

Os Sustentaculi with Pain in a Child

Yoko Matsuda,¹ Hideaki Watanabe,¹ Rieko Furukawa,²
Toshinori Aihara,² Ichiro Kikkawa¹

¹Department of Pediatric Orthopedic Surgery, Jichi Medical Children's Center, Tochigi, Japan

²Department of Pediatric Radiology, Jichi Children's Medical Center, Tochigi, Japan

Abstract : We report a rare case of painful os sustentaculi in a 12-year-old boy. The incidence of painful os sustentaculi in the accessory bones of the foot is low, and is easily overlooked since diagnosis using plain radiography alone is difficult. In our case, diagnosis was achieved using computed tomography (CT), short time inversion recovery (STIR) magnetic resonance imaging (MRI), and contrast-enhanced MRI. 3 months after application of plantar plate apparatuses, the pain was reduced. At 12 months later, the os sustentaculi was not detectable on CT, and pain was absent. This case reminds us that in a child with undiagnosed pain in the sustentaculi tali of the foot, then painful os sustentaculi should be suspected. These findings indicate that CT, STIR MRI and contrast-enhanced MRI are useful to confirm diagnosis, and CT was useful for following the recovery.

Introduction

In 1896, Pfltzner⁴⁾ reported the presence of the os sustentaculi, an accessory bone of the foot, for the first time. This bone is present on the medial side of the talocalcaneal joint, adhering to the posterior surface of the sustentaculum tali on plain radiography. The incidence of painful os sustentaculi is low among the accessory bones of the foot¹⁾²⁾, and it is impossible to confirm its presence using plain radiography. Therefore, this disorder is not widely recognized as an etiological factor of pain³⁾. For this reason, it is overlooked in many cases. Further-

more, its etiology remains unclear. Therefore, this disorder is difficult to differentiate from other diseases in children, particularly fractures and tumors, making it difficult to achieve a diagnosis in many cases. We herein report a pediatric patient in whom a diagnosis of painful os sustentaculi was made using plain computed tomography (CT), short time inversion recovery (STIR) magnetic resonance imaging (MRI), and contrast-enhanced MRI and in whom treatment with a plantar plate apparatus reduced the pain.

Case Report

Pain of the right medial foot and numbness of

Key words : child, computed tomography, contrast-enhanced magnetic resonance imaging, painful os sustentaculi, short time inversion recovery

Corresponding author : Yoko Matsuda

Department of Pediatric Orthopedic Surgery, Jichi Medical Children's Center, 3311-1 Yakushiji, Shimotuke-shi, Tochigi 329-0489, Japan

TEL: +81-285-58-7374

e-mail : y_tsudama_pc@yahoo.co.jp

the plantar region appeared in a 12-year-old boy during basketball training. He was taken to a local clinic. Plain radiographs did not show any abnormalities. Plain MRI led to differential diagnoses of either a ganglion or tumor. Although puncture was performed, nothing was withdrawn, and the patient experienced severe pain in the plantar region. The patient was recommended to undergo extirpation at another hospital, but he refused the surgery. After 6 months, neither the pain of the medial foot nor the numbness of the plantar region had subsided. The patient was referred to our center. The bilateral feet were flexible and flat. The range of motion of the ankle was not limited. In the sustentaculum tali of the right foot, pain and a hard, immobile, 5-mm-diameter tumor were noted. When the site was pressed, numbness involving the plantar region occurred. Neither blood tests nor plain radiographs showed any abnormalities. Plain CT revealed an accessory bone and synchondrosis on the posteromedial side of the calcaneus (Fig. 1). The articular surfaces were slightly irregular between the calcaneus and accessory bone. Plain MRI revealed an accessory bone and synchondrosis on the posteromedial side of the calcaneus and talus. The accessory bones were isointense on T1- and T2-weighted MRI (Fig. 2) and showed high intensity on STIR MRI. However, they were not enhanced on contrast-enhanced MRI (Fig. 3). The patient was diagnosed with painful os sustentaculi⁴⁾ and was prohibited from participating in sports activities. Additionally, because his feet were flexible and flat, plantar plate apparatuses were prepared and applied. After 3 months, the pain was reduced. After 1 year, plain CT confirmed the disappearance of the accessory bones and synchondrosis, and the pain had completely disappeared (Fig. 1).



Fig. 1. Computed tomography of the right foot. Left: initial clinic visit. An accessory bone and synchondrosis were present in the sustentaculum tali. However, the articular surfaces were slightly irregular between the calcaneus and accessory bone. Right: 1 year post-treatment. The pain had completely disappeared. Disappearance of the accessory bone and synchondrosis were simultaneously achieved.



Fig. 2. Magnetic resonance imaging of the right foot.

Right: T1-weighted magnetic resonance image, Left: T2-weighted magnetic resonance image. There were accessory bones and synchondrosis on the posteromedial side of the calcaneus and talus (white arrows).



Fig. 3. Magnetic resonance imaging of the right foot.

Right: short time inversion recovery, Left: contrast-enhanced. The accessory bones showed high intensity on short time inversion recovery magnetic resonance imaging and were not enhanced on contrast-enhanced magnetic resonance imaging.

Discussion

Os sustentaculi with localized pressure pain is termed painful os sustentaculi^{3,6)}. Pfitzner⁴⁾ reported that os sustentaculi was detected in 0.47% of 425 autopsied feet and that this accessory bone is rare among those of the foot. Furthermore, Tsuruta et al.⁵⁾ investigated accessory bones appearing in the feet of Japanese individuals >8 years of age using plain radiographs and indicated that the os sustentaculi was present in 0.3%. Thus, this bone is also rare in Japanese individuals. For this reason, it is not widely known that the presence of an os sustentaculi causes foot pain⁶⁾, and this accessory bone is consequently overlooked in many cases. Furthermore, its presence is not detected on plain radiographs in many cases, making diagnosis

difficult.

Few studies have reported painful os sustentaculi. For diagnosis, it is necessary to rule out other diseases such as tumors, talocalcaneal coalition²⁾, fracture, and pseudarthrosis. Yagami et al.⁶⁾ and Mellado et al.³⁾ reported that painful os sustentaculi in adults could be suspected/diagnosed in the presence of irregular features on the articular surfaces of the os sustentaculi on plain CT and MRI. In children, however, the presence of painful os sustentaculi makes it difficult to achieve a diagnosis because the articular surfaces of the accessory bones are slightly irregular, as demonstrated in the present case and that of Bencardino et al.¹⁾ According to Bencardino et al.¹⁾, painful os sustentaculi can be differentiated from fractures and diagnosed when plain MRI does not reveal any edema around the os sustentaculi site. However, Mellado et al.³⁾ reported that MRI reveals some edema around the os sustentaculi site. It is impossible to evaluate edema in and around the os sustentaculi using plain MRI. Thus, we performed STIR MRI to evaluate edema and contrast-enhanced MRI to evaluate microfractures and tumors. The os sustentaculi showed high intensity on STIR MRI, but was not enhanced on contrast-enhanced MRI. For this reason, fractures and tumors were ruled out and a diagnosis of edema in os sustentaculi and painful os sustentaculi were made. Furthermore, we used follow-up plain CT to confirm the absence of os sustentaculi because talocalcaneal coalition and pseudarthrosis had been ruled out.

However, the etiology of painful os sustentaculi remains unclear¹⁾. Mellado et al.³⁾ suggested that painful os sustentaculi in adults is associated with repeated trauma/stress and osteoarthritis of the talus because degenerative changes were present on the articular surfaces of the os

sustentaculi, talus, and calcaneus. Bencardino et al.¹⁾ speculated that synchondrosis between the os sustentaculi and calcaneus might be etiologically involved in painful os sustentaculi in children. In this present case, the os sustentaculi showed high intensity on STIR MRI and was not enhanced on contrast-enhanced MRI. These findings indicate the edema in os sustentaculi. In addition, follow-up plain CT confirmed the disappearance of the os sustentaculi, and the symptoms subsided. This finding indicates that bone union between os sustentaculi and calcaneus improves painful os sustentaculi. For this reason, we speculate that os sustentaculi and synchondrosis may be etiological factors of painful os sustentaculi in children and the etiology of painful os sustentaculi may be insufficiency bone union between os sustentaculi and calcaneus.

In the treatment of painful os sustentaculi in children, including our patient, healing has been achieved using plantar plate apparatuses¹⁾⁶⁾. In particular, when a flexible flat foot is present, a load may be added to the os sustentaculi of the medial foot, enhancing pain. The os sustentaculi load may be reduced by switching the loaded site to the lateral foot with a plantar plate apparatus, relieving pain. In children with pain and

pressure pain in the sustentaculum tali of the medial foot, painful os sustentaculi should be suspected. Plain CT with STIR MRI and contrast-enhanced MRI, follow-up plain CT, and treatment with a plantar plate apparatus until the disappearance of os sustentaculi may be useful for relieving pain.

REFERENCES

- 1) Bencardino J, Rosenberg ZS, Beltran J, Sheskier S: Os sustentaculi: depiction on MR images. *Skeletal Radiology* **26** : 505-506, 1997.
- 2) Linklater J, Hayter CL, Tse VK: Anatomy of the subtalar joint and imaging of talo-calcaneal coalition. *Skeletal Radiol* **38** : 437-49, 2009.
- 3) Mellado JM, Salvado E, Camins A et al: Painful os sustentaculi : imaging findings of another symptomatic skeletal variant. *Skeletal Radiol*. **31** : 53-56, 2002.
- 4) Pfitzner W: Beitrage zur Kenntnis des menschlichen Extremitatenskelets. VII. Die Variationen im Aufbau des Fuss skelets. *Schwalbes. Morphol Arb* **6** : 245-527, 1896. (In German)
- 5) Tsuruta T, Shiokawa Y, Kato A et al: Radiological study of the accessory skeletal elements in the foot and ankle. *J Jap Orthop Assoc* **55** : 357-370, 1981. (In Japanese)
- 6) Yagami T, Aihara T, Honda M: A case of painful os sustentaculi. *J Jap Pediatr Radiol Assoc* **27** : 66-70, 2011. (In Japanese)