Clinical note

99mTc-MDP SPECT/CT as the one-stop imaging modality for the diagnosis of early setting of Kienbock's disease

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ABSTRACT

99mTc-Methylene diphosphonate (MDP) triple phase bone scintigraphy (BS) has a role in early diagnosis of Kienbock's disease, especially when the X-ray is negative. Early diagnosis can result in prompt management of the patient since wrist pain in older individuals due to aging may go unnoticed or be due to other diagnoses with the production of greater damage and eventually a worse prognosis. Herein, we present a case report of a 29-year-old female with Kienbock's disease in whom the X-ray was negative and MRI incorrect. The 99mTc-MDP SPECT/CT BS helped the diagnosis of the disease in an early stage (stage 1) and had a clinical impact on the patient's management.

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SPECT/TC con 99mTc-MDP como la técnica de imagen de elección en el diagnóstico de la enfermedad de Kienbock en fase inicial

RESUMEN

La gammagrafía ósea en tres fases con 99mTc-metilendifosfonato (MDP) tiene un papel en el diagnóstico precoz de la enfermedad de Kienbock, especialmente cuando el estudio radiológico es negativo. El diagnóstico precoz puede conducir a un rápido manejo del paciente ya que el dolor de muñeca en individuos mayores de edad debido al envejecimiento puede pasar desapercibido o ser debido a otros diagnósticos con la producción de una lesión mayor y, eventualmente, un peor pronóstico. Presentamos un caso de una mujer de 29 años con enfermedad de Kienbock en la que el estudio radiológico fue negativo y la RM equivoca. La SPECT/TC ósea con 99mTc-MDP ayudó al diagnóstico en una etapa precoz de la enfermedad (estadio 1) y tuvo un impacto clínico en el manejo del paciente.

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Introduction

Kienbock's disease is an aseptic necrosis of lunate bone initially described by Kienbock in 1910. It is the most common form of avascular necrosis in the upper extremity. Clinically, patients tend to present with pain and stiffness in the wrist with associated swelling and tenderness dorsally over the radio-lunate joint. Exact cause for the disease is not known but factors leading to decreased blood supply of lunate are usually associated. X-ray changes are evident in late stages (destruction/collapse) with surgery remaining as the only option. 99mTc-Methylene diophosphonate (MDP) triple phase bone scintigraphy (BS) has a role in early diagnosis especially when the X-ray is negative. Early diagnosis can result in prompt management, on the other hand neglected wrist pain in older individuals on account of aging problem or other diagnosis results in greater damage and eventually poorer prognosis.

Case report

We here present a case of a 29-year-old female, housewife by profession with no prior history of heavy work. She presented with complaints of pain in wrist since past two years that was gradually increasing in intensity. There was no history of trauma; no diurnal variation and pain got relieved temporarily with anti-inflammatory drugs. On examination there was tenderness on dorsal side of the right wrist with slight limitation of range of motion. X-ray right wrist was unremarkable (Fig. 1). Subsequently patient underwent magnetic resonance imaging (MRI) of the right wrist that revealed focal hypointensity on T1 and hyperintensity on T2 in lunate with maintained shape which was a equivocal finding for early stages (stage 1) of Kienbock's disease (Fig. 2). Based on clinical suspicion, patient was referred for BS to look for avascular necrosis of lunate. BS was performed after injecting 20 mCi of 99mTc-MDP. Blood flow and pool images showed no significant increase in radio-tracer activity in bilateral wrist soft tissue region. Delayed three hour static images showed focal area of uptake in the region of lunate bone that was corroborated on single photon emission computed tomography—computed tomography (SPECT/CT) (Fig. 3). In

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the given clinical context, $^{99m}$Tc-MDP SPECT/CT was consistent with early setting of avascular necrosis of lunate or Kienbock's disease.

**Discussion**

Kienbock's disease is an aseptic avascular necrosis of lunate bone. Etiology of the disease is still debated, but loss of blood supply to the lunate resulting in necrosis of the bone is the basic pathophysiology ultimately resulting in collapse of the bone. Various factors have been proposed; including skeletal and vascular variations, repetitive loading and trauma. It has been reported in literature that in around 7–20% of population normal lunate is supplied only by palmar vessels, thereby placing it at a high risk of avascular necrosis due to traumatic interruption of its vascular supply. Progression of Kienböck's disease is substantially faster and the articular cartilage of the lunate degenerates in early stages. Middle-aged adult predominantly male manual workers are affected. The condition is typically unilateral. Bilateral involvement, diminished range of motion of wrist joint, and weakness in grip strength may be present. Diagnosis is usually made clinically. Imaging modalities that can be used are X-ray, computed tomography (CT), MRI and BS. In stage I, the density of the lunate and its shape are normal on X-ray, hence MRI or BS may be helpful. MRI may demonstrate decreased signal intensity on T1-weighted images, but these findings are non-specific. Subchondral edema seen in ulno-carpal impaction or post-traumatic changes of the wrist, may give similar images. Hence in such cases where X-ray is negative and MRI is equivocal, BS can aid in diagnosis of the disease at early stages (stage 1). Stage 2 is characterized by densification of the lunate, without significant alteration of its shape; stage 3 by collapse of the lunate and in stage 4, there are extensive degenerative changes in the carpal bone. In our case when compared to the conventional imaging procedures, $^{99m}$Tc-MDP SPECT/CT was able to identify the early setting of avascular necrosis of lunate which helped in timely intervention and treatment.

![Figure 1](image1.png)  
*Figure 1. X-ray wrist (A, B) revealing no abnormal changes in lunate bone.*

![Figure 2](image2.png)  
*Figure 2. MRI of the right wrist. Focal hypointensity on T1 (A, arrow) and hyperintensity on T2 (B, arrow) is noted in the lunate with maintained shape.*
Aim of the treatment is to relieve pain, preserve motion and improve function. Severity of disease and patient-specific factors are the factors which decide the treatment, but there is no gold standard treatment. Management initially includes conservative treatment in the form of temporary immobilization. However some patients do not respond and present with progressive radiological deterioration on follow up. Also the severity of changes in the lunate and of carpal collapse does not always correlate with symptoms. BS can be used in follow up of these patients to demonstrate the disease activity. Surgery is advised only for patients with symptomatic disease after an adequate trial of immobilization and anti-inflammatory medication. In the present case, patient was taken up for conservative management (plaster cast for 4 weeks). Hence in the present case BS helped in early diagnosis and thereby having a clinical impact on the patient management.

Conflicts of interest

None declared.

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References