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CASE REPORT

SPECT-CT of an unsuspected ischial tuberosity avulsion fracture

Rasha Al-Husseini*, Qaisar H Siraj

Department of Nuclear Medicine, Farwania Hospital, Kuwait

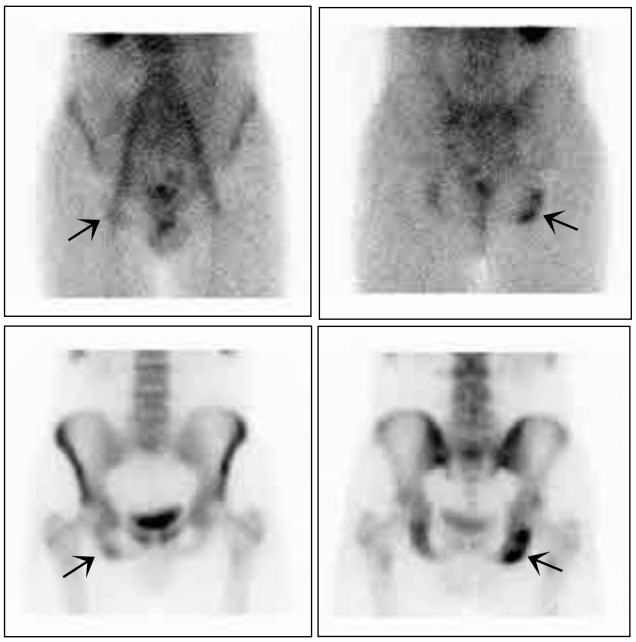

Figure 1 *2-Phase Scan with blood-pool (top row) and delayed 3-hour bone scan (bottom row) images of the pelvis in the anterior (left column) and posterior (right column) projections. There is increased blood pool activity in the ischial region on the right in the posterior projection with the planar images showing focal increased uptake in the right ischium (arrows)*

***Correspondence**

Dr Rasha Al-Husseini
Department of Nuclear Medicine
Farwania Hospital
PO Box 18373, Kuwait 81004
Email: Farwanianucmed@gmail.com

Abstract

Ischial tuberosity avulsion fracture usually occurs between puberty and late adolescence where the ischial tuberosity apophysis remains open and non-ossified. Avulsion commonly occurs in young athletes resulting from sudden forcible contraction of the hamstrings during sudden forceful physical activity or chronic repetitive traction. Misdiagnosing ischial tuberosity avulsion is not uncommon since the clinical presentation closely mimics that of a hamstring injury. Early recognition of the fracture is important as this will enable proper management and prevent the development of chronic pain. However, occasionally, the diagnosis is missed on plain radiographs since the radiographic features may be absent, suble or non-specific. We present such a case of an unsuspected ischial tuberosity avulsion fracture diagnosed on SPECT-CT.

Key words*: avulsion fracture, ischial tuberosity, Tc-99m MDP bone scan, SPECT-CT*

Introduction

Early recognition of the ischial tuberosity avulsion fracture is important for proper management. However, occasionally, the diagnosis is missed on plain radiographs since the radiographic features may be absent, subtle or non-specific. We present such a case of an unsuspected ischial tuberosity avulsion fracture diagnosed on SPECT-CT.

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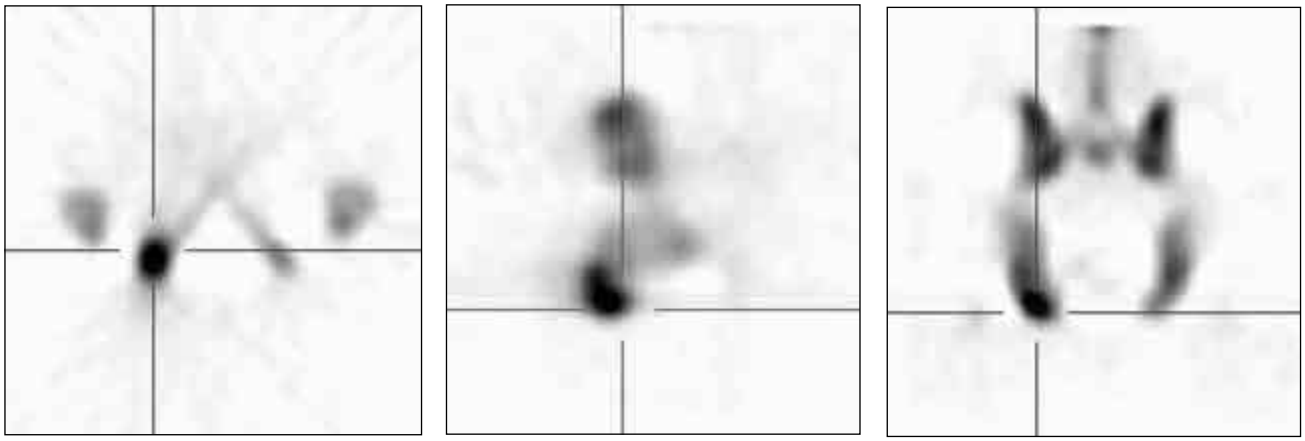

Figure 2 *Bone scan SPECT images in the coronal (left), sagittal (middle) and coronal (right) axes showing focal increased uptake in the region of the right ischial tuberosity with features suggestive of exostosis*

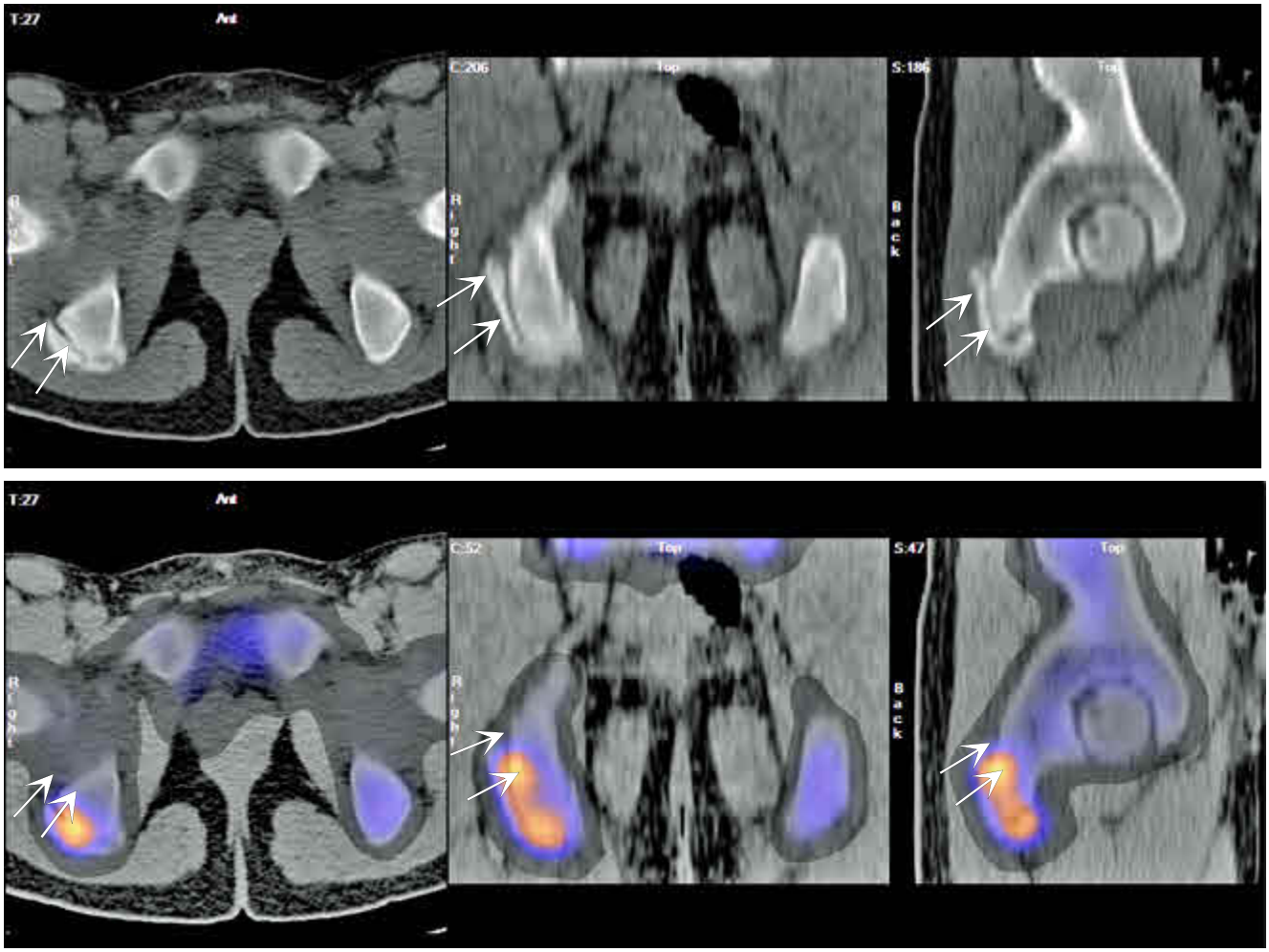

Figure 3 *CT images (top row) and SPECT-CT fusion images (bottom row) in the transaxial (left), coronal (middle) and sagittal (right) axes showing increased uptake at the site of avulsion fracture in the right ischium*

Case report

A 15-year-old boy presenting with a history of sports injury (twisted his ankle whilst playing football) one year ago, with subsequent pain in the posterior aspect of the right upper thigh and buttock. X-ray taken following the injury was negative. A 2-phase bone scan with SPECT-CT of the pelvis was performed. Blood pool images showed mild hyperemia in the ischial region on the right in the posterior projection (Figure 1). The planar images showed two foci of increased tracer uptake in the right ischium on a background of mild increased uptake in the bone (Figure 1). The SPECT-CT however showed a complete fracture of the ischial tuberosity with increased uptake in the region of fracture with features suggestive of oxostosis (Figure 2). The fusion image showed increased uptake at the site of the avulsion (Figure 3).

Discussion

Avulsion fracture is a unique type of bone pathology that results from sudden forceful muscular contractions pulling a fragment of the bone away. The apophyses are the most likely portions of the bone to avulse. Avulsion fractures are highly prevalent among adolescent males and are usually preceded by history of physical activity [1]. If not properly diagnosed and treated, these injuries can be debilitating to an adolescent athlete.

Patients suffering from avulsion fractures of the pelvis typically present as adolescents engaging in physical activity that requires sudden and forceful muscular contraction that results in a popping sensation with local pain, tenderness and difficulty with ambulation. A careful history and physical examination along with imaging are essential for an accurate diagnosis of avulsion fractures. Table 1 provides clinical causation criteria for the diagnosis of ischial tuberosity avulsion fractures.

Plain radiographs, CT, MRI and bone scans all help in the diagnosis. Functional bone imaging however provides a sensitive and early diagnosis at an early stage when structural changes are minimal or not apparent. The degree and the pattern of uptake on serial bone scans also provides information on the healing process (union) or lack thereof (nonunion) since a large proportion (around 68%) of ischial tuberosity avulsion fractures do not reunite [2]. These fractures can be treated conservatively or surgically: the choice of the treatment method also depends on the amount of displacement of the avulsed segment with greater than 2 cm displacements considered for surgical treatment [3].

The SPECT bone scan is more sensitive and specific than the planar bone scan. The addition of the CT component adds to the specificity SPECT and also provides additional

Table 1 *Clinical causative criteria for the diagnosis of ischial tuberosity avulsion*

Sex predilection	Males (mostly)
Prime onset mechanism	Physical activity
Commonest physical activity	Soccer & gymnastics
Onset factor	Sudden Forceful muscular contraction
Commonest site	Ishial tuberosity
Commonest activity	Running and kicking
Skeletal maturity	Immature; adolescent

structural information. The hybrid functional-structural modality of SPECT-CT is ideal for imaging patients with suspected ischial tuberosity avulsion fractures as it provides the requisite functional and structural information necessary for both diagnosis and subsequent treatment.

This case highlights the importance of an awareness of the clinical causative criteria that may help in the appropriate diagnosis particularly in the light of the fact that although the patient fulfilled almost all the clinical criteria but the correct diagnosis wasn't established in a timely fashion. The case also illustrates the value of SPECT-CT in establishing the diagnosis of ischial apophyseal avulsion fractures. The case also illustrates the importance of an awareness of the radiographic and scintigraphic features of this pathology and its associated complications such as exostosis formation and nonunion, which are crucial for correct management. SPECT-CT also provides information for instituting the appropriate treatment and follow-up.

References

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