

Jenny Bencardino
Zehava Sadka Rosenberg
Javier Beltran
Steven Sheskier

Os sustentaculi: depiction on MR images

J. Bencardino · Z.S. Rosenberg (✉)
J. Beltran
Department of Radiology,
Hospital for Joint Diseases,
Orthopaedic Institute,
305 E. 17th. Street,
New York, NY 10003, USA

S. Sheskier
Department of Orthopaedics,
St. Vincent Hospital,
New York, USA

Abstract We describe a 14-year old patient with pain in the medial ankle. The MR study depicted a rare accessory ossicle called the os sustentaculi. This accessory bone should not be confused with a fracture of the sustentaculum tali of the calcaneus.

Key words Ankle · MR · Normal variant calcaneus

Introduction

The os sustentaculi (OS) is a rare accessory bone located at the posterior end of the sustentaculum tali. It is usually bridged to the calcaneus via a fibrous or fibrocartilaginous tissue. The first report of this ossicle was in an anatomic dissertation published by Pfitzner in 1896 [1]. He presented one case in which the OS was an independent ossicle and noted it to occur in less than 1% of cases. Since then a few case reports have appeared dealing with the clinical manifestations and the plain radiographic features of this condition [2–4]. In this case report we present the MR manifestations of an OS in a young child. To our best knowledge there has been no previous reported MR imaging of this accessory bone.

Case report

A 14-year-old boy presented with a history of right medial ankle pain associated with a

bump. Pain was more pronounced on walking for prolonged periods of time. There was no history of trauma. Physical examination revealed mild restriction to passive inversion and tenderness in the area of the medial talocalcaneal articulation. Only plain radiographs of the right foot were obtained, and they appeared normal. The patient was referred for MR imaging of the ankle. He was imaged with a 1.5 T magnet. Gradient echo sagittal images (730/18, TR/TE; 20° flip angle) and spin echo T1-weighted coronal images (650/15, TR/TE) were acquired. Axial images were obtained with spin echo proton density and T2-weighted sequences (2000/20,90, TR/TE). The slice thickness was 4 mm, and the interslice gap was 1.5 mm. The imaging matrix was 256×256, with a field of view of 14–15 cm and one signal excitation.

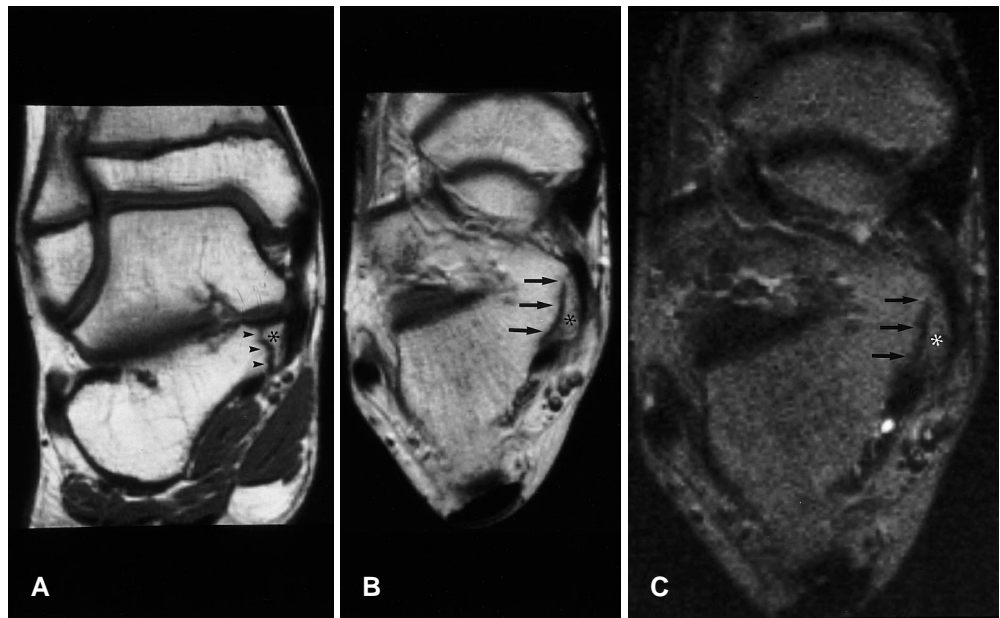
The MR images demonstrated an irregular low signal intensity line transecting the sustentaculum tali (Fig. 1). This was noted on coronal and axial images. No bone marrow edema was evident on the T2-weighted images (Fig. 1C). The MR findings were consistent with an OS. The patient was treated with casting and bracing, with moderate pain improvement.

Discussion

During the embryonic period, the occurrence of a talocalcaneal union extending from the posterior aspect of the sustentaculum tali to the talus has been described in up to 20% of the cases [3]. According to Harris and Beath, this bridge could resorb, remain cartilaginous, or ossify [5]. An OS results when the center ossifies.

This ossicle is quite a rare variant. In 1981 Tsuruta and Shiokawa [4] examined 3460 radiographs of patients over 7 years of age for the presence of accessory bones and ossification centers in the foot and ankle. The OS was found in 0.3% of these. The majority of patients who have accessory bones in their feet and ankles are asymptomatic [4]. In some instances, however, the OS may become painful. The etiology of the pain is not clear. It may be related to shearing stress forces across the synchondrosis between the OS and the calcaneus. Osteoarthritic

Fig. 1A–C MR appearance of the os sustentaculi (OS). **A** Coronal T1-weighted (650/15, TR/TE) image of the hindfoot shows an irregular line (*arrowheads*) separating the sustentaculum tali from the OS (*asterisk*). **B** Axial proton density and **C** T2-weighted images (2400/20,90, TR/TE) through the sustentaculum tali. The OS (*asterisk*) is distinguished from the calcaneus by a low-signal line (*straight arrows*). No bone marrow edema is evident on the T2-weighted image



changes may also produce symptoms [6]. On clinical examination a hard bony projection may be palpated below and posterior to the medial malleolus. The term “double ankle” has been used to define this clinical appearance, which must be differentiated from the more anterior protuberance produced by an os tibiale externum [2]. The OS also has been mistaken on examination for a bone tumor or an exostosis [6]. Arch supports usually relieve any discomfort caused by the anomaly [6]. It rarely requires surgical excision [7].

Roentgenographically, the OS can be visualized on an AP view of the ankle, although it is best seen with a minimal amount of external rotation [2]. A small accessory bone lodged at the posterior end of the sustentaculum tali is noted on the medial aspect of the calcaneus. The ossicle may also be depicted on a well-penetrated Harris-Beath view [8].

A variant of the OS has been dubbed the “articulatio talo-calcanea” [2] or assimilated os sustentaculi [8]. This, in effect, is an acces-

sory joint formed between the bony projections at the sustentaculum tali and the adjacent talus [6]. Guntz speculated that the OS may incorporate to the sustentaculum tali at the end of the growth period, representing a fused variety of the condition [2]. A talocalcaneal bridge occurring at the posterior end of the sustentaculum tali may be attributed to this ossicle fusing with both bones [3, 9]. Harris and Beath suggested that an assimilated OS may be associated with subtalar coalition and peroneal spastic flat foot [5].

In our case the OS was separated from the adjacent sustentaculum tali by a low signal intensity, irregular interphase. No degenerative changes or edema were associated with this finding. The differential diagnosis includes a non-united secondary ossification center.

The absence of edema eliminated the diagnosis of acute fracture. An old fracture of the sustentaculum tali was also a very unlikely possibility in view of the complete absence of previous trauma in our patient.

In conclusion, an OS is a rare entity that may be depicted on axial or coronal MR images. Familiarity with this entity should aid in distinguishing it from a fracture or an unusual exostosis.

References

1. Pfitzner W. Beiträge zur Kenntnis des menschlichen Extremitatenskeletts VII. Die Variationen im Aufbau des Fußskeletts. *Schwalbes Morphol Arb* 1896; 6:245.
2. March HC, London RI. The os sustentaculi. *AJR* 1956; 96:1114–1118.
3. Sarrafian SK. Anatomy of the foot and ankle, 2nd edn. Philadelphia: Lippincott, 1993: 1–112.
4. Tsuruta T, Shiokawa Y. Radiological study of the accessory skeletal elements in the foot and ankle (abstract). *J Jap Orthop Assoc* 1981; 55:357–370.
5. Harris RI, Beath T. Etiology of peroneal spastic flat foot. *J Bone Joint Surg Br* 1948; 30:624–638.
6. Bloom RA, Libson E, Lax E, et al. The assimilated os sustentaculi. *Skeletal Radiol* 1986; 15:455–457.
7. Coughlin MJ. Sesamoids and accessory bones. In: Mann RA, Coughlin MJ (eds). *Surgery of the foot and ankle*, 6th edn. St Louis: Mosby-Year Book, 1993: 467–539.
8. Kohler A, Zimmer EA. Borderlands of normal and early pathologic findings in skeletal radiology, 4th edn. New York: Thieme, 1993: 802–803.
9. Dwight T. Variations of the bones of the hands and feet: a clinical atlas. Philadelphia: Lippincott, 1907: 14–23.