# Longitudinal stress fracture of tibia – a rare diagnosis

I Gupta, S Sethi, J Shankar

**Citation**

I Gupta, S Sethi, J Shankar. *Longitudinal stress fracture of tibia – a rare diagnosis*. The Internet Journal of Radiology. 2008 Volume 10 Number 2.

**Abstract**

A 44year old female presented in radiology department for evaluation of a left sided distal tibial pain. There was no history of trauma or any unaccustomed exercise. Physical examination was remarkable for significant tenderness to palpation of distal third of left tibia. Presumptive diagnosis of stress fracture or osteoid osteoma was made. Patient was referred for radiological evaluation. roentgenogram revealed focal distal cortical thickening. CT and MRI revealed an unusual type of stress fracture-longitudinal stress fracture of tibia.

## INTRODUCTION

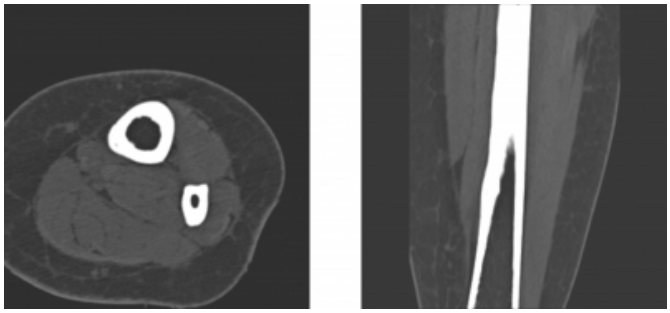
Tibial stress fracture account for over 50% of all stress fracture and are particularly common in military practice and athletes [1] . Individual with tibial stress fracture present with shin pain which is often associated with a recent acceleration in their level of lower extremity exercise. Majority of tibial stress fracture are transverse in orientation with longitudinal orientation in only 10% of cases. Unlike the much more common transverse tibial stress fracture, longitudinal stress fractures usually occurs in middle aged and elderly adults and are not typically exercise related [2345] . Medial tibial stress syndrome also known as “shin splints” is an early stage in the continuum that culminates in a stress fracture. The relative role of compressive versus torsional forces in the development of MTSS and ultimately stress fractures have been debated. Recent work appears to favour the latter [67] . Compressive forces account for transverse often subchondral, stress fractures in proximal tibia. Torsional forces may be of greater significance in the tibial shaft and may account for higher number of longitudinal fractures. Here we report a case of this unusual type of tibial stress fracture.

## CASE REPORT

A 44year old female presented in radiology department for evaluation of a left sided distal tibial pain. There was no history of trauma or any unaccustomed exercise. Physical examination was remarkable for significant tenderness to palpation of distal third of left tibia. There was associate swelling in the distal third of tibia. Roentgenogram revealed focal distal cortical thickening. CT revealed a small longitudinal cortical break in the distal third of tibia with associated callus formation. There were no associated soft tissue changes.

**Figure 1**

Figure 1 axial and coronal CT image showing fracture line with callus formation



MRI findings revealed small area of endosteal and periosteal marrow edema, a small longitudinal cortical break and callus formation in posteo-medial tibial cortex with subtle post contrast enhancement. There was nothing to suggest any underlying bony pathology in the study. Findings were consistent with medial tibial stress syndrome with a longitudinal stress fracture of tibia.

**Figure 2**

Figure 2 coronal MR image showing endosteal and periosteal edema

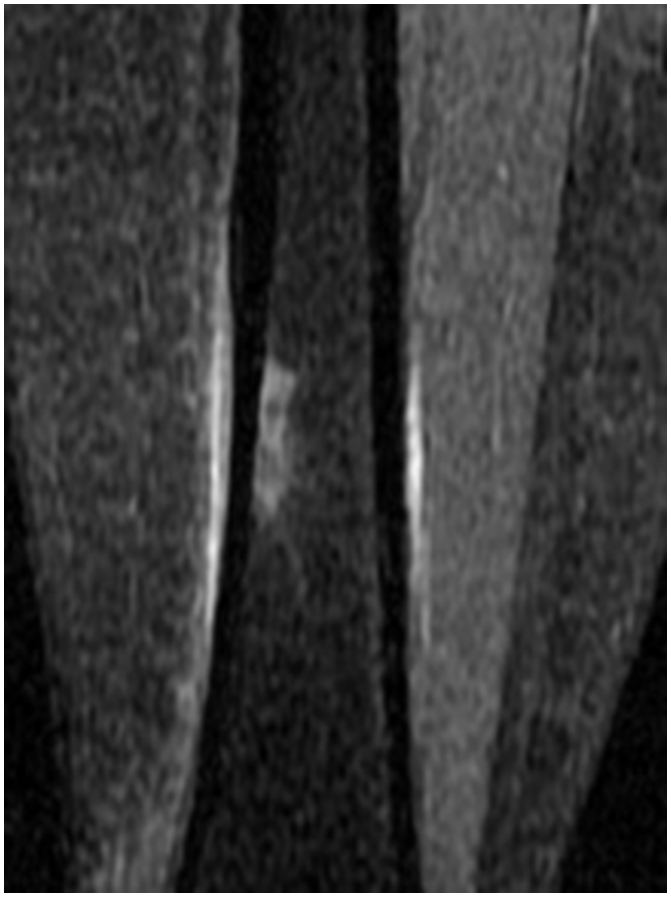
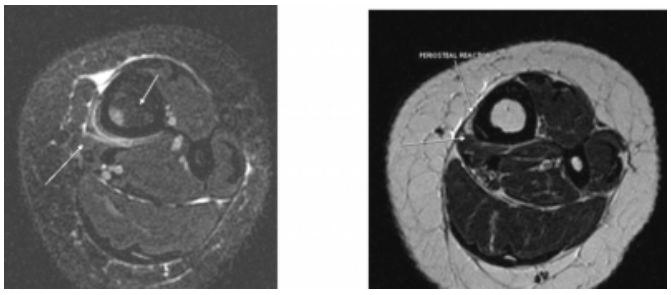


**Figure 3**

Figure 3 axial MR images showings periosteitis and edema in relation to endosteal & periosteal aspect of medial cortical bone



## DISCUSSION

stress reaction and stress fracture represents a spectrum of soft tissue and osseus injuries that occur in response to abnormal repetitive stress applied to healthy bone. Repetitive submaximal stress leads to osteoclastic resorption exceeding osteoblastic bone regeneration creating a region of accelerated bone remodeling, which may progress to a stress fracture if the stress continues.

The tibia is the most common location for the development of stress fractures. The pain is typically posteromedial in nature and the diagnosis is usually made clinically without the need for further imaging. Radiographs have a low sensitivity for detection of stress fracture and are usually normal. A cortical fracture line is infrequently seen, although subtle periosteal new bone formation can sometimes be detected [8]. CT findings in stress fracture are sometimes non specific, but findings of endosteal and periosteal reaction surrounding a thin cortical infarction are diagnostic of stress fracture [9]. Due to its increased sensitivity, bone scan was sometime the favored method for diagnosing early stress injuries. However the technique has low specificity [10]. More recently MRI has emerged as a highly sensitive method for detection of stress reactions of bone. MRI findings reveals subtle periosteal edema, marrow edema and fracture lines that are often not seen on radiograph [8]. MRI grading for tibial stress reaction consists of five grades: grade 0 indicates normal MRI findings. Grade 1 indicated increased signal involving the periosteal region as seen on T2-weighted images only, with normal marrow signal intensity on all images. Grade 2 added bone marrow signal changes on T2-weighted images. Grade 3 added the presence of bone marrow signal changes on T1-weighted images, and grade added the presence of a clearly visible fracture line [11].

In majority of cases diagnosis can be made from clinical history and physical examinations but in case of atypical fractures like this case where no history of trauma or unaccustomed exercise was given further evaluation becomes necessary. MRI has become the gold standard in diagnosis of patients with early tibial stress injuries (medial tibial stress syndrome) and tibial stress fracture.

## References

1. Vann der Wall H, Kannangara S, Magee M. In: Nuclear medicine in clinical diagnosis and treatment, EII PJ, Gambhi SS (eds), Edinburgh; Churchill Livingston, 2004: 729
2. Clayer M, Krishnan J, Lee WK, Tamblyn P. longitudinal stress fractures of the tibia: two cases. Clinical radiology 1992;46:401-402
3. Keating JF, Beggs I, Thorpe GW. 3 cases of longitudinal stress fracture of the tibia. Acta Orthop Scand 1995; 66 (1) 41-42.
4. Daunt N, Gribbin D, Slater GS. Longitudinal tibial stress fracture. Australasian Radiology 1998; 42: 188-190.
5. Miniaci A, Mc Laren AC, Haddad RG. Longitudinal stress fracture: case report. Journal of the Canadian Association of Radiologist 1988; 39:221-223.
6. Taylor D, O'Reilly P, Vallet L, Lee TC. The fatigue strength of compact bone in torsion. J Biomech. 2003 Aug;36(8):1103-9
7. Bouche RT and Johnson CH. Medial tibial stress syndrome (Tibial Fasciitis). A Proposed Pathomechanical Model Involving Fascial traction. Journal of the American

Podiatric Medical association.,VOLUME 97 Number 1 31-36 2007.
8. Bergman AJ, Fredericson M, HO C, and Matheson GO. asymptomatic tibial stress Reactions: MRI detection and clinical follow up in distance runners. Am. J. Roentgenol.,september 2004: 183: 635-638.
9. Yousem D, Magid D, Fishman EK, Kuhajda F, Siegelman SS. Computed tomography of stress fractures. J comput Assist Tomogr 1986; 10:92-95.
10. Shearman CM, Brandser EA, et al. Longitudinal tibial stress fracture: A report of Eight Cases and Review of the literature. Journal of Computer Assisted Tomography. 22(2):265-269, March/April 1998.
11. Fredericson M, Bergman AG, Hoffman KL, Dillingham MF. Tibial stress reaction in runners: correlation of clinical symptoms and scintigraphy with a new mgnetic resonance imaging grading system. Am J Sports Med 1995;23:472-481.

## Author Information

**I Gupta**
1- Department of Radiology, Lady Hardinge medical college

**SK Sethi**
1- Department of Radiology,VIMHANS and NMC diagnostics

**J Shankar**
1- Department of Radiology,VIMHANS and NMC diagnostics