

# Kienböck's disease: an unusual cause of wrist pain in a 13-year-old girl

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**K**ienböck's disease is a condition that results in osteonecrosis and collapse of the lunate bone. The disease usually presents in adults between the ages of 20 and 40 years and is rare in children.<sup>1</sup> We report a case of this disorder in a teenage girl.

## Case report

A 13-year-old girl presented with a 5-month history of right (dominant) wrist pain that resulted from a forced dorsiflexion-type injury. She experienced progressive discomfort in the wrist that

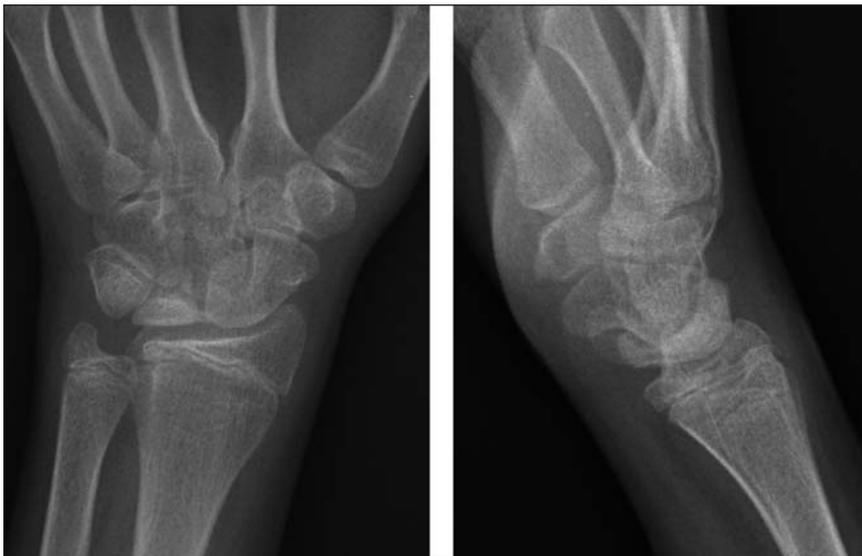
subsequently was associated with stiffness and weakness. The pain persisted even though she curtailed her sporting activities, and it became progressive and disabling. She had no history of a fracture or dislocation and no risk factors for avascular osteonecrosis.

Physical examination of the right wrist revealed swelling and tenderness over the proximal row of carpal bones. She had decreased range of motion with 30° of palmar flexion and 60° of dorsiflexion, compared with the uninvolved wrist. Neurologic and vascular status findings were satisfactory. Hand grip strength was

10 kg, compared with 21 kg on the uninvolved side.

Radiographs demonstrated a collapsed, sclerotic lunate bone with a negative ulnar variance deformity of the wrist measuring 3 mm (Fig. 1). The lunate was graded according to the classification of Lichtman and associates<sup>2</sup> as stage IIIA Kienböck's disease (lunate collapse without change in intercarpal relation). Further, the carpal height was measured at 2.1 cm, producing a carpal height ratio of 0.44 (normal range 0.45–0.60).<sup>2</sup> CT confirmed fragmentation and collapse of the lunate bone with marked sclerosis but no intercarpal changes.

The girl underwent right distal radial shortening osteotomy 6 months after presentation. A dorsal approach was used, and 4 mm of radius was removed, resulting in neutral ulnar variance at the wrist. The osteotomy was fixed with a one-third tubular plate, and a neurectomy of the terminal branch of the posterior interosseous nerve was performed. Postoperatively, she wore a cast for 6 weeks. At that time, radiographs showed progressive consolidation at the osteotomy site and an improved appearance of the lunate bone in both height and density. The carpal height had increased to 2.4 cm, producing a carpal height ratio of 0.58 (Fig. 2). The patient underwent physical therapy to improve strength and range of motion of the wrist. Clinically, her symptoms resolved gradually, and 8 months postoperatively she was pain free and had resumed her normal sports and activities.



**FIG. 1.** Anteroposterior (left) and lateral (right) radiographs of the right wrist at the time of presentation demonstrate a flattened and sclerotic lunate bone with associated negative ulnar variance.

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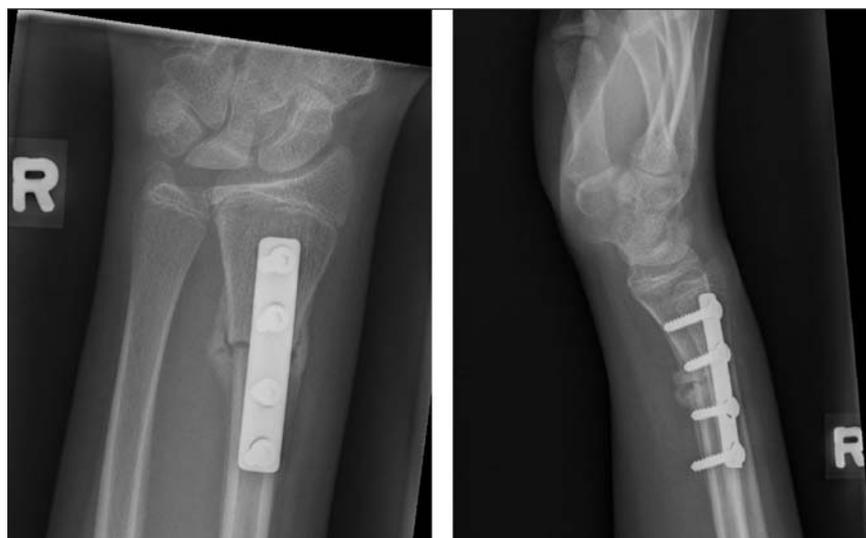


FIG. 2. Anteroposterior (left) and lateral (right) radiographs 6 weeks postoperatively show progressive consolidation at the osteotomy site. The lunate bone appears to have increased height and density.

### Discussion

The etiology of Kienböck's disease remains controversial. Various biomechanical and anatomic changes can cause repetitive compression loading and microfractures of the lunate bone that result in vascular compromise. Even though trauma may precipitate the disease, the most consistent mechanical risk factor is negative ulnar variance at the wrist. An increase in negative ulnar variance or shortening of the ulna increases the load borne by the ulnocarpal joint.<sup>3</sup>

Plain radiography allows the disease to be classified into 4 stages according to Lichtman and associates.<sup>2</sup> CT can be used to further evaluate anatomic changes of the carpal bones. In the early stages of the

disease, the use of MRI can aid in making the diagnosis and is more sensitive and specific than bone scanning.<sup>4</sup>

The treatment of Kienböck's disease depends on the radiographic stage.<sup>3,4</sup> More advanced disease is usually treated operatively.<sup>3</sup> The majority of surgical procedures aim to unload the lunate and thereby reduce the compressive forces and any additional fragmentation and collapse, theoretically promoting revascularization of the lunate.<sup>5</sup> Joint levelling is probably the most widely used technique.<sup>3</sup> It can be achieved by either a radial shortening osteotomy, which appears to be effective in 80% of adult subjects,<sup>4</sup> or by ulnar lengthening, which is associated with a higher rate of nonunion.<sup>3</sup> Of note is that in this patient

a neurectomy of the terminal branch of the posterior interosseous nerve was performed, thereby partially denervating the sensory fibres to the wrist joint. We believe that radial osteotomy also increases local blood flow, promoting greater revascularization of the lunate bone. The radial shortening technique was effective in our case and, apparently, in the literature. To date there are about 13 reports of Kienböck's disease treated with radial shortening in the pediatric age group. Nine (69%) of those cases resulted in a successful outcome with a pain-free wrist.<sup>5</sup>

Kienböck's disease rarely occurs in children. However, because of its progressive nature and destructive effect on the wrist, it is important that clinicians should make themselves aware of the condition and attempt to detect it and refer patients early.

**Competing interests:** Dr. McKee received travel assistance from Zimmer of Canada Ltd. to attend a trauma symposium.

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