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Case Report

Peroneus brevis tear caused by an impingement between hypertrophied peroneal tubercle and lateral malleolus ☆

Miki Morimoto, MD[a], Satoshi Yamaguchi, MD, PhD[a,b,], Seji Kimura, MD, PhD[a], Yukio Mikami, MD, PhD[a], Hirofumi Nakajima, MD[a], Shotaro Watanabe, MD, PhD[a], Takahisa Sasho, MD, PhD[a,c], Seiji Ohtori, MD, PhD[a]*

[a] *Department of Orthopaedic surgery, Graduate School of Medical and Pharmaceutical Sciences, Chiba University, 1-8-1 Inohana, Chuo-ku, Chiba-shi, Chiba 260-8670, Japan*

[b] *Graduate School of Global and Transdisciplinary Studies, Chiba University, 1-33 Yayoi-cho, Inage-ku, Chiba-shi, Chiba 263-8522, Japan*

[c] *Center for Preventive Medical Sciences, Chiba University, 1-33 Yayoi-cho, Inage-ku, Chiba-shi, Chiba 263-8522, Japan*

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ABSTRACT

We report a 15-year-old female patient who sustained peroneus brevis injury caused by an impingement between the hypertrophied peroneal tubercle and lateral malleolus. The patient had pain for 3 years in the lateral side of her left ankle with unsuccessful conservative treatment. The oblique sagittal images of 3-dimensional magnetic resonance imaging and ultrasonography were useful in depicting the peroneus brevis injury and identifying the location of impingement between the hypertrophied peroneal tubercle and the tip of the lateral malleolus. The flatfoot deformity of the patient further aggravated the impingement. The patient was treated surgically, with excision of the enlarged tubercle and tendon repair. The ankle pain resolved 12 months postoperatively. Although rare, clinicians should recognize this condition as the cause of lateral ankle pain.

Introduction

The peroneal tubercle is a bony prominence on the lateral wall of the calcaneus, distal and anterior to the tip of the fibula. It separates the peroneus brevis tendon superiorly and the peroneus longus tendon inferiorly. It is also an attachment site of the inferior retinaculum that covers the brevis and longus tendon. The size and shape of the tubercle vary greatly among individuals, and a width

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* Corresponding author.
E-mail address: y-satoshi@mvb.biglobe.ne.jp (S. Yamaguchi).

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greater than 5 mm is generally defined as hypertrophied [1,2].

Although rare, peroneal tendon injuries occur due to the hypertrophied peroneal tubercle and cause lateral ankle pain [3–5]. Studies have reported several etiologies of peroneal tendon injuries associated with hypertrophied peroneal tubercles. An enlarged tubercle causes excessive tendon friction, compression, and tendon sheath stenosis, resulting in tenosynovitis and longitudinal tear [4,6]. The hypertrophic tubercle even forms a bony canal, which encases the tendons and causes tendon tear [7]. Irritation due to the compression of the footwear can also lead to inflammation around the tubercle [6]. Moreover, athletic patients can injure the inferior peroneal retinaculum, leading to dislocation of the peroneus longus tendon on the tubercle [4]. The peroneus longus tendon is more vulnerable to injury than the peroneus brevis tendon because of the long excursion and changing direction of the tendon [5].

We report an adolescent patient with a peroneus brevis tear caused by the impingement between hypertrophied peroneal tubercle and lateral malleolus, which has rarely been described as the causative factor.

Case report

A 15-year-woman referred to our hospital with pain and swelling on the lateral aspect of her left ankle. The pain started 3 years before visiting our hospital without trauma. She was initially diagnosed with flatfoot and received treatment using insoles and rehabilitation in a local orthopedic clinic. However, her symptom did not improve. The pain deteriorated while weight-bearing activities such as long-distance walking, and therefore she could not participate in physical education classes. She was 143 cm in height and weighed 42 kg with a body mass index of 20.5 kg/m^2. There was no history of recurrent ankle sprain or other specific medical histories.

On examination, there were bilateral flatfeet. However, the deformity was rigid on the left (affected) side because of peroneal spasticity as opposed to a flexible deformity on the right (unaffected) side. A hard mass with tenderness was palpable in the distal aspect of the lateral malleolus. The Japanese Society for Surgery of the Foot and Ankle hindfoot scale score was 32 points out of 100 [8].

In the weight-bearing anteroposterior radiograph of the ankle, hypertrophied peroneal tubercle was observed. It extended laterally below the lateral malleolus (Fig. 1A). The weight-bearing lateral view revealed a flatfoot, with the talo-first metatarsal angle of 34° (Fig. 1B). On the weight-bearing hindfoot view, the calcaneus was in a valgus position, with a hindfoot alignment angle of 8° valgus and a hindfoot alignment distance of 12 mm valgus (Fig. 1C).

In 3-dimensional magnetic resonance imaging (MRI), a proton-weighted oblique sagittal image along the course of the peroneus brevis tendon showed that the tendon impinged between the lateral malleolus and the enlarged peroneal tubercle (Fig. 2A). In another oblique sagittal image for the assessment of the peroneus longus tendon, no obvious injury was detected (Fig. 2B). In the proton-weighted fat-suppressed coronal image, a high signal area surrounding the peroneus brevis tendon was observed, indicating tenosynovitis (Fig. 2C). In dynamic ultrasonography, the location of pain was consistent with the location of peroneus brevis impingement (Fig. 3A and Supplementary Video 1). In the axial CT image, the width and length of the tubercle were 11 mm and 33 mm, respectively (Fig. 4A). The height was 17 mm in the coronal image (Fig. 4B). Based on the physical examination and image findings, the patient was diagnosed with peroneus brevis injury associated with the hypertrophied peroneal tubercle.

We performed an ultrasound-guided injection of 5 mg of triamcinolone mixed with 3 mL of 1% xylocaine into the peroneal tendon sheath, which resulted in only temporal pain relief of 2 days. Because of the long-standing symptom and apparent impingement that may not resolve with nonoperative treatment, the patient underwent surgery.

Surgery was performed under spinal anesthesia and a thigh tourniquet. A longitudinal incision of 4 cm was made on the peroneal tubercle. Subcutaneous tissue was divided, while the sural nerve was carefully preserved. The inferior peroneal retinaculum was sharply released, and the peroneal tubercle, as well as the peroneal tendons, was exposed. With passive eversion of the hindfoot, impingement of the peroneus brevis tendon was clearly observed (Fig. 5A). The tendon had a degenerated longitudinal tear at the impingement site, with surrounding synovitis. There was no abnormal finding in the peroneus longus tendon. We excised the hypertrophied tubercle using an osteotome. The peroneus brevis tear was repaired using 3-0 nonabsorbable interrupted sutures (Fig. 5B), after which the subcutaneous tissue and skin were closed in layers.

Postoperatively, a nonweight-bearing cast was applied for 2 weeks. Then, the patient started ankle mobilization and weight-bearing as tolerated, followed by physical therapy focusing on a range of motion exercise and muscle strengthening. At 12 months after surgery, the patient had minimal ankle pain with a Japanese Society for Surgery of the Foot and Ankle hindfoot scale score was 85 points. The peroneal spasticity also disappeared. The ultrasonography showed complete resection of the peroneal tubercle and resolution of the impingement (Supplementary Video 2).

Discussion

The patient in our report injured the peroneus brevis tendon because of the impingement between the hypertrophied peroneal tubercle and the lateral malleolus. She also had a flatfoot deformity and valgus hindfoot. The peroneal longus is commonly injured by the enlarged peroneal tubercle, and the brevis injury is relatively rare [4]. Moreover, only two patients with a peroneus brevis tendon injury due to a similar mechanism have been reported [9,10]. In our case, the valgus hindfoot decreased the interval between the peroneal tubercle and the lateral malleolus, which may have been another causative factor of peroneus brevis injury.

The peroneal tubercle in this patient was large, with a width of 11 mm on CT images. Anatomical studies have reported that the mean peroneal tubercle width was 2 mm

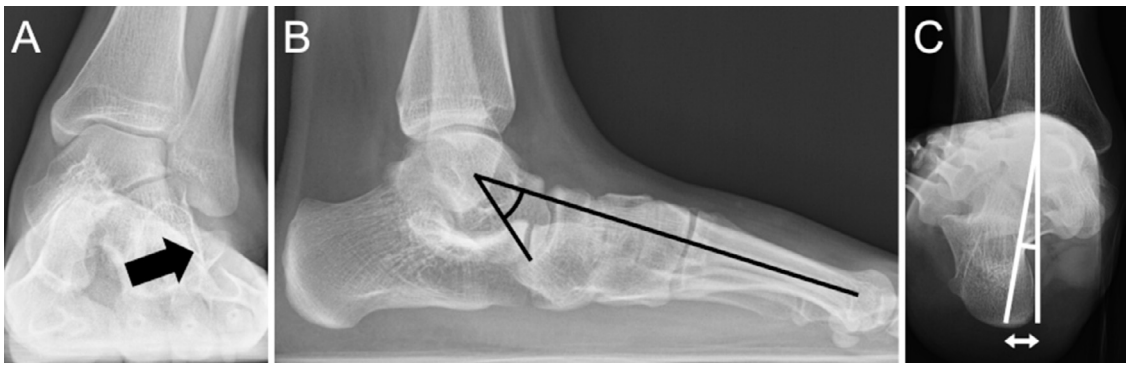

Fig. 1 – In the weight-bearing anteroposterior radiograph of the left ankle (A), an enlarged peroneal tubercle extends laterally beneath the tip of the lateral malleolus (arrow). The weight-bearing lateral radiograph of the foot shows a flatfoot deformity, with the talo-first metatarsal angle of 34° (B). In the hindfoot view (C), the hindfoot alignment angle is 8° valgus, and hindfoot alignment distance is 12 mm valgus, indicating valgus hindfoot.

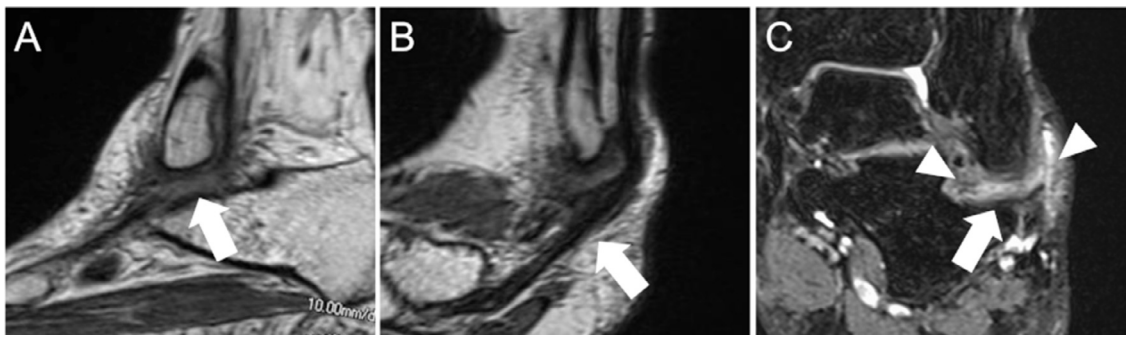

Fig. 2 – MRI proton-weighted oblique sagittal image (A) shows a signal change of the peroneus brevis tendon that is impinged between the lateral malleolus and peroneal tubercle (arrow). The peroneus longus tendon is not injured (B). In the proton density fat suppression coronal image (C), a flattened peroneus brevis tendon (arrow) and the surrounding tenosynovitis (arrowheads) are seen.

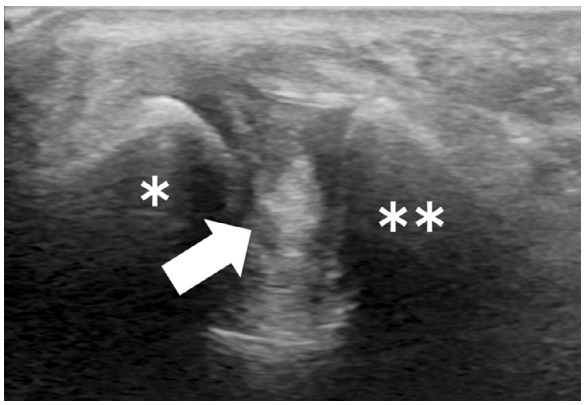

Fig. 3 – Ultrasound short-axis image of the peroneal brevis tendon (arrow) shows an impingement between the lateral malleolus (*) and hypertrophied peroneal tubercle (**).

to 4 mm [1–3,11–15], and it rarely exceeds 5 mm [12,14]. However, the width varies greatly among individuals and may depend on ethnicity, age, and measurement method. Some studies have suggested no association between the size of the peroneal tubercle and peroneal tendon pathology [14,15]. In contrast, another study has shown high diagnostic accuracy for detecting partial tears for a width ≥ 4.3 mm [1].

In our case, 3-dimensional MRI and ultrasonography were useful for diagnosis and surgical planning. MRI is a gold standard imaging examination for evaluating peroneal tendon pathology and differential diagnoses [16]. Additionally, the 3-dimensional sequence provides reconstructed images in arbitrary planes [16]. Because the peroneal tendons do not align with the standard image planes, it is difficult to delineate the entire length of the tendons on a single image. Therefore, the reconstructed image along the course of the peroneal brevis tendons allowed us to identify the injury site accurately in our case. Ultrasonography has advantages in evaluating the correlation of the location of pain with tendon pathology [17]. It is also helpful for the assessment of real-time peroneal tendon impingement [17].

The patient in our report was treated successfully with resection of the hypertrophied tubercle and tendon repair. Previous literature reviews consistently stated that most peroneal tendon injuries due to enlarged tubercles are refractory to conservative treatment and require surgery, which agrees with our case [4,5,18]. The reported surgical techniques are

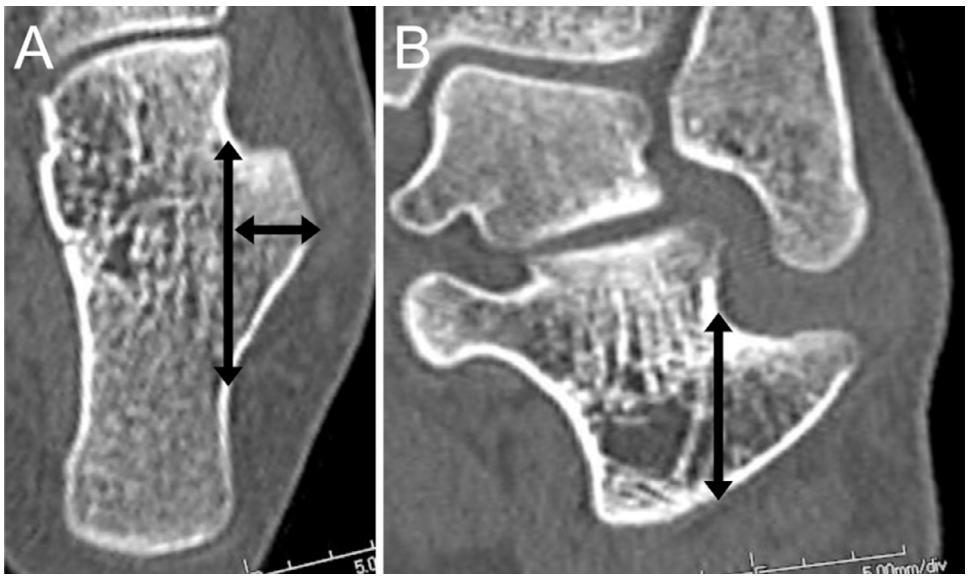

Fig. 4 – The width and length of the hypertrophied peroneal tubercle are 11 mm and 33 mm, respectively, in the axial CT image (arrows, A). The height is 17 mm in the coronal image (arrow, B).

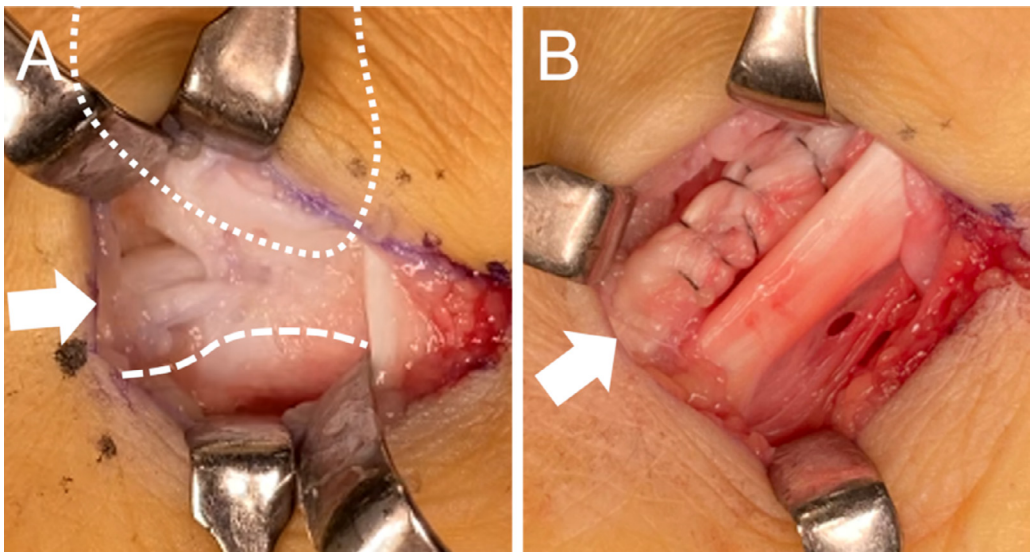

Fig. 5 – Intraoperative finding. Impingement of the peroneal brevis tendon (arrow) between the lateral malleolus (dotted line) and hypertrophied peroneal tubercle (dashed line) is observed (A). The peroneus longus tendon is retracted posteriorly. The tubercle is excised, after which the longitudinal tear of the peroneal brevis tendon is repaired (B).

also consistent with that of our patient unless severe tendon damage exists that requires tendon reconstruction or tenodesis [4,5,18]. However, care should be taken to excise the tubercle completely because incomplete resection and the remaining bone prominence could cause further tendon injury [19]. Therefore, surgical treatment would be recommended when there is obvious compression and tendon injury from a hypertrophied peroneal tubercle, and conservative treatment is not effective.

In conclusion, we reported a patient who sustained peroneus brevis injury caused by an impingement between the hypertrophied peroneal tubercle and lateral malleolus. Although rare, clinicians should recognize this condition as the cause of lateral ankle pain. MRI and ultrasonography were useful in identifying the impingement and tendon injury. Finally, surgical treatment, including excision of the peroneal tubercle and tendon repair, resulted in successful pain relief.

Patient consent

The research ethics committee of our hospital approved to publish this case, and the patient provided written informed consent.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.radcr.2023.01.030.

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