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Summary

MRI findings were analyzed to determine their value in the differential diagnosis of tibial stress fractures and shin splints.
The study subjects were the long-distance runners who complained of pain on the posteromedial side of the tibia. They had undergone plain radiographs and MRI.
The diagnosis of stress fracture was possible if a patch-shaped high-intensity area distributed entirely or partially in the bone marrow was accompanied by thick periosteal edema in the posterior region. Shin splints presented no specific feature on MRI.
MRI seems to be useful in the differential diagnosis of these conditions.

Keywords
Stress fracture – Shin splints – MRI

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Differenzierung zwischen Tibialer Stressfraktur und Schienbeinkantensyndrom durch MRI

Zusammenfassung

Die Ergebnisse von MRI wurden analysiert, um ihren Nutzen in der Differentialdiagnose von tibialer Stressfraktur und Schienbeinkantensyndrom zu untersuchen.
Die Studiumsthemen waren die Fernläufer, die über Schmerzen auf der posteromedialen Seite des Schienbeins klagten. Sie hatten schlichte radiologische und MRI.
Die Diagnose von Stressfrakturen war möglich, wenn im Knochenmark ein punktförmiger hochdichter Bereich vollständig oder teilweise verteilt war und dazu ein starkes periosteales Ödem im posterioren Bereich festgestellt wurde. Schienbeinkantensyndrome zeigten in den MRI-Aufnahmen keine.
MRI scheint nützlich bei die Differentialdiagnose von diesen Bedingungen zu sein.

Schlüsselwörter
Stressfraktur – Schienbeinkantensyndrom – MRI

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Differentiating Tibial Stress Fracture from Shin Splints by using MRI☆

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Introduction

Pain on the medial side of the crus is frequent complaint caused by running. This pain is primarily attributable to tibial stress fractures and shin splints. The diagnosis of these conditions was customarily based on clinical findings, plain radiography and bone scintigraphy. Recently, MRI has also been used for diagnosis. The test for accreditation of specialists of the Japanese Orthopaedic Association in 2011 included the question "Is MRI useful for early diagnosis of shin splints?" The correct answer to this question was "Yes." Is this really the correct answer? The present study was undertaken to determine whether or not MRI would be useful in the differential diagnosis of tibial stress fractures and shin splints, by analyzing MRI findings from cases encountered at our hospital. As MRI findings were sometimes difficult to judge, I showed 3 cases as example and explained about them not to mislead.

Subjects and Methods

The study involved long-distance runners in junior and senior high schools who complained of pain on the posteromedial side of the tibia. The stress fracture group consisted of 25 limbs in which callus formation on the posterior/posteromedial area of the tibia was confirmed by plain radiography taken in 4 views (frontal, lateral, and right/left oblique); MRI was also performed within 2 months of symptom onset. The shin splints group consisted of 25 limbs in which callus formation was not confirmed by plain radiography in the same 4 views until healing occurred and MRI was performed during the period from 2 days to 6 months after symptom onset. The healthy control group consisted of 25 unaffected limbs. 30 intact limbs were available for the study after bilateral cases and those with multiple recurrences were excluded. We chose most recent 25 limbs for the healthy control group. MRI of bilateral limbs were taken in 2 views (coronal and axial) using the short TI inversion recovery [STIR] sequence with the Excelart 1.5T system (Toshiba Medical Systems, Japan).T1- and T2-weighted imaging has been omitted at our facility in recent years because depiction of abnormalities on these images is often difficult [10]. During image evaluation, high-intensity changes in the bone marrow at the painful location

☆ I declare that this paper is my original article.

were rated on a three-category scale: (1) patch-shaped distribution of high intensity in the entire, or in part of, the bone marrow (primarily in the posteromedial area) on both coronal and axial images; (2) linear distribution of high-intensity on coronal images, and punctate/membrane-like distribution of high-intensity on axial images; and (3) no change (Fig. 1). Periosteal high-intensity changes were rated on the posterior plane of the tibia at the same painful location using a three-category scale: (1) edematous (apparent high-intensity area thickly-distributed); (2) membraneous (attenuated high-intensity area without thickness); and (3) no change (Fig. 2). Because the area affected by tibial stress fractures is located in the posterior/posteromedial areas[8], evaluation was confined to the posterior periosteum, and evaluation of changes in anteromedial and lateral areas of the periosteum was omitted.

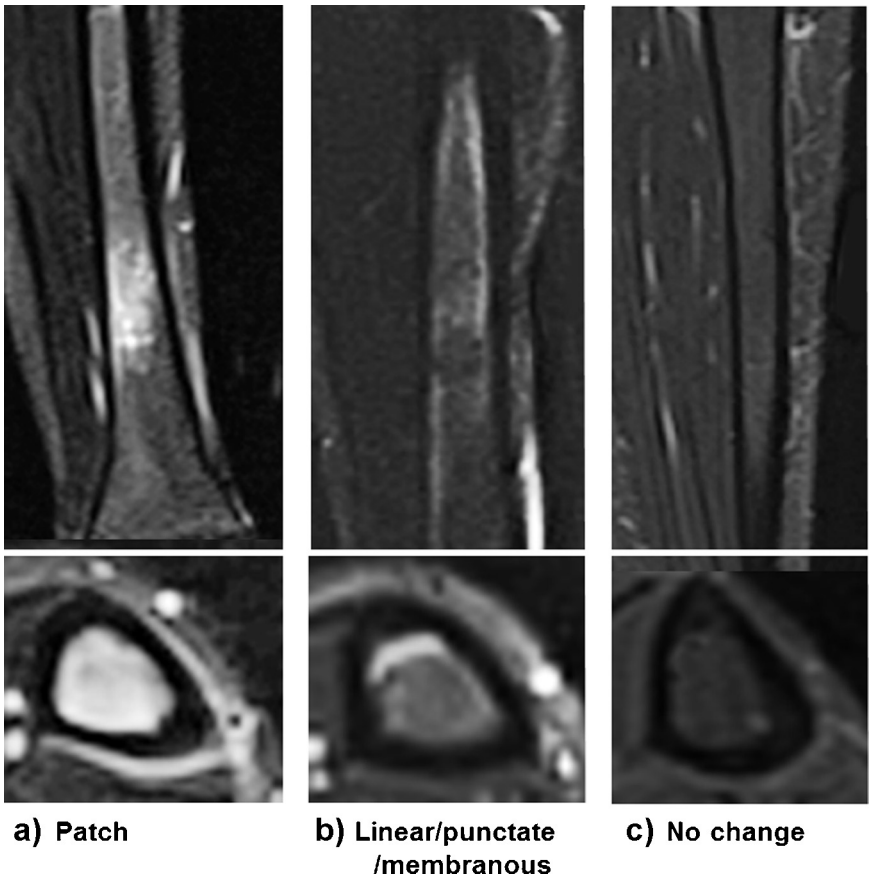

Figure 1
Evaluation and classification of high-intensity changes of bone marrow.

Results

In the stress fracture group, the bone marrow showed high-intensity changes in 24 of 25 limbs, with the changes visible on axial images as patch-shaped (in the entire, or in part of, the bone marrow, primarily the posteromedial area) in most limbs (22 limbs) (Table 1). Changes in the posterior periosteum were also seen in all cases, with thick edematous changes noted in 24 of 25 limbs and membraneous change in the other one case. In the shin splints group, various changes were seen in both the bone marrow and the periosteum, ranging from no change to those with patch-shaped high-intensity areas of bone marrow accompanied by edematous changes of the posterior periosteum resembling stress fracture (Table 2). However, in the bone marrow, the high-intensity changes seen on axial images in 17(5+12) of 22 (excluded absent 3) limbs of the shin splints group were linear/punctate/membrane-like changes of anterior/medial areas, and the extensive changes or patch-shaped areas of posteromedial regions seen in the stress fracture group were rare (5 cases). The change of posterior periosteum, if there, were thin membrane-like changes in most cases (10 of 11 limbs) in the shin splints

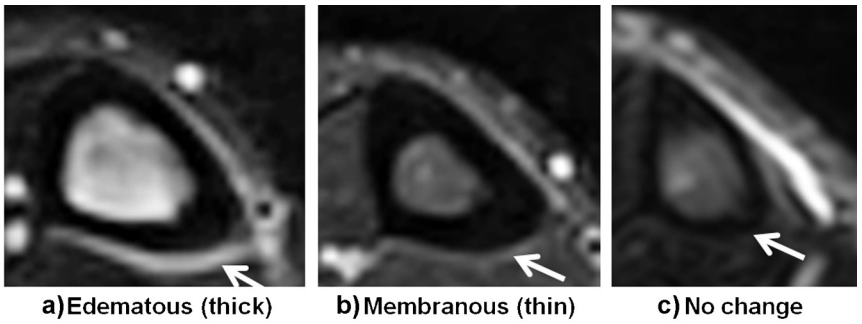

Figure 2
Evaluation and classification of high-intensity changes of periosteum.

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