the lunate keeps its original form and volume, although with changes in radiological density, flattening of the lunate appears in stage III and there are already signs of radiocarpal osteoarthritis in stage IV. Lichtman later divided stage III into A, without carpal collapse, and B, already with carpal collapse.²

More recently, new classifications and staging of Kienbock's disease based on magnetic resonance imaging (MRI) and/or arthroscopy were introduced with theoretical therapeutic implications.^{3–5}

Conservative treatment of the symptomatic disease—immobilization—is generally not advised,^{6,7} except in very early cases or children and adolescents,⁵ and many surgical techniques have been used to treat Kienbock's disease.^{2,3}

Hulten stated in 1928 that "cubitus minus" was more frequent in Kienbock's disease patients and would be the main cause of the disease. That led to the use of lengthening osteotomies of the ulna and shortening osteotomies of the radius in the treatment of Kienbock's disease, with good clinical results.¹

Although that statement was challenged,^{8,9} biomechanical studies seem to prove that those osteotomies, in fact, lessen the pressure on the lunate bone.^{10,11} The shortening osteotomy of the radius, with less bone union problems than the lengthening osteotomy of the ulna,¹² became probably the most popular surgery for Kienbock's disease around the world,³ sometimes combined with other techniques.^{13,14}

Lichtman, following his radiological classification of Kienbock's disease, stated that with carpal collapse (stage IIIB) "equalization procedures, though they may unload the

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lunate, are not likely to reestablish normal carpal architecture and mechanics." Therefore, for stage IIIB, scaphotrapeziotrapezoid or scaphocapitate fusion is recommended. If there is significant synovitis, then the lunate should be excised as well.² This became a dogma for most hand surgeons¹⁵ despite the good clinical results published by many authors with radial osteotomies in advanced Kienbock's disease.¹⁶⁻²³

Materials and Methods

Since 1985, the only surgical technique used primarily in our Kienbock's disease patients was radial shortening osteotomy (except cases already with radiocarpal osteoarthritis): 52 cases. All patients files were reviewed, but only the 21 cases with carpal collapse (Lichtman IIIB) are presented here (**►Fig. 1**).

After surgery, patients were asked to visit yearly for revision, but many, living far away, were lost to follow-up. They were all operated and reviewed by the first authors of this work. The last clinical and radiological revision was between 1 and 23 years (median: 8).

Only 7 were male, and only 8 left wrists were operated. Age was between 15 and 66 years (median: 32). Patients' complaints had started between 1 month and 3 years prior to presentation.

Pain was classified into the following:

- Grade 3 Nakamura: constant, 8 cases.
- Grade 2 Nakamura: even in light work, 12 cases.
- Grade 1 Nakamura: only in heavy work, 1 case.
- Grade 0 Nakamura: no pain, none.

Before surgery, median wrist mobility in flexion-extension was 77 degrees, and prehension strength, measured with a pneumatic manometer, was 26% of that of the other hand.

These measures were not tested in a spastic patient.²⁴ A total of 15 patients were considered to have an "ulna minus" and 6 to have a neutral ulnar variance.² Thirteen patients had fragmentation of the lunate bone seen in standard X-rays of the wrist²⁵: "Lichtman IIIC stage."²⁶ Classification of the Kienbock's disease in stage IIIB (with carpal collapse) was done comparing to the contralateral wrist.

The shortening osteotomies of the radius (2–3 mm) were performed in the initial years using a dorsal approach in the distal metaphysis and fixation with a straight plate (two patients of this series). The last 19 patients were operated using a palmar approach,²⁷ with the very distal osteotomy fixed with a T-plate (**►Fig. 2**). They were immobilized with an anteribrachial plaster splint for 4 weeks and then started active mobilization for another month followed by formal physiotherapy, if needed. Work was resumed when a sound union was seen in X-rays, or even before in cases of light work. Three posterior interosseous neurotomies and one carpal tunnel release were performed with the osteotomies.

Results

According to our files review, all patients improved after surgery. Pain, generally 2 or 3 before surgery (median: 2.3), was normally 1 or 0 afterward (median: 0.9); median flexion-extension of the wrist improved from 77 to 99 degrees; and grip strength of the other hand improved from 26 to 76%.

None of the six patients with neutral ulnar variance had lasting ulnar pain after surgery. That was only described with bigger radial shortening,²⁸ but we must admit that in most of these cases, the distal shortening osteotomy was wedged - wider on the radial side than on the ulnar one.²⁹

Rather subjectively, X-rays were considered improved in just one patient, unchanged in 11, and worsened in 9, with no



Fig. 1 Case 25: preoperative status and X-rays (1997, 22 years). Pain: 2, flexion-extension: 45 degrees; grip: 10%.



Fig. 2 Case 25: postoperative status and X-rays (2018). Pain: 1; flexion–extension: 110 degrees; grip: 80%; light work.

correlation with clinical status. Four patients were reoperated: three with plate removals (two dorsal plates and one palmar) with posterior interosseous neurotomy and one with Pheemister³⁰ grafted delayed union (operated with a palmar plate) that united quickly with a good clinical result.

Discussion and Conclusions

Etiology and natural evolution of Kienbock's disease are largely unknown,³¹ and asymptomatic cases are rather frequent.^{32,33} Carpal collapse in Kienbock's disease does not progress to radiocarpal osteoarthritis as in posttraumatic cases,³⁴ probably because there are no abnormal movements between the carpal bones³⁵—it is an adaptative carpal collapse, not a carpal instability.³⁶

Intercarpal arthrodesis (with or without lunate excision) lessen wrist pain but also wrist mobility.^{37,38} Radial osteotomies lessen wrist pain and improve wrist mobility, and are probably more effective in increasing grip strength.³⁸

These are the main reasons to avoid primary aggressive carpal surgery, such as carpal arthrodesis, proximal carpectomy,^{15,39} and others,⁴⁰ in Kienbock's disease, even in cases with carpal collapse (Lichtman stage IIIB) or lunate fragmentation.²⁵

Finally, any carpal surgery can be added to an eventually failed radial shortening osteotomy.⁴¹ As a conclusion, radial shortening osteotomy should not be contraindicated in advanced Kienbock's disease (without radiocarpal osteoarthritis), as stated,^{2,5,15,26} because it achieves long-lasting good clinical results, with very few complications.

Conflict of Interest

None declared.

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