The Journal of Foot & Ankle Surgery xxx (2017) 1–4

Contents lists available at ScienceDirect

The Journal of Foot & Ankle Surgery

journal homepage: www.jfas.org

Case Reports and Series

Metatarsal Periosteal Plantar Ganglion Cyst Associated With Stress Fracture: A Case Report

Kenji Serigano, MD, PhD [1,2], Masayoshi Ikeda, MD, PhD [3,4], Tadashi Nukaga, MD [2], Masahiko Watanabe, MD, PhD [5]

[1] *Head Physician, Department of Orthopaedic Surgery, Shonan Central Hospital, Fujisawa, Japan*
[2] *Assistant Professor, Department of Orthopaedics, Tokai University School of Medicine, Isehara, Japan*
[3] *Director, Department of Orthopaedic Surgery, Shonan Central Hospital, Fujisawa, Japan*
[4] *Associate Professor, Department of Orthopaedics, Tokai University School of Medicine, Isehara, Japan*
[5] *Professor, Department of Orthopaedics, Tokai University School of Medicine, Isehara, Japan*

ARTICLE INFO

Level of Clinical Evidence: 4

Keywords:
foot
fragility fracture
magnetic resonance imaging
metatarsal
periosteal ganglion cyst
stress fracture

ABSTRACT

We encountered a rare case of a periosteal ganglion cyst at the plantar aspect of the metatarsal that induced a stress fracture in a 77-year-old female. The clinical manifestation of the plantar ganglion cyst of the foot was not evident because of its location deep beneath the plantar fascia. A pressure cortical indentation was detected at the metatarsal neck on the initial radiographs. Magnetic resonance imaging showed a stress fracture of the metatarsal with a ganglion cyst. The stress fracture was thought to have resulted from several factors, including structural weakness due to bony absorption from the ganglion cyst, osteoporosis that induced a fragility fracture, and a load-induced fatigue fracture. The fracture completely healed following complete resection of the ganglion cyst with the surrounding periosteum along with medication for osteoporosis. When confirmation of a stress fracture is necessary or when presentation of a stress fracture is atypical, magnetic resonance imaging should be considered to confirm or rule out any other associated pathologic features. Resection of the periosteal ganglion cyst with the surrounding periosteum is important to prevent recurrence.

Ganglion cysts are benign tumorous lesions that result from mucinous degeneration of the connective tissue in the joint capsule, ligament, and so forth that commonly occur around the hand and wrist joints (1,2). Ganglion cysts of the foot and ankle have also been reported (3,4). In the foot, ganglion cysts are more common on the dorsal aspect than the plantar ganglion aspect (5). We report a case of a plantar ganglion cyst of the metatarsal periosteum associated with a stress fracture of the metatarsal and present the findings of a related review of the published data.

Case Report

A 77-year-old female was referred to our hospital because of a complaint of pain in the right foot after walking for a longer time than usual. On the initial clinical examination, the pain was induced in the forefoot on weightbearing, and mild swelling of the dorsal aspect of the foot was observed. Radiographic examination revealed an erosive cortical lesion at the third metatarsal neck (Fig. 1). Magnetic resonance imaging (MRI) revealed a cystic mass between the plantar aspect of the second and third metatarsals showing low signal intensity on T1-weighted images and high signal intensity on T2-weighted images. Adjacent to the cystic lesion, the third metatarsal generally showed high signal intensity on T2-weighted images (Fig. 2). Quantitative ultrasonography revealed that the bone mineral density was 75% of the mean for young adults.

On the basis of these findings, the mass was considered to be a ganglion cyst adjacent to the metatarsal that had caused a pathologic fracture. Thus, we planned to excise the cystic lesion. A longitudinal incision at the plantar aspect between the second and third metatarsals was used to explore the cystic lesion, which was located adjacent to the medial aspect of the third metatarsal deep beneath the plantar fascia. The lesion was covered by a relatively dense fibrous capsule and was continuous with the periosteum. The mass was excised en bloc with the surrounding periosteum. The cystic lesion contained mucinous fluid, characteristic of a ganglion cyst (Fig. 3).

Histopathologically, the cyst wall was thick and consisted of a lining cell layer with a dense layer of fibrous collagen tissue adjacent

Financial Disclosure: None reported.
Conflict of Interest: None reported.
Address correspondence to: Kenji Serigano, MD, PhD, Department of Orthopaedic Surgery, Shonan Central Hospital, 1-3-43 Hatori, Fujisawa, Kanagawa 256-0056, Japan.
E-mail address: serigano@is.icc.u-tokai.ac.jp (K. Serigano).

1067-2516/$ - see front matter © 2017 by the American College of Foot and Ankle Surgeons. All rights reserved.
http://dx.doi.org/10.1053/j.jfas.2017.06.003

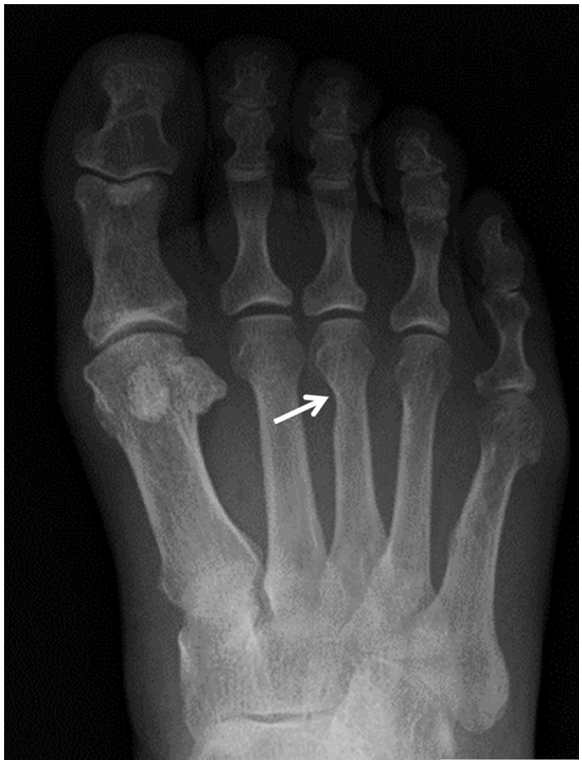

Fig. 1. Radiograph of the right foot showing an erosive cortical lesion at the third metatarsal neck *(white arrow)*.

to the periosteum (Fig. 4). Thus, the mass was diagnosed as a periosteal ganglion cyst. On the basis of the clinical presentation and histopathologic findings, the metatarsal fracture was thought to be a stress fracture resulting from the ganglion cyst.

A hard foot sole plate was used for weightbearing gait for 2 months postoperatively. Concurrently, oral medication for osteoporosis was started with a combination of alendronate at 35 mg/wk and alfacalcidol at 1 μg/day. At 18 months postoperatively, remodeling was complete, and she experienced no symptoms or disability with gait (Fig. 5).

Discussion

Approximately 2% to 17% of all ganglion cysts occur in the foot (3,4), with the dorsal aspect the most common and accounting for approximately 70% to 80% (5,6). In contrast, the incidence of such cysts on the plantar aspect is rare and estimated to be approximately 2% (5). A ganglion cyst in the foot characteristically and most commonly appears in elderly females, such as in the present case (7–9). The etiology and onset mechanism of a ganglion cyst are thought to be mucinous degeneration of the collagen tissue, and most develop in the joint capsule and ligament or tendon sheath (1). Although several etiologies have been proposed for periosteal ganglion cysts, mucinous degeneration of the periosteal collagen tissue is the most commonly accepted theory at present (10). However, relatively few cases have been reported of stress or pathologic fractures resulting from an intraosseous or periosteal ganglion cyst (11,12). The present case was diagnosed as a periosteal ganglion cyst on the basis of the operative and histopathologic findings. The most common sites of occurrence are the tibia, followed by the femur and radius, with rare involvement of the metatarsal (13). Plain radiographs will often show bony changes, such as pressure absorption or sclerotic erosion of the underlying

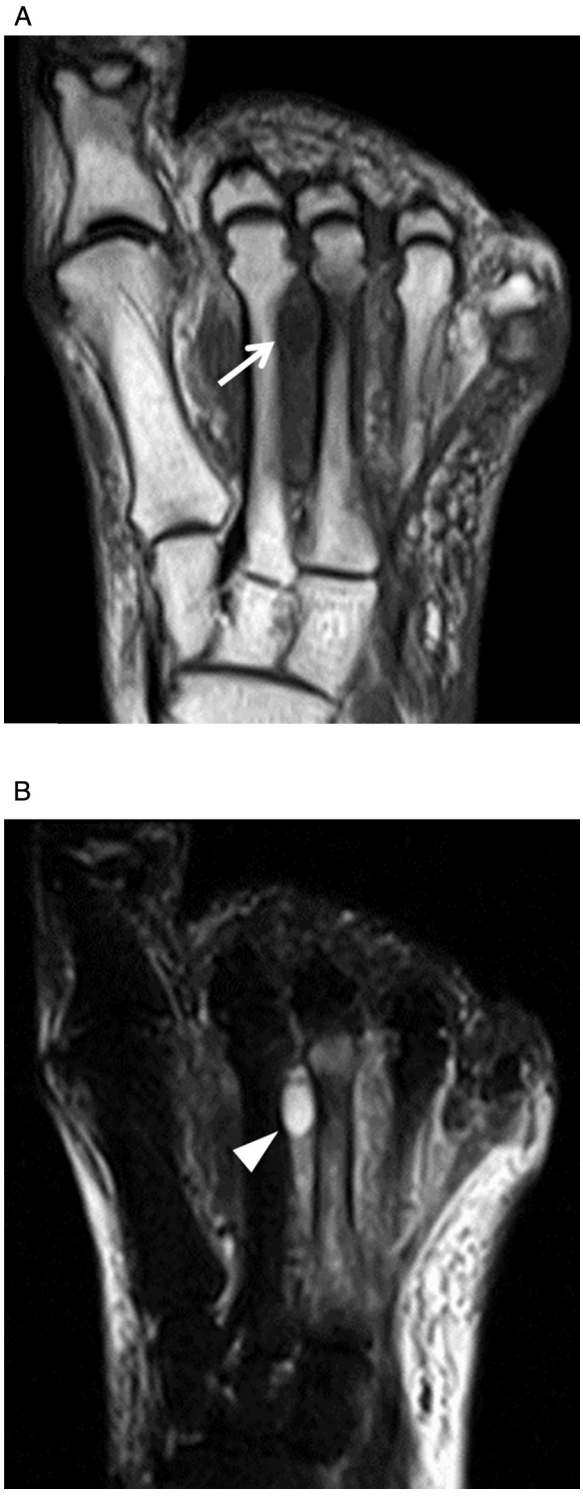

Fig. 2. Magnetic resonance imaging scans of the right foot. (*A*) T1-weighted image showing low signal intensity *(white arrow)* at the third metatarsal neck. (*B*) T2-weighted image showing a high-intensity cystic mass lesion *(arrowhead)* between the second and third metatarsals with high signal intensity of the whole third metatarsal.

cortex, or a periosteal reaction (14). In the present case, plain radiography showed an erosive cortical lesion at the metatarsal neck, and MRI showed a stress fracture and a ganglion cyst. The characteristic clinical feature of periosteal ganglion cysts is that the mass is not movable on the underlying floor and shows no signs of