Adductor Insertion Avulsion Syndrome Mimicking Neoplastic Processes in a 14-year-old Long-distance Runner

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Abstract

Adductor insertion avulsion syndrome, also known as thigh splints, is an uncommon condition that can mimic primary bone tumors or osteomyelitis.

This article describes the clinical and imaging findings of adductor insertion avulsion syndrome in a 14-year-old male long-distance runner. The patient presented with a 1-month history of progressively worsening pain in the medial aspect of the left thigh. No significant findings were noted on physical examination except slight tenderness to palpation. Radiographs revealed an intracortical radiolucent lesion with a solid periosteal reaction in the medial aspect of the femoral diaphysis. Bone scintigraphy showed an increased uptake corresponding with the lesion of the left medial femoral diaphysis. Computed tomography confirmed the presence of periosteal reaction and intracortical linear hypoattenuation and showed no fracture line. Magnetic resonance imaging revealed periosteal, cortical, and intramedullary signal intensity abnormalities. These clinical and radiologic features suggested adductor insertion avulsion syndrome. The patient was treated with initial avoidance of weight bearing using 2 crutches for ambulation, followed by progressive weight bearing over a period of 2 weeks. The symptoms resolved completely 7 weeks after initial evaluation, and the patient had normal gait without pain.

Knowledge of this condition is important for the appropriate interpretation of imaging findings and the avoidance of unnecessary biopsy with potentially misleading results. Moreover, this case provides a time line as a reference for the rehabilitation of patients in similar cases.

Figure: Axial T1- (A) and T2-weighted (B) short T1 inversion recovery images showing periosteal, cortical, and intramedullary signal intensity abnormalities.
Adductor insertion avulsion syndrome, or thigh splints, is a stress-related avulsion injury of the adductor muscles that occurs at the medial aspect of the proximal or mid-femoral shaft. This syndrome is commonly seen in athletes and military personnel, with a high female predominance.\(^1,2\) It may be confused with more worrisome neoplastic processes.\(^3\)

This article describes a case of adductor insertion avulsion syndrome in an adolescent male long-distance runner. This case highlights the difficulty of early diagnosis of this syndrome and the importance of clinical follow-up with serial imaging.

**Case Report**

A 14-year-old boy presented with a 1-month history of progressively worsening pain in the medial aspect of the left thigh. He was a member of a track athletics club and was running more than 10 km daily. The pain was initially present only after running and was not relieved by physical therapy but soon occurred during weight-bearing activities as well. No significant findings were noted on physical examination except slight tenderness to palpation. He had full hip and knee joint range of motion. Neurologic and vascular examinations were unremarkable. Laboratory data were within normal limits, including erythrocyte sedimentation rate, C-reactive protein level, and white blood cell count. His medical, surgical, and family histories were unremarkable.

Initial plain radiographs revealed an intracortical radiolucent lesion with a solid periosteal reaction in the medial aspect of the femoral diaphysis (Figure 1). Bone scintigraphy showed an increased uptake corresponding with the lesion of the left medial femoral diaphysis. Computed tomography (CT) confirmed the presence of periosteal reaction and intracortical linear hypoattenuation and showed no fracture line (Figure 2). Magnetic resonance imaging (MRI) revealed periosteal, cortical, and intramedullary signal intensity abnormalities. T2-weighted short TI inversion recovery (STIR) MRI sequences showed contrast enhancement of the bone marrow and adjacent soft tissue (Figure 3).

Based on these findings, a diagnosis of adductor insertion avulsion syndrome was suggested. However, a neoplastic process could not be entirely ruled out. The patient was treated with initial avoidance of weight-bearing using 2 crutches for ambulation, followed by progressive weight bearing for 2 weeks. He was followed up every 2 weeks for 3 months. His symptom resolved completely 7 weeks after initial evaluation, and he had normal gait without pain. At 3-month follow-up, he remained asymptomatic and returned to a gradual running program. Follow-up plain radiographs at that time revealed extensive cortical thickening along the medial proximal to mid-femoral shaft (Figure 4). A subsequent follow-up CT scan showed mature periosteal new bone formation (Figure 5). These clinical and radiologic features were consistent with adductor insertion avulsion syndrome.

**Discussion**

Adductor insertion avulsion syndrome was first described by Ozburn and Nichols\(^4\) in 1981. They reported that short...
stature and female sex are intrinsic risk factors. The concept of this syndrome is similar to that of the more commonly encountered medial tibial stress syndrome, or shin splints. Based on anatomy, proximal abnormalities are associated with the adductor brevis, whereas mid-femoral and distal posteromedial abnormalities are related to the adductor longus and adductor magnus, respectively. Clinically, symptoms tend to resolve in response to rest over 1 to 2 months.

Plain radiographs are often obtained as the initial evaluation of patients with suspected adductor insertion avulsion syndrome. Radiographs may be normal or show smooth periosteal reactions along the proximal third of the medial femoral shaft. In the current case, radiographs revealed an intracortical radiolucency in addition to periosteal reaction. This radiographic finding might represent hyperemia and edema of the injured cortex. However, bone scintigraphy and MRI are highly sensitive but not specific for the diagnosis of adductor insertion avulsion syndrome. Bone scintigraphy shows an elongated linear increased uptake at the injury site, which is often visible before radiographic abnormalities are identified. The MRI findings include periosteal edema, bone marrow edema, and intracortical signal abnormality. Typically, bone or soft tissue mass is absent. Moreover, Robinson et al reported a case of secondary chronic osteomyelitis in an adolescent girl who was originally diagnosed as adductor insertion avulsion syndrome. They reported that clinical follow-up with imaging is necessary in certain patients with apparent adductor insertion avulsion syndrome. The absence of cortical destruction and soft tissue extension can help distinguish this syndrome from malignant bone tumors. Osteoid osteoma can be excluded on the basis of the absence of nidus.

In the current case, the main differential diagnostic consideration was osteoid osteoma. The current authors eliminated the possibility of osteoid osteoma because no evidence existed of the nidus on follow-up CT scan. If adductor insertion avulsion syndrome is suspected on imaging modalities, the current authors recommend a trial of conservative treatment with adequate rest. However, a biopsy may be considered if pain persists or increases.

Radiographs showed an intracortical lucent lesion in the current case. Several conditions have similar radiographic findings, including osteoid osteoma, intracortical abscess, intracortical hemangioma, and intracortical osteosarcoma. According to a study of imaging findings of intracortical hemangioma, radiographs show an intracortical lytic lesion with characteristic calcification of the trabeculae in a vertical alignment. A hypointense intracortical lesion with spotty internal calcification, or a so-called wire-netting appearance, is seen on CT. The absence of calcification can help differentiate adductor insertion avulsion syndrome from intracortical hemangioma.

Intracortical osteosarcoma is the rarest variant of osteosarcoma, usually occurring in the femoral or tibial diaphysis. In intracortical osteosarcoma, radiographs typically show an intracortical lucent ranging from 1 to 4 cm in diameter, surrounded by sclerosis and cortical thickening and with a somewhat irregular outline. The pattern of periosteal reaction may help distinguish intracortical osteosarcoma from its benign mimickers.

CONCLUSION
This article describes a case of adductor insertion avulsion syndrome mimicking neoplastic processes. Knowledge of this condition is important for appropriate interpretation of imaging findings and
avoidance of unnecessary biopsy with potentially misleading results.

REFERENCES


