

Posterior tibial tendon impingement due to os subtibiale: a case report and up-to-date review

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Abstract Os subtibiale is a rare accessory ossicle located at the tip of the medial malleolus. Although this small ossicle usually has no clinical significance, in some cases it may be a source of ankle pain. Symptomatic os subtibiale is an extremely rare diagnosis, and few cases have been reported to date. The case presented is of a 35-year-old female patient with symptomatic os subtibiale, with a discussion of the diagnosis, clinical findings, and treatment options.

Keywords Accessory ossicle · Os subtibiale · Medial malleolus · Symptomatic · Excision

Introduction

There are numerous accessory ossicles around the foot and ankle. Many of these are detected incidentally on plain radiographs taken for other reasons, and often have no clinical significance [1, 2]. Os subtibiale is a rare, rounded and well-corticated accessory ossicle located at the tip of the medial malleolus. The incidence of os subtibiale in radiographic survey studies has been reported to be between 0.2 and 1.2% [1–3]. Although os subtibiale is usually asymptomatic, it may cause

impingement and irritation of the adjacent posterior tibial tendon (PTT), leading to a painful syndrome. This condition, in other words, *symptomatic os subtibiale*, is extremely rare and only a few cases have been reported in current English-language literature (Table 1) [4–9]. Owing to the apparent rarity, it was decided to report the following case of symptomatic os subtibiale in a young female patient. A review is also included of all previously published cases of symptomatic os subtibiale, and the imaging findings, clinical characteristics, and treatment options are discussed.

Case report

A 35-year-old woman presented at our clinic with pain in the posterior aspect of the medial malleolus, which had been ongoing for 3 months. The pain was dull and was exacerbated by walking and standing. On palpation, there was pain over the posterior edge of the medial malleolus and along the PTT. There were no other abnormal physical findings. Radiographs of the ankle showed a small ossicle located just inferior to the medial malleolus (Fig. 1). The patient reported no previous or recent ankle trauma. To exclude an avulsion fracture, computed tomography (CT) was applied to the ankle. CT imaging demonstrated that the ossicle was rounded and corticated and located just inferior to the posterior colliculus of the medial malleolus (Fig. 2). A volume rendered 3D CT image showed close contact between the ossicle and the PTT (Fig. 3). Further magnetic resonance (MR) imaging showed diffuse edema, particularly at the level of the medial malleolus and fluid within the PTT, suggesting tenosynovitis (Fig. 4). Based on the clinical and imaging findings, a diagnosis was made of

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Table 1 Previously cases of symptomatic os subtibiale reported in the current English-language literature

Case number	Reference	Year	Age	Sex	Clinical findings	Imaging findings	Treatment	Outcome
1	Park et al. [4]	2005	28	Male	Localized pain and mild swelling on the medial malleolus after exercise	Os subtibiale	Removal of the bone	Excellent
2	Han et al. [5]	2008	34	Male	Chronic pain around the medial malleolus	Os subtibiale	Arthroscopic debridement, removal of the bone	Excellent
3			26	Male	Chronic pain around the medial malleolus	Os subtibiale	Arthroscopic debridement, removal of the bone	Good
4			48	Male	Chronic pain around the medial malleolus	Os subtibiale	Arthroscopic debridement, removal of the bone	Excellent
5	Vega et al. [6]	2010	36	Male	Pain around the ankle	Os subtibiale, subfibulare	Arthroscopic debridement, removal of the bone	Excellent
6	Bellapianta et al. [7].	2011	20	Male	No symptoms	Bilateral os subtibiale,	Arthroscopic debridement, without removal of the bone	Excellent
7	Kim et al. [8]	2012	16	Male	Chronic pain around the medial malleolus	Os subtibiale	Removal of the bone	Excellent
8			15	Male	Chronic pain around the medial malleolus	Os subtibiale	Fixation and autogenous iliac bone grafting	Gap was still seen between the medial malleolus and the ossicle, pain-free daily activities
9			16	Male	Chronic pain around the medial malleolus	Os subtibiale	Fixation and autogenous iliac bone grafting	Gap was still seen between the medial malleolus and the ossicle, pain-free daily activities
10	Shinohara et al. [10]	2016	16	Female	Pain and mild swelling	Os subtibiale	Arthroscopic debridement, removal of the bone	Excellent
11	Current case		35	Female	Chronic pain around the medial malleolus	Os subtibiale	Removal of the bone	Excellent



Fig. 1 **a** Antero-posterior (AP) and **b** lateral ankle radiographs of the patient. The ossicle was prominent on the AP view (*white arrow*)

PTT impingement secondary to os subtibiale. Conservative treatment was applied for 3 months, consisting of rest, anti-inflammatory medication, and stretching/strengthening, but no pain relief was obtained. After failure of the conservative treatment, surgical excision of the ossicle was planned.

Under spinal anesthesia and in the supine position, a curved incision was made over the PTT. The ossicle was located just anterior to the PTT and was mobile. The tendon sheath was thickened and inflamed, which was consistent with tenosynovitis. The ossicle was



Fig. 2 **a** Coronal and **b**, **c** 3D CT appearance of the ossicle. Note the relationship between the ossicle and the posterior colliculus of the medial malleolus (*white arrows and the dotted circle*)

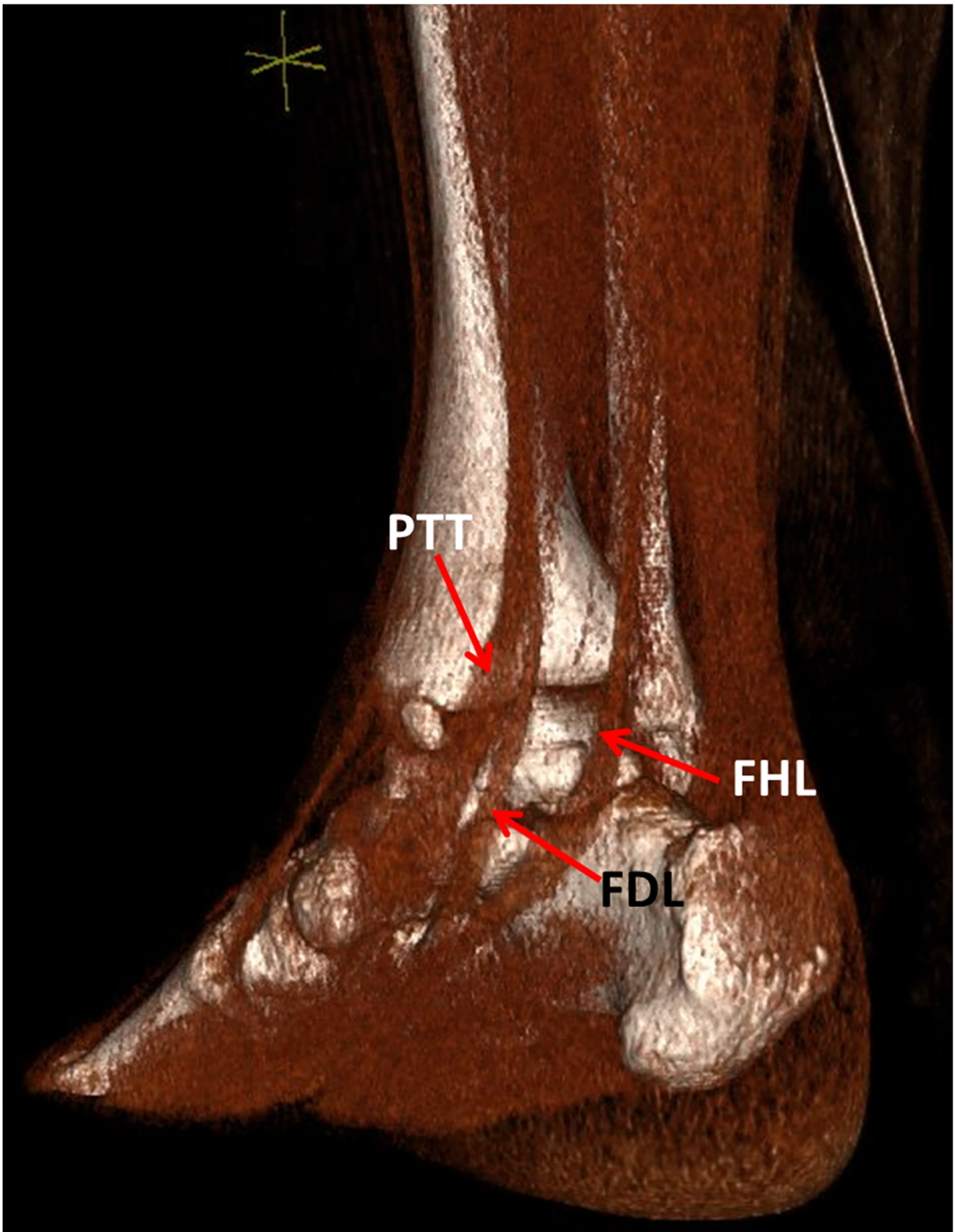


Fig. 3 Volume rendered 3D CT image showing the close proximity of the ossicle and the posterior tibial tendon (PTT). Red arrows indicate the tendons. FDL flexor digitorum longus, FHL flexor hallucis longus

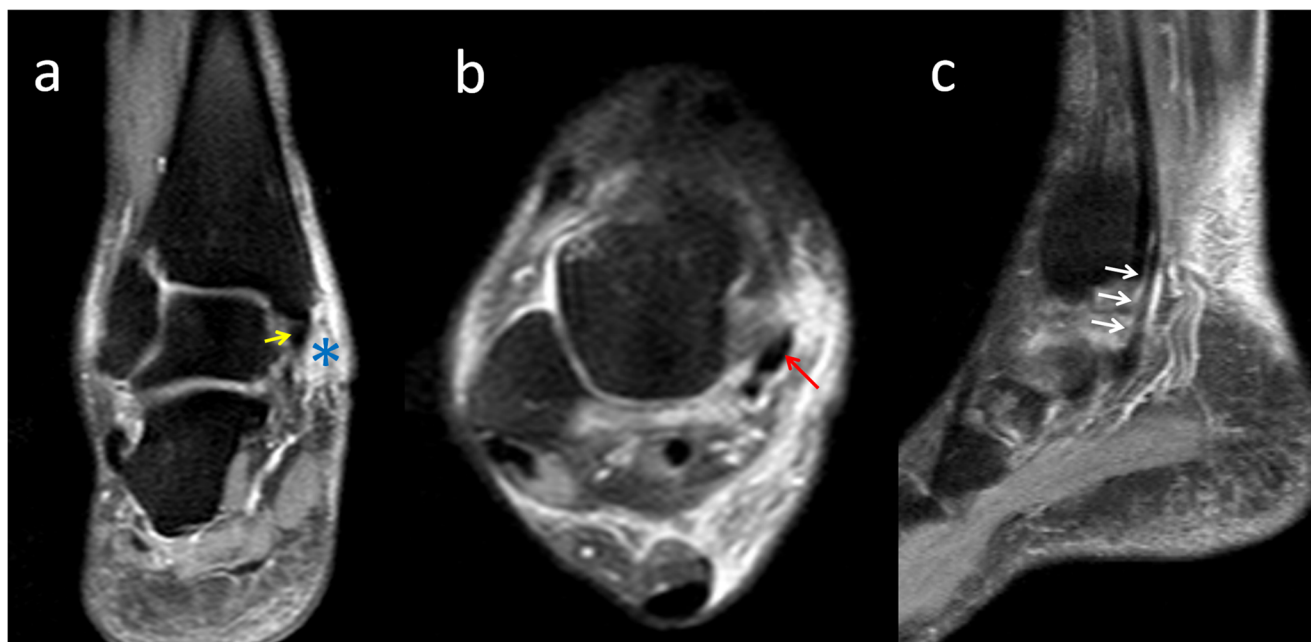


Fig. 4 Magnetic resonance imaging (MRI) of the ankle. **a** Coronal (PDW_TSE_SPIR) MR image of the patient shows subcutaneous edema (blue asterisk) and the os subtibiale (yellow arrow) **b** Axial (PDW_TSE_SPIR) MRI shows the diffuse edema and PTT (red arrow).

c Sagittal (STIR_TSE) MR image demonstrates the fluid around the PTT (white arrows). Although MRI did not show significant PTT abnormality, inflammation of the PTT sheath was observed during surgery

excised completely. The size of the ossicle was 10 mm (Fig. 5). The tendon sheath, retinaculum, and skin were subsequently closed using absorbable suture material. The pathological examination of the ossicle showed a well-corticated rounded ossicle (Fig. 6). The patient was encouraged in immediate postoperative weight-bearing as far as could be tolerated. The postoperative period was uneventful and sutures were removed on the 15th day after surgery. At the final follow-up examination at 6 months postoperatively, the patient was symptom-free and functioning well with no abnormal radiographic findings (Fig. 7).

Discussion

The medial malleolus is a thick buttress projecting from the medial tibial shaft. It is the main attachment point for the deltoid ligament. The inferior border is divided by a groove into a large anterior colliculus and a smaller posterior colliculus. There is groove for the PTT posterior to the posterior colliculus (Fig. 8). Coral described os subtibiale as a rounded ossicle, larger than 4 mm, with well-defined margins related to the posterior colliculus of the medial malleolus. He proposed that the term os subtibiale should be reserved for the rare unique accessory bone that fits this strict definition [3]. In the presented case, the ossicle was associated with the posterior

colliculus; thus, it can be suggested that this is a true os subtibiale. Furthermore, in the pathology examination of the fragment showed a complete cortical edge. The close proximity of the ossicle and the PTT may explain why os subtibiale becomes symptomatic in some cases. The contact and compression effect of the ossicle over the PTT sheath increases during dorsiflexion and eversion of the ankle. The exacerbation of the symptoms with exercise, walking, and physical activity in patients with symptomatic os subtibiale indicates that the etiology is probably mechanical in origin.

Various bony elements can be detected beneath the medial malleolus; a secondary (accessory) ossification center of the medial malleolus, which is seen in adolescents, medial malleolar avulsion fractures, os subtibiale, and ossification within the deltoid ligament (Fig. 9). It is important to discriminate among these distinct entities because the management of each entity differs greatly. Moreover, failure to identify these lesions may result in under- or overtreatment. An accessory center of ossification at the tip of the medial malleolus may appear between the ages of 7 and 10 years. Fusion with the main mass of the medial malleolus is complete in most children by the age of 11. During this period, any radiographic assessment may reveal an accessory ossification center at the tip of the medial malleolus. This is part of normal development and does not signify a pathological condition. In healthy children, the incidence of

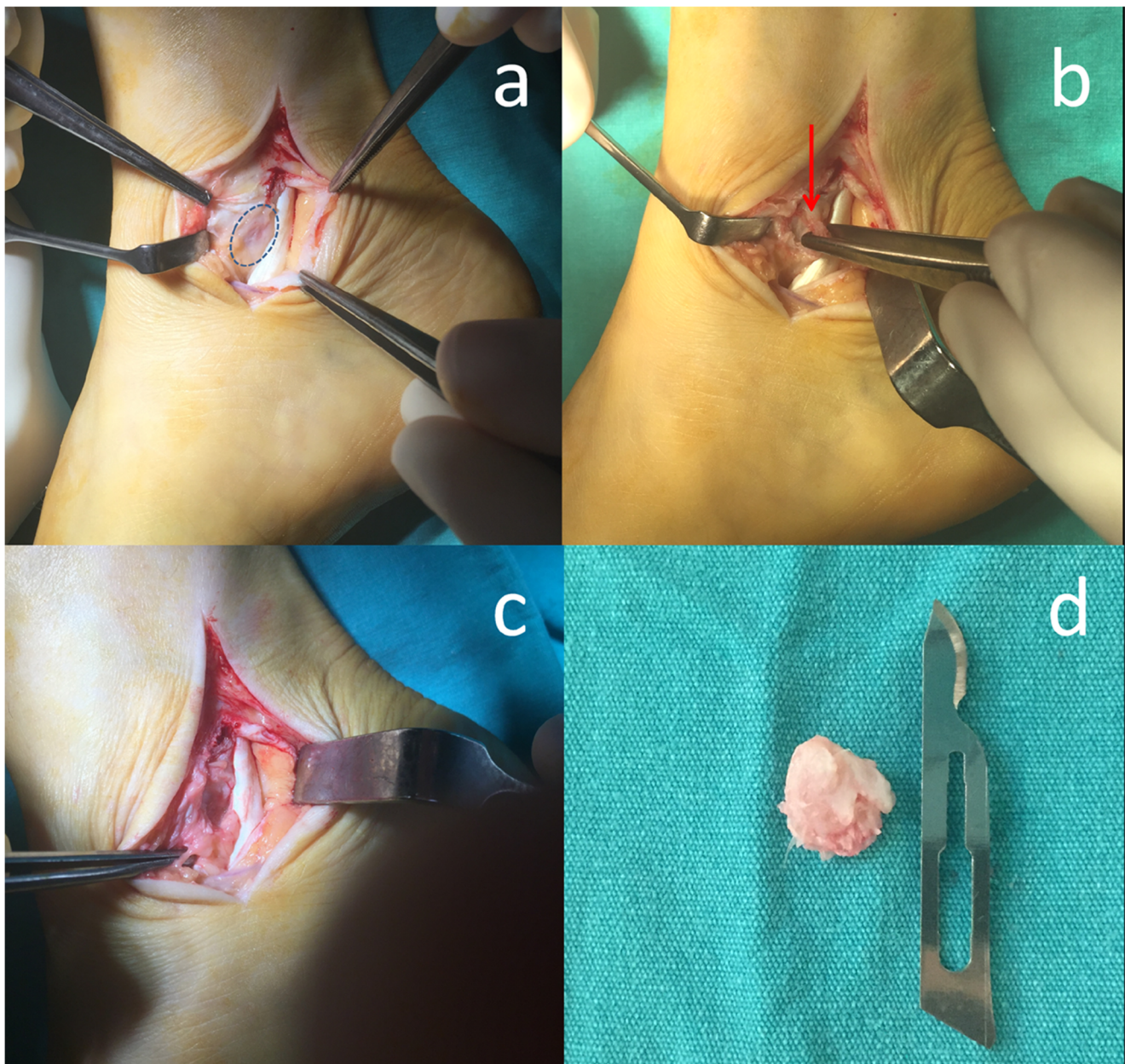


Fig. 5 **a** Intraoperative appearance of the ossicle after incision of the PTT sheath (*dotted circle* indicates the ossicle). The ossicle was adherent to the tendon sheath, but not within the sheath. **b** Removal of the ossicle (*red arrow*). **c** After the removal. **d** Macroscopic appearance of the ossicle

an accessory ossification center has been reported to be as high as 20% [3, 10, 11]. Foot and ankle trauma is one of the most common musculoskeletal injuries seen in both children and adults. Thus, in the context of trauma, any radiographs taken after an ankle injury may reveal this kind of imaging findings. The os subtibiale is a rounded accessory bone of large diameter, whereas a medial malleolar fracture has a sharp, radiolucent, uncorticated fracture line, often fitting well to the

adjacent medial malleolus. There are case reports in the current literature in which an os subtibiale has been misdiagnosed as an acute malleolar fracture, or malleolar pseudoarthrosis [12, 13]. In patients with repetitive eversion type ankle sprains, there may be ectopic ossification within the deltoid ligament [14]. This finding may also simulate the presence of os subtibiale. However, these ossifications are usually elongated, of irregular shape, and lie within the deltoid ligament

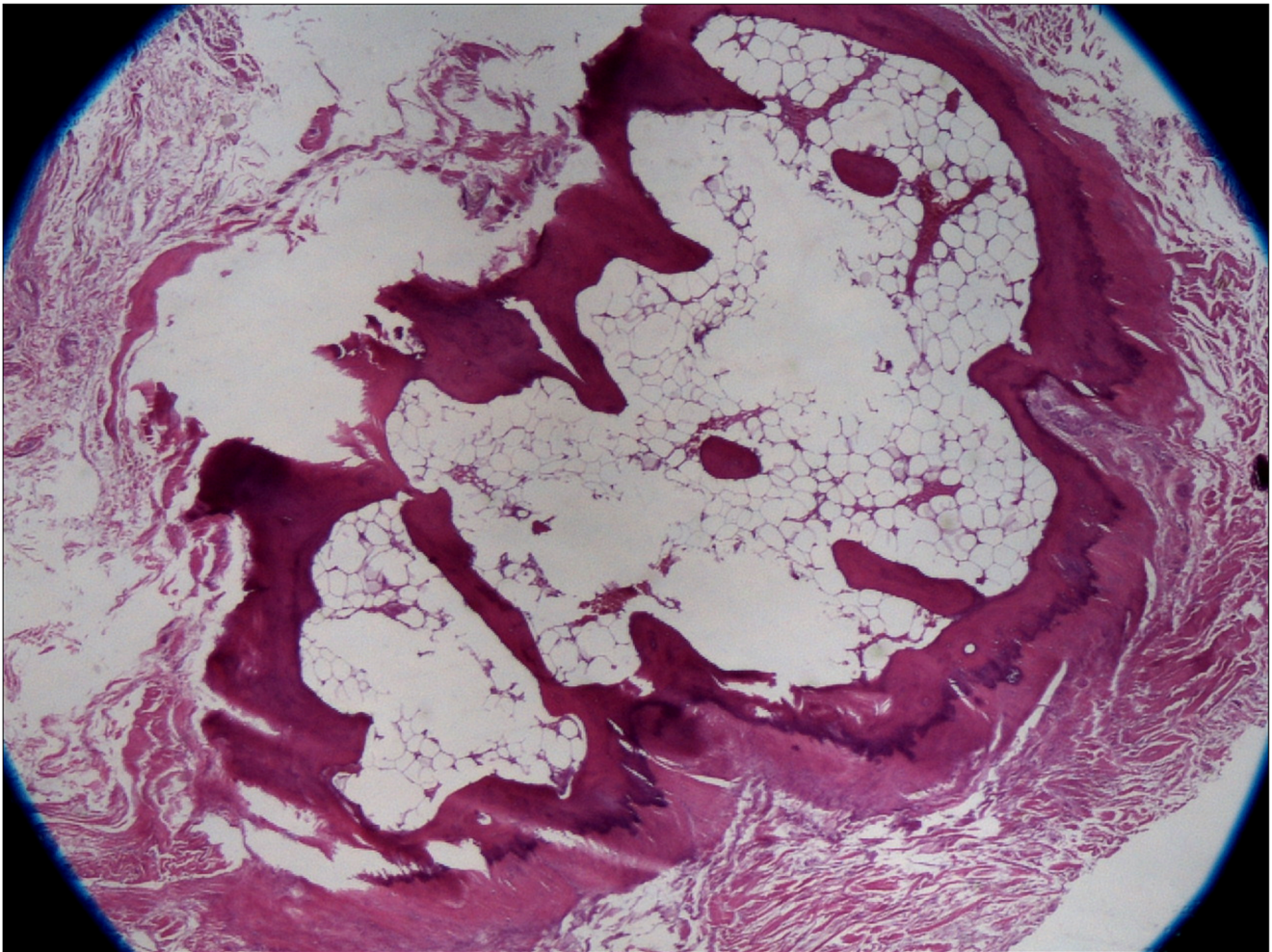


Fig. 6 Trabecular bone surrounded by circumferential cortical bone can be seen (H&E, magnification $\times 20$)

localization under the tip of the anterior colliculus. Abnormal and normal variants of the bony elements of the medial malleolus, skeletal development, and their radiographic appearance should be kept in mind during radiographic evaluation of patients with ankle symptoms. In addition to radiographic assessment, a complete history and physical examination should be performed to localize the tender points.

The treatment of symptomatic os subtibiale should be started with conservative treatment consisting of ice, rest, nonsteroidal anti-inflammatory drugs, and activity modification. If a course of conservative treatment fails, surgical treatment can be planned. However, it is recommended to ensure that the ossicle is the true underlying reason for the symptoms [4–9]. MR imaging may be beneficial for this purpose. In the current case, there was edema around the ossicle and the PTT.

Shinohara et al. performed an injection test with local anesthetic (xylazine) to the articulation between the ossicle and the medial malleolus under ultrasound guidance and reported that after the injection, complete disappearance of the patient's symptoms can be considered a strong sign that the patient will benefit from surgery [10].

In the current literature, two main surgical treatment modalities are described, namely: fixation of the ossicle to the main bone or removal of the bone. Kim et al. proposed that fixation could be preferred rather than surgical removal to achieve ankle joint stability especially in cases where the accessory bone is larger than 10 mm. Thus, they attempted to obtain bone union instead of removal of the ossicle with surgical fixation and autogenous bone grafting [8]. Although bony union could not be achieved, the symptoms of patients were

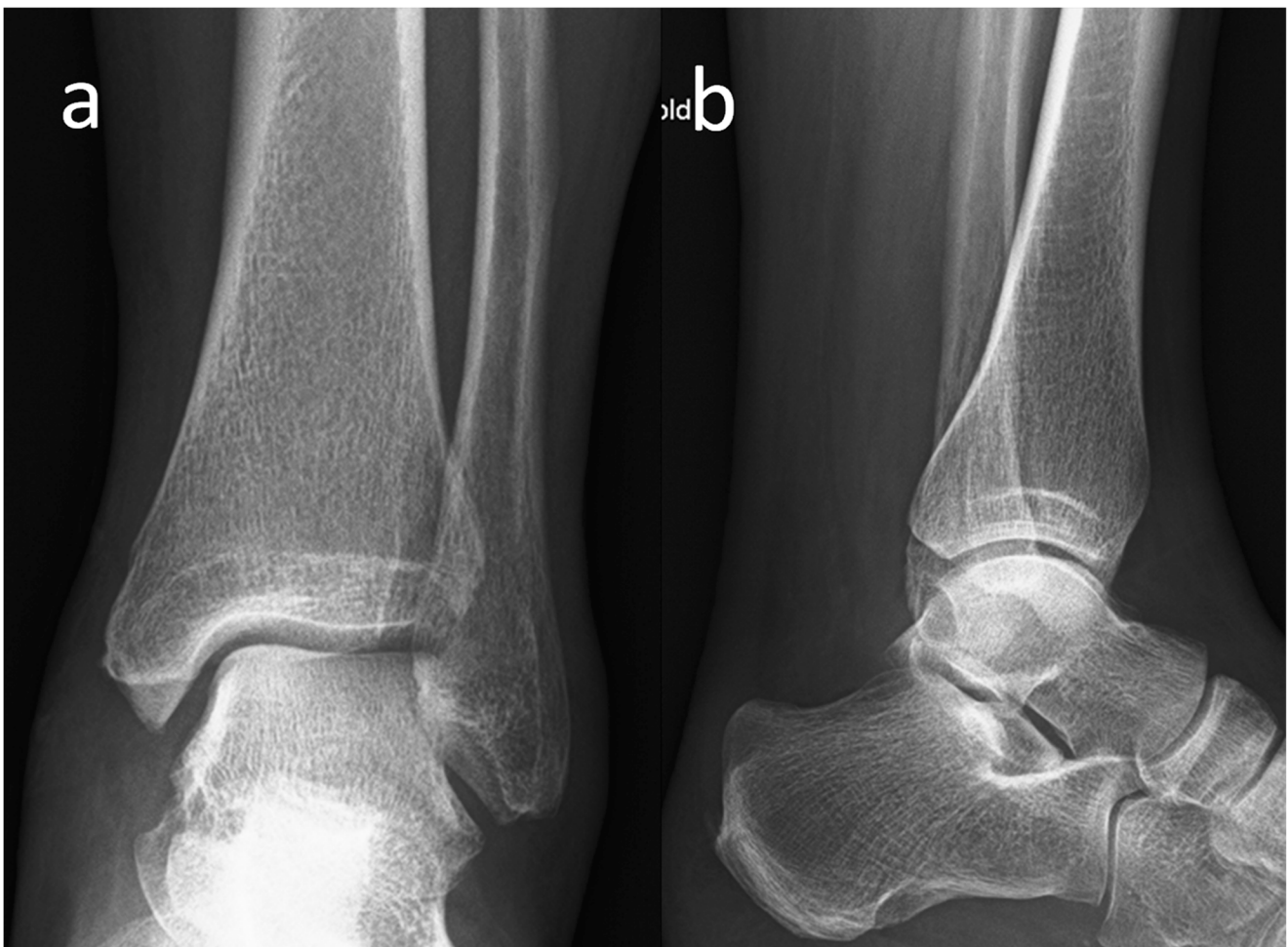


Fig. 7 **a** AP and **b** lateral ankle radiograph of the patient at the final follow-up. (Note that the ossicle has been removed)

relieved. Bellapianta et al. performed arthroscopic debridement of hypertrophic synovium on the anterior capsule and also in the space between the ossicle and the tibia proper, without removal of the ossicle. This procedure relieved the patient's symptoms and allowed him to return to the college soccer team [7]. This case emphasized the need for careful preoperative evaluation and identification of the main reason for the patient's symptoms. Other authors have performed removal of the ossicle and reported good and excellent results, similar to those of the current case. Based on the experience of this case, and previous observations and findings, removal of the ossicle can be considered likely to result in a good outcome. Removal of the bone can be performed using either an open surgical technique or an arthroscopic technique [5, 6, 9]. In fact, only a small incision, and superficial dissection are needed to remove the ossicle with open surgery. However, the arthroscopic

technique has the advantages of observation of the intra-articular structures, diagnosis of these intra-articular pathological conditions (if present), and simultaneous treatment.

In conclusion, if a rounded, large, and corticated ossicle is detected at the tip of the posterior colliculus of the medial malleolus on radiographs in patients presenting with pain around the medial malleolus, symptomatic os subtibiale should be considered in the differential diagnosis. Typical imaging findings on MRI and CT are beneficial to reaching the definitive diagnosis. Initially, conservative treatment is advocated before any surgical intervention. Surgery should be performed when the true underlying cause of the symptoms is ascertained. Immediate relief of pain after local anesthetic injection, preferably under ultrasound or fluoroscopic guidance, can be used for this purpose. Although fixation and achieving bone union have been

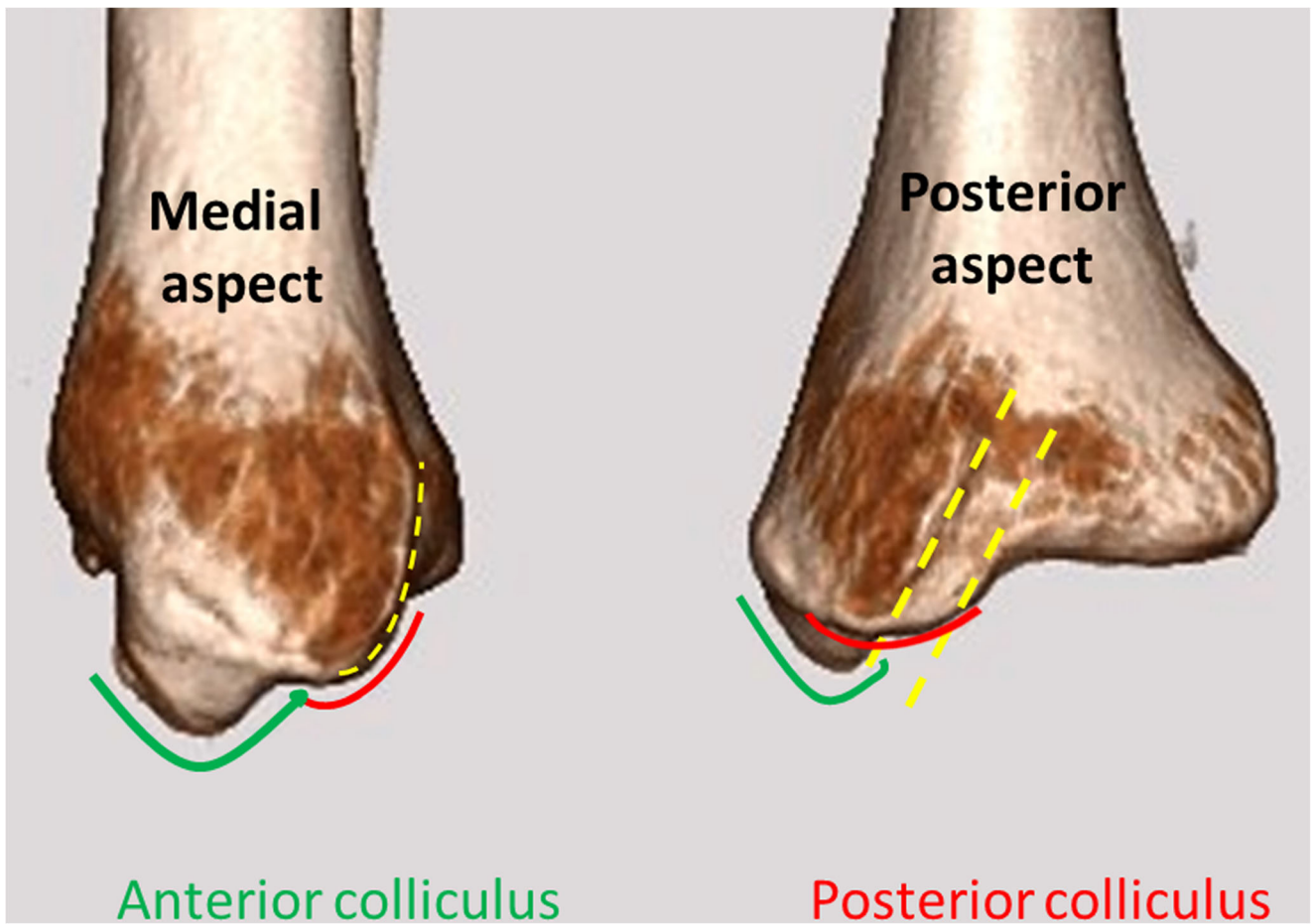


Fig. 8 Medial and posterior aspect of the distal tibia showing the anterior colliculus (*green line*), posterior colliculus (*red line*), and the groove for the PTT (*yellow dotted line*)

advocated for large fragments, in respect of the stability of the ankle, either open or arthroscopic removal of the

ossicle can be considered the best treatment option in the light of previous reports in the literature.



Fig. 9 **a** Accessory ossification center of the medial malleolus in a 9-year-old boy (*red dotted circle*). **b** Acute fracture of the medial malleolus (*black asterisk*). **c** *White asterisk* indicates os subtibiale (present case). **d**

Ossification within the deltoid ligament in a 35-year old basketball player with a history of repeated eversion-type ankle sprain (*white arrows*)

Compliance with ethical standards

Conflicts of interest None of the authors have any conflicts of interest.

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Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from the patient.

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