



^{99m}Tc-MDP bone scintigraphy in the diagnosis of stress fracture of the metatarsal bones mimicking oligoarthritis

Scintigrafija kosti primenom ^{99m}Tc-MDP u dijagnostici stres frakture metatarzalnih kostiju koja liči na oligoarthritis

Ljiljana Jauković*, Boris Ajdinović*, Ksenija Gardašević†,
Marija Dopuđa*

Military Medical Academy, *Institute of Nuclear Medicine,
†Clinic of Rheumatology, Belgrade

Abstract

Background. Stress fractures are the injuries of soft tissues and bones caused by intensive and repeated stress on a bone. Repeated submaximal stress disturbs the balance between the processes of bone production and resorption that results in fracture. **Case report.** We presented a case of a patient with stress fracture of metatarsal bone. The patient was diagnosed and treated as having reactive oligoarthritis caused by *Chlamydia trachomatis* and administered antibiotics. Initial plain radiography was negative for bone fracture. Tc-99m bone scintigraphy suggested stress fracture of the second metatarsal. Plain radiography was became positive three weeks later, showing callus formation in the proximal part of the second metatarsal. **Conclusion.** Bone scintigraphy is a diagnostic test of choice in early diagnosis of stress fracture, and it is important to apply it timely in order to include the entire therapy and prevent complications, as well as to let a patient return to previous daily activities.

Key words:

fractures, stress; radionuclide imaging; radiography; arthritis, reactive; diagnosis; diagnosis differential.

Apstrakt

Uvod. Stres frakture predstavljaju povrede mekih tkiva i kostiju koji nastaju pri izlaganju zdrave kosti intenzivnom i ponovljenom stresu. Ponavljani submaksimalni stres remeti ravnotežu između procesa izgradnje i resorpcije kostiju što ima za posledicu pojavu frakture. **Prikaz bolesnika.** U radu je prikazan bolesnik sa stres frakturom metatarzalne kosti. Kod bolesnika je inicijalno postavljena dijagnoza reaktivnog oligoartritis uzrokovanog *Chlamydom trachomatis* i sprovedena je antibiotiska terapija. Radiografijom stopala na prijemu dobijen je normalan nalaz. Scintigrafija kostnog sistema sa tehnecijum 99m metilen difosfonatom (^{99m}Tc-MDP) ukazala je na stres frakturu druge metatarzalne kosti. Kontrolnom radiografijom stopala nakon tri nedelje uočena je kalusna formacija proksimalnog dela druge metatarzalne kosti. **Zaključak.** Scintigrafija kostiju predstavlja metodu izbora u ranoj dijagnostici stres frakture. Važno je da se primeni pravovremeno čime se omogućava sprovođenje adekvatne terapije, sprečavanje pojave komplikacija i brži oporavak bolesnika.

Ključne reči:

prelomi usled zamora; radioizotopsko snimanje; radiografija; artritis, reaktivni; dijagnoza; dijagnoza, diferencijalna.

Introduction

Stress reaction and stress fractures represent a spectrum of soft tissue and bone injuries that occur in response to abnormal repetitive stress applied to healthy bone¹. Repetitive submaximal stress creates the imbalance between bone resorption and bone replacement. If stressful activities continue the accelerated intracortical remodeling may progress to stress fracture. Early diagnosis of stress fractures is important for appropriate treatment, low risk for complications, and a return to pre-disease activity.

Case report

We reported a case of a 21-year-old male military recruit, presented with pain and oedema of the left foot. He had a two-week history of swelling and pain in his foot, in coincidence with intensive military training. There were no data of previous spine pain, urogenital or digestive infections, conjunctivitis or skin and mucosal lesions. Bone fracture was rule-out by physical examination and normal finding on plain radiography at presentation (Figure 1). Ultrasonography of the left foot did not find any destructive changes of metatar-

sophalangeal joints. Erythrocyte sedimentation rate, full and differential blood count, C-reactive protein and the routine laboratory tests were within normal range; rheumatoid factor was negative. Physical examination of musculoskeletal system revealed metatarsophalangeal arthritis with coexisting tendinitis of the left foot. *Chlamydia trachomatis* was isolated from the urethral discharge. Bone scintigraphy demonstrated focal lesion in tarsus and diffusely increased tracer uptake in second metatarsal of the left foot, with no other

foci in joints and with sacroiliac joint index within normal range (Figure 2). Although bone scan was suggestive to stress fracture, the clinical presentation of arthritis and the other findings were likely to represent the reactive oligoarthritis caused by *Chlamydia trachomatis*. The patient was treated by 10-day antibiotics therapy and avoided exercise for two weeks. The control plain radiography three weeks later clearly showed callus formation in the proximal part of second metatarsal of the left foot (Figure 3).



Fig. 1 – Initial plain radiography of the left foot. The examination was considered negative for bone fracture



Fig. 3 – Control radiography showing callus formation in the proximal part of the second metatarsal.

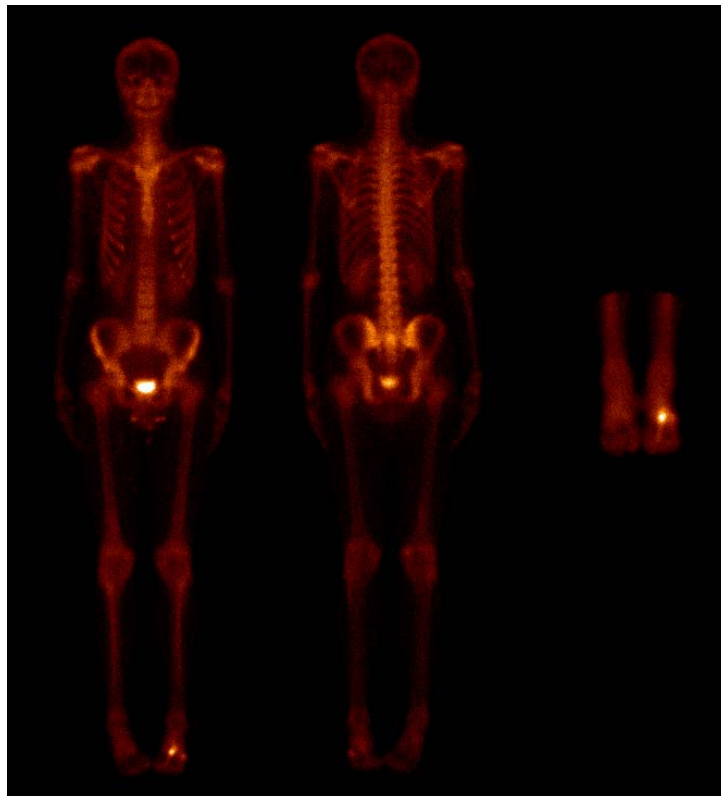


Fig. 2 – Bone scintigraphy. There is a focal lesion present in the tarsus bone and also diffusely increased tracer uptake in the second metatarsal of the left foot

Discussion

Prolonged hiking or running by an untrained individual may cause a fatigue fracture of a metatarsal. Conventional radiographs are insensitive in the detection of early-stage stress injuries^{2,3}. Bone scintigraphy has been an important imaging tool since 1970, because it is a more sensitive indicator of an early stress fracture than a radiography. Kiuru⁴ reported the sensitivity of radiography of 56%, specificity of 94% and accuracy of 67%, compared to the bone scintigraphy as the gold standard. Radiography detects stress fracture late in the bone reaction process, at least two to three weeks after positive scintigraphy, as demonstrated in our case. Re-

cent studies reported that magnetic resonance imaging (MRI) provided more diagnostic information and was even more sensitive and should be used as the gold standard in the assessment of stress injuries of the bone⁴⁻⁶.

Conclusion

Our case supports the need to search for stress fracture in patients presenting with some symptoms and signs of arthritis, especially in the risk population. Advanced imaging studies such as bone scintigraphy and MRI will be needed to ensure an early diagnosis when the plain radiography fails.

R E F E R E N C E S

1. Anderson MW, Greenspan A. Stress fractures. *Radiology* 1996; 199(1): 1-12.
2. Daffner RH, Pavlov H. Stress fractures: current concepts. *AJR Am J Roentgenol* 1992; 159(2): 245-52.
3. Spitz DJ, Newberg AH. Imaging of stress fractures in the athlete. *Radiol Clin North Am* 2002; 40(2): 313-31.
4. Kiuru MJ, Pihlajamäki HK, Hietanen HJ, Aho J. MR imaging, bone scintigraphy, and radiography in bone stress injuries of the pelvis and the lower extremity. *Acta Radiol* 2002; 43(2): 207-12.
5. Ishibashi Y, Okamura Y, Otsuka H, Nishizawa K, Sasaki T, Tob S. Comparison of scintigraphy and magnetic resonance imaging for stress injuries of bone. *Clin J Sport Med* 2002; 12(2): 79-84.
6. Sofka CM. Imaging of stress fractures. *Clin Sports Med* 2006; 25(1): 53-62, viii.

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