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Topics in Diagnostic Medicine

Kienbock Disease: A Complicated Postsurgical Case Study Using Diagnostic Ultrasonography

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Abstract

Objective: The purpose of this case report is to describe a case of Kienbock disease (lunatomalacia) that was identified through diagnostic ultrasonography.

Clinical Features: A 27-year-old man presented to a chiropractic teaching clinic with a 3-year history of wrist pain. The history of chief concern consisted of lunatomalacia, diagnosed 2 years prior, with surgical intervention consisting of radial osteotomy and vascularized bone graft. Radiography and ultrasonography were performed upon presentation and at 2-year follow-up that demonstrated progressive collapse and fragmentation of his lunate with the development of progressive scapholunate advanced collapse of the wrist.

Intervention and Outcome: Conservative care included class IV cold laser and a splint worn during strenuous activity and while sleeping. The patient received minimal pain relief and continued to experience chronic left wrist pain. He is continuing conservative care and evaluating options for further surgical intervention.

Conclusion: This case demonstrates a patient with chronic wrist pain and progressive collapse of the lunate demonstrated on multiple imaging modalities after surgical intervention. To our knowledge, this is the first case demonstrating Kienbock disease using diagnostic ultrasonography.

Introduction

Osteonecrosis of the lunate, also known as *lunatomalacia*, was described by Robert Kienbock in 1910 and thought to be caused by rupture of the ligaments and vessels around the lunate producing aseptic necrosis, osseous softening, and collapse.[1] The eponym *Kienbock disease* was coined after his classic description. Kienbock disease typically affects adult men between 20 and 40 years old who present with wrist pain and weakness in the dominant hand.[2,3] Accurate diagnosis can be challenging, as the differential diagnosis includes scapholunate sprain, lunate fracture, and dislocation.[3,4] The etiology is not well understood and remains controversial, but is traditionally thought to be related to trauma or anatomical

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factors.[5,6] Stahl et al[5] reported no relationship between the development of Kienbock disease and trauma (although commonly reported), hand-arm vibration, heavy manual labor, and comorbidities. They did, however, report an association with the use of oral corticosteroids. This is consistent with findings of osteonecrosis in other areas of the skeleton, as prolonged use of corticosteroids is the most common nontraumatic etiology.[5] Anatomical features may be a predisposing factor such as impaired blood supply and anatomical variation that results in increased shear force on the lunate such as negative ulnar variance.[1,3,7] The association with negative ulnar variance is controversial and not consistent worldwide. Interestingly, it has been reported as a noncausative factor in Europe and Japan; yet a strong association has been reported in North America and China.[6–9]

The radiographic staging of Kienbock disease is classified according to Lichtman's system. It includes 4 stages that progress from normal radiographic appearance of the lunate (stage I) to collapse and rotation of the scaphoid with degenerative disease in the carpus (stage IV). Detailed discussion of the staging of Kienbock disease is beyond the scope of this case report. Operative procedures are targeted at realignment and restoration of vascularity, and good subjective outcomes are reported.[10,11] Radial osteotomy may slow progression in patients with stage III disease (lunate collapse without scaphoid rotation [IIIA] or with scaphoid rotation [IIIB]) but has not been shown to prevent or reverse carpal collapse.[9,12] Conservative management includes immobilization for up to 3 months and anti-inflammatory medication.[8,13]

To our knowledge, there are no reported cases of Kienbock disease demonstrated on ultrasonography (US). Therefore, the purpose of this case report is to describe a case of Kienbock disease (lunatomalacia) that was identified through diagnostic US. This report highlights a case of a 27-year-old man diagnosed with Kienbock disease that was treated surgically and subsequently progressed to further osseous collapse at 4-year follow-up with the development of scapholunate advanced collapse (SLAC). Imaging evaluation included diagnostic US.

Case Report

A 27-year-old right-handed male chiropractic student presented to our clinic with a 3-year history of left wrist pain. Approximately 2 years prior, he presented to an emergency department (ED) with a chief concern of left wrist pain, 1 year in duration, exacerbated 5 days earlier while working at a landscaping company gardening and pulling roots. Physical examination revealed minimal swelling and evidence of extensor tendon tenosynovitis, without crepitus. His medical history consisted of a Meckel diverticulum with surgical resection and appendectomy. Radiography in the ED revealed flattening of the lunate with sclerosis, soft tissue swelling, negative ulnar variance, and a volar ossicle adjacent to the lunate (not pictured) (Fig 1). The radiologic findings within the lunate were overlooked, and the patient was diagnosed with tenosynovitis and discharged with a splint. No further treatment was provided.

Fig 1. Initial posteroanterior radiograph of the left wrist performed in the emergency department demonstrated irregularity, collapse, and deformity of the lunate along with osteosclerosis. There is negative ulnar variance of the ulna.

The patient's left wrist pain was unabated, and he sought consultation with an orthopedic surgeon 17 days later. Upon examination, he had minimal swelling; and ranges of motion in flexion and extension were 45° in each direction. The radiographs obtained in the ED were reviewed, and avascular necrosis of the lunate was suspected. Magnetic resonance imaging (MRI) was requested that revealed flattening of the lunate and mixed signal intensity of the bone marrow consistent with edema and necrosis (Fig 2). The patient was then referred to an orthopedic hand surgeon.

Preoperative grip strength was 80 lb on the left and 190 lb on the right. Surgical intervention was performed 39 days after initial presentation to the ED. Procedures on the left wrist consisted of vascularized bone graft, corrective osteotomy of the radius with 3.0 mm of shortening, extensor tendon synovectomy (done on 9 tendons), and posterior interosseous nerve neurectomy to denervate the radiocarpal joint. Radiography was performed 10 days later and demonstrated