Successful Treatment of Bilateral Calcaneal Intraosseous Lipomas Using Endoscopically Assisted Tumor Resection

HIROYUKI FUTANI, SATORU FUKUNAGA, SHOJI NISHIO, MASAYOSHI YAGI and SHINICHI YOSHIYA

Department of Orthopaedic Surgery, Hyogo College of Medicine, Hyogo 663-8501, Japan

Abstract. Background: Intraosseous lipoma is a rare benign bone tumor. Removal is required when there is pain or the lesion is large enough to lead to a pathological fracture. However, conventional surgery requires non-weight-bearing for at least 6 weeks. Here, we present a case with bilateral calcaneal intraosseous lipomas successfully treated by the use of endoscopically assisted curettage. Case Presentation: A 30-year-old female noted pain in both heels for 1 year. Radiological findings revealed well-defined lytic lesions at the neck of both calcanei. Magnetic resonance (MR) images showed hyper-intense signals on the T1 and T2 sequences. Curettage was performed through small bone fenestrations in the medial and lateral aspects under observation with a 2.7-mm-diameter Hopkins telescope. The bone void was filled with beta-tricalcium phosphate (β-TCP). Full weight-bearing was permitted the day after the surgery. Conclusion: Endoscopically assisted curettage is feasible in patients with benign bone tumors of the calcanei to avoid a long period of non-weight-bearing post-operatively.

Intraosseous lipoma is a rare benign bone tumor (1-3). The calcaneus is the second most common location after the proximal femur (2). This condition is frequently asymptomatic (1-4). However, surgery is required when the tumor causes pain or a lesion is large enough to lead to a pathological fracture (2, 4-7). Curettage followed by bone graft is the most common surgery (2, 4, 6). However, the conventional open procedure is associated with slow functional recovery and cosmetic disadvantage due to a large operative incision. Previous studies have reported that a period of non-weight-bearing varying from 6 to 12 months is needed after curettage and bone graft by the open procedure (5, 8-10). Recently, endoscopically assisted tumor resection has been introduced as a feasible technique to obtain early functional recovery (11, 12).

We present a patient with bilateral calcaneal intraosseous lipomas. Both tumors were successfully removed at the same time by the use of endoscopically assisted tumor curettage through a small bony hole, followed by filling of the bone void with beta-tricalcium phosphate (β-TCP) (OSferion Olympus, Tokyo, Japan). Written consent was obtained from the patient for publication of this study.

Case Presentation

A 30-year-old female noted right heel pain after she hit her heel in the bath tub. Soon after she also experienced left heel pain without any trauma. In her daily activity the pain did not bother her. However, her pain worsened with sporting activity, especially while playing badminton once a week. The pain was relieved overnight with rest. One year later she was referred to the bone and soft tumor section of our Department.

On physical examination, the lateral aspects of each central calcaneus were tender. A lateral X-ray revealed a well-defined lytic lesion at the base of the neck of the right calcaneus (Ward's triangle) (Figure 1). Computerized tomography (CT) demonstrated the lesion as a well-circumscribed area of lucency with an expanded and thin sclerotic rim in the right calcaneus. A well-circumscribed area of lucency was also found in the left calcaneus (Figure 2). The size of the right tumor was 3.5x2x2 cm and that of the left tumor was 2x1x1.5 cm. On magnetic resonance (MR) imaging the lesions had hyper-intense signals on the T1 and T2 sequences, suggesting fatty tissues (Figure 3). No enhancement was observed by Gadolium enhanced T1 weighted MR imaging. The lesions virtually disappeared on the fat-suppressed T2 weighted MR images, confirming fatty tissues. Thus, most likely the diagnosis would be intraosseous lipomas.

Surgery was performed under spinal anesthesia with the patient in the supine position. A pneumatic tourniquet was used. A 1 cm skin incision was made over both the medial and the lateral aspects of the right calcaneus and 0.5x0.5 cm bone fenestrations were made on each side as portals. A 2.7 mm...
diameter, 30 degrees Hopkins telescope (Karl Storz, Tuttlingen, Germany) was introduced through both the medial and the lateral portals. A yellowish tumor was observed through the endoscope (Figure 4a). Under careful observation of one portal, the tumor was removed by punch and sharp curette inserted through the other portal (Figure 4b, c). Intraoperatively, an imaging intensifier was also used to confirm that those tools reached the entire bone cavity. After the tumor resection, the bone void was filled with beta-tricalcium phosphate (β-TCP) (OSferion Olympus, Tokyo, Japan) -TCP (Figure 5). The gross appearance of the resected specimen consisted of fibro-osseous fragments with small pieces of yellow soft tissue. The same procedure was repeated on the left side. Histology revealed that the lesion was composed of mature fat cells surrounding a few residual bone trabeculae (Figure 6).

Full weightbearing was permitted the day after surgery. Over a 3 month period, the β-TCP was resolved and replaced by mature new bone. No recurrence was found 2 years after surgery.

Discussion

Intraosseous lipomas account for approximately 0.1% of all primary bone tumors. However, this may not be the true incidence since the lesions are frequently asymptomatic (1, 3). The largest number in the literature presented by Milagram (2) was of 61 patients with intraosseous lipomas, of which 21 were located in the proximal femur (34%) and five each (8%) in the calcaneus and the ilium followed by 4 each (7%) in the proximal tibia, rib and mid-humerus. Bilaterally calcaneal involvement of intraosseous lipomas has been reported in only four cases in the English literature (2, 13-15). Due to a painful lesion one patient underwent curettage followed by filling of the bone void with calcium sulfate (13). In the case reported by Milgram (2; Case #61) the patient
underwent curettage, however, detailed information of the surgery was not mentioned. The other 2 cases did not have surgery since the lesions were asymptomatic.

The postoperative course may vary, depending upon the size, location, and extent of the lesion as well as involvement of the subtalar joint (5). Goldenhar et al. (10) reported a conventional procedure of curettage followed by bone graft using a 2x2 cm bone fenestration in the central lateral calcaneus. This procedure required non-weight-bearing for 12 weeks to avoid pathological fracture postoperatively. With the same procedure, others have reported a period of

---

**Figure 4.** Endoscopic images from inside the calcaneus show: a) a yellow tumor; b) the tumor is removed by use of a grasper; c) the bone void and cortical wall after removal of the tumor.

**Figure 5.** Immediate postoperative roentgenogram showing a dense region of the \( \beta \)-TCP after the removal of bone tumor in the right calcaneous.

**Figure 6.** Histology of the tumor, comprised of viable fat and small bone trabeculae, indicating a lipoma (bar equals 100 \( \mu \)m).
non-weight-bearing of 6 to 10 weeks (5, 8, 9) even though a mixture of hydroxyapatite and bone graft was used to reinforce the residual bone. Endoscopically assisted tumor curettage has an advantage in this regard by avoiding the risk of postoperative pathological fracture since the small bony fenestration (0.5x0.5 cm) can preserve the stiffness and strength of the affected bone. In terms of early mobilization, this technique can reduce the time to full weight-bearing. In fact, our patient could walk with full weight-bearing the day after the surgery.

Historically, extra-articular endoscopic resection of bone tumors was first introduced in 1995 and applied in the case of a chondroblastoma of the femoral head (11, 12). When the tumor is located in a bone, the endoscope can decrease the blind area of the lesion. Consequently, complete curettage is assured even though the portals are small. So far, endoscopic curettage without bone graft has been reported in only one case of a secondary calcaneal aneurysmal bone cyst with chondroblastoma (16).

Several graft options, after the curettage of this condition, have been reported, such as autologous bone graft (2), autologous bone graft with hydroxyapatite (7), calcium sulfate (13), or curettage without graft (17). The advantage of using a bone substitute is to avoid the pain of a donor site. Among bone substitute materials, Ogose et al. (18) have shown the advantage of β-TCP compared to hydroxyapatite due to the nature of the remodeling and superior osteoconductivity. In addition, Chazono et al. (19) determined that filling a bone defect with β-TCP was superior to leaving a bone defect without a graft, in terms of new bone formation. The present case is the first report of the application of β-TCP to a calcaneal intraosseous lipoma. β-TCP was gradually replaced by newly formed bone without any complication by 3 months after surgery.

Endoscopically assisted tumor curettage followed by filling the bone defect with β-TCP is feasible for patients with calcaneal intraosseous lipoma to avoid a long-term period of non-weight-bearing and to obtain early functional recovery.

Acknowledgements

In support of preparation of this manuscript one of the authors (H.F.) received a grant from the Fund of the Ministry of Education, Science, Sports, and Culture, Japan.

References