Pain Physician 2012; 15:E743-E748 • ISSN 2150-1149

Case Report

Percutaneous Osteoplasty for the Treatment of a Painful Osteochondral Lesion of the Talus: A Case Report and Literature Review

Sung-Suk Seo, MD, Joo-Yeon Park, MD, Hae-Jin Kim, MD, Ji-Wook Yoon, MD, Sang-Hyun Park, MD, PhD, and Kyung-Hoon Kim, MD, PhD

From: Department of Anesthesia and Pain Medicine, School of Medicine, Pusan National University Korea

Address correspondence:
Kyung-Hoon Kim, MD, PhD
Professor
Department of Anesthesia and Pain Medicine
School of Medicine
Pusan National University, Pusan, Korea
Pain Clinic, Pusan National University Yangsan Hospital, Bumeuri, Mulgeumup, Yangsan, Kyungnam, 626-770, Korea
E-mail: pain@pusan.ac.kr

Disclaimer: There was no external funding in the preparation of this manuscript.
Conflict of interest: None.

Manuscript received: 02/21/2012
Revised manuscript received: 03/21/2012
Accepted for publication: 05/25/2012

Free full manuscript: www.painphysicianjournal.com

An osteochondral lesion of the talus (OLT) is a lesion involving the talar articular cartilage and its subchondral bone. OLT is a known cause of chronic ankle pain after ankle sprains in the active population. The lesion causes deep ankle pain associated with weight-bearing, impaired function, limited range of motion, stiffness, catching, locking, and swelling. There are 2 common patterns of OLTs. Anterolateral talar dome lesions result from inversion and dorsiflexion injuries of the ankle at the area impacting against the fibula. Posteromedial lesions result from inversion, plantar flexion, and external rotation injuries of the ankle at the area impacting against the tibial ceiling of the ankle joint. Early diagnosis of an OLT is particularly important because the tibiotalar joint is exposed to more compressive load per unit area than any other joint in the body. Failure of diagnosis can lead to the evolution of a small, stable lesion into a larger lesion or an unstable fragment, which can result in chronic pain, joint instability, and premature osteoarthritis.

A 43-year-old man, with a history of ankle sprain one year previously, visited our pain clinic for continuous right ankle pain after walking or standing for more than 30 minutes. There was a focal tenderness on the posteromedial area of the right talus. Imaging studies revealed a posteromedial OLT classified as having a geode form according to the FOG (fractures, osteonecroses, geodes) radiological classification and categorized as a stage 2a lesion on magnetic resonance imaging.

The patient was scheduled for aspiration and osteoplasty with hydroxyapatite under arthroscopic and fluoroscopic guidance. A 26-gauge needle was inserted to infiltrate local anesthetics into the skin over the cyst and ankle joint. An arthroscope was placed into the joint to approach the OLT. The arthroscopic view showed that there was no connection between the OLT and the cyst of the talus body. A 13-gauge bone biopsy needle was inserted into the cyst, and aspiration was performed. Aspirated fluid from the cyst was originally white and clear; however, it changed to a blood-tinged, reddish color due to mixing with the incisional blood. After aspiration, contrast medium was injected, and the shape of the spread was observed. Bone cement comprising hydroxyapatite was injected to fill the bone defect of the cyst. A 1.5 mL volume of cement was injected into the talus under vigilant fluoroscopic and arthroscopic monitoring to prevent its dissemination into the joint. There was no cement leakage into the vessels or articular space. Postoperative fluoroscopy and computed tomography images showed bone cement filling of the defect.

In the present case, arthroscopic and fluoroscopic guidance was used for aspiration of an OLT and for performing percutaneous osteoplasty with hydroxyapatite for one defect; this treatment decreased pain upon weight bearing and enabled a return to work without any restrictions one week after the procedure. The purpose of this report was to highlight the presence of OLT in chronic ankle pain and to review its management strategies.

Key words: Ankle, bone fracture, cartilage fracture, calcium polyacrylate-hydroxyapatite cement, cementoplasty, endoscopy, osteochondritis dissecans, pain, sprain, talus.

Pain Physician 2012; 15:E743-E748

An osteochondral lesion of the talus (OLT) is the collective term for a focal lesion involving the talar hyaline cartilage and its underlying subchondral bone, mostly caused by a single or multiple traumatic events and leading to partial or complete detachment of the fragment. The lesion causes deep ankle pain associated with weight-bearing, impaired function, limited range of motion, stiffness, catching, locking, and swelling. These symptoms may adversely affect the ability to walk, work, and participate in sports at risk (1,2).

There are 2 common patterns of OLTs. Anterolateral talar dome lesions result from inversion and dorsiflexion injuries of the ankle at the area impacting against the fibula. Posteromedial lesions result from inversion, plantar flexion, and external rotation injuries of the ankle at the area impacting against the tibial ceiling of the ankle joint (3,4).

Early diagnosis of an OLT is particularly important because the tibiotalar joint is exposed to more compressive load per unit area than any other joint in the body. Failure of diagnosis can lead to the evolution of a small, stable lesion into a larger lesion or an unstable fragment, which can result in chronic pain, joint instability, and premature osteoarthritis (5).

The purpose of this report was to emphasize the importance of considering an OLT as a cause of chronic ankle pain and to review its management strategies.

Case Report

A 43-year-old man with a history of ankle sprain one year previously visited our pain clinic for continuous right ankle pain after walking or standing for more than 30 minutes. He was unresponsive to conservative treatments, including immobilization, restricted weight-bearing, nonsteroidal anti-inflammatory drugs, and rehabilitation. There was a focal tenderness on the posteromedial area of the right talus with no limitation of joint motion on physical examination. Imaging studies revealed a posteromedial OLT classified as having a geode form according to the FOG (fractures, osteonecroses, geodes) radiological classification and categorized as a stage 2a lesion according to Anderson and Crichton's classification of the magnetic resonance image (MRI) (6). Bone scans showed an active bone lesion of the right talus (Fig. 1).

The patient was scheduled for aspiration and osteoplasty with hydroxyapatite under arthroscopic and fluoroscopic guidance. Informed consent was obtained after explaining the risks of extravasation of bone cement into the ankle joint, infection, bleeding, and joint stiffness or locking due to arthroscopy.

Basic noninvasive monitoring of parameters such as noninvasive blood pressure, electrocardiography, and pulse oximetry was performed throughout the procedure. One milligram of cefazolin was infused intravenously 30 minutes beforehand. To reduce intraoperative pain, we also injected 30 mg of ketorolac and 50 μg of fentanyl intravenously before the operation.

The patient was placed in a supine position, and the skin was prepared and draped in a sterile fashion. All procedures were performed under fluoroscopic guidance. A line representing the tibiotalar joint and a circle representing the cyst were drawn on the right ankle. A 26-gauge needle was inserted to infiltrate local anesthetics into the skin over the cyst and ankle joint. An arthroscope was placed into the joint to approach the OLT. The arthroscopic view showed that there was no connection between the OLT and the cyst of the talus body. A 13-gauge bone biopsy needle was inserted into the cyst, and aspiration was performed. Aspirated fluid from the cyst was originally white and clear; however, it changed to a blood-tinged, reddish color due to mixing with the incisional blood. After aspiration, contrast medium was injected, and the shape of the spread was observed. Bone cement comprising hydroxyapatite (Spine-Fix, Teknimed SAS, Vic en Bigorre, France) was injected to fill the bone defect of the cyst. A 1.5 mL volume of cement was injected into the talus under vigilant fluoroscopic and arthroscopic monitoring to prevent its dissemination into the joint. There was no cement leakage into the vessels or articular space (Fig. 2). Postoperative fluoroscopy and computed tomography (CT) images showed bone cement filling of the defect (Fig. 3).

The patient was discharged one day after the procedure with postoperative pain fairly controlled. At the one-week and one-month postoperative follow-ups, no significant complications were detected. There was no complaint of pain or limitation of range of motion. One week after the operation, the patient returned to work without any restrictions and was fairly satisfied with the results. He was scheduled to revisit the clinic at 3 and 6 months postoperatively.

Discussion

The present patient experienced chronic pain after an ankle sprain; this pain was unresponsive to conservative treatment. A focal tenderness of the talus was

Fig. 1. Preoperative images. (A) Finding a definite lesion of the right ankle in the radiographic images (anteroposterior, Mortise, and lateral view from left to right) was difficult; (B) Magnetic resonance images revealed an abnormal high signal area surrounded with marrow edema (6.57 mm x 12.21 mm x 12.31 mm) in the posteromedial dome of the right talus; (C) Bone scans showing an active bone lesion.

identified on physical examination without limitation of range of motion, and MRI was performed as an OLT was suspected. Aspiration of the talar cyst and osteoplasty of the relatively large bone defect with hydroxyapatite was performed under arthroscopic and fluoroscopic guidance. The patient was discharged one day after the procedure without significant complications, and he returned to work without any restrictions after one week.

A patient with acute ankle sprain and no evidence of fracture or complete ligament injury is prone to be left without medical attention. The most common mechanism of injury in ankle sprains is a combination of plantar flexion and inversion. The lateral stabilizing ligaments, which include the anterior talofibular, calcaneofibular, and posterior talofibular ligaments, are most often damaged. The anterior talofibular ligament is the most easily injured structure. Concomitant injury to this ligament and the calcaneofibular ligament can result in appreciable instability (7).

Commonly missed diagnoses in patients with chronic ankle pain include either fractures of the

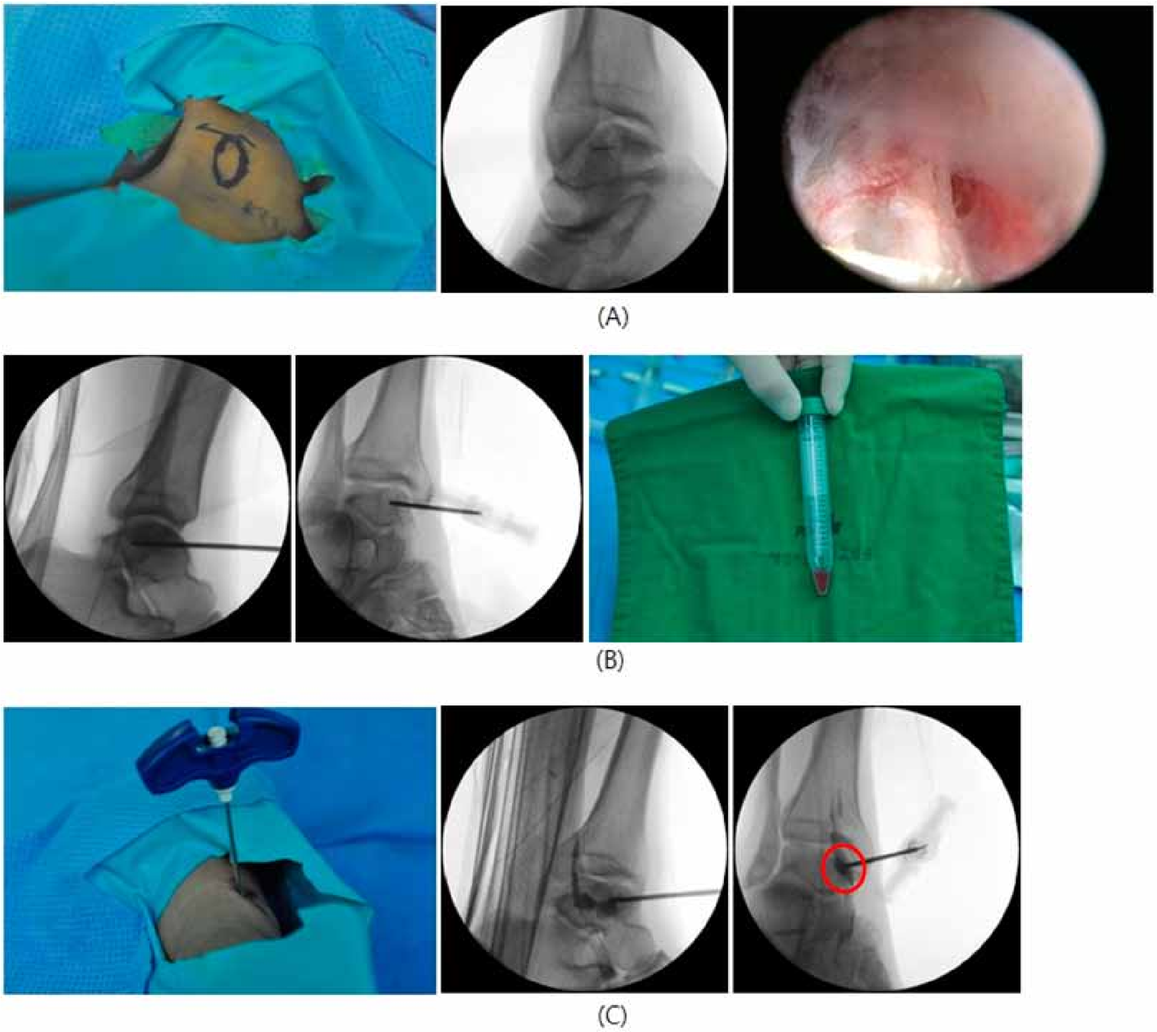

Fig. 2. *Intraoperative images. (A) An imaginary line of the tibiotalar joint and an imaginary circle of the cyst were drawn on the right ankle under fluoroscopy. A 26-gauge needle was inserted to infiltrate local anesthetics into the skin over the cyst and ankle joint under fluoroscopy. There was no connection from the OLT into the cyst of the talus body in the arthroscopic view. (B) A 13-gauge bone biopsy needle was inserted into the cyst and aspiration was performed. Aspirated fluid from the cyst was originally white and clear; however, it changed to a blood-tinged, reddish color when mixed with the incisional blood. (C) After aspiration (left), contrast medium was injected to observe the spread (middle). Hydroxyapatite bone cement was injected to fill the bone defect of the cyst. A 1.5 ml volume of cement was injected into the talus under vigilant monitoring of arthroscopy to prevent its dissemination into the joint. There was no cement (dark black one within a red circle) leakage into the vessels or articular space (right).*

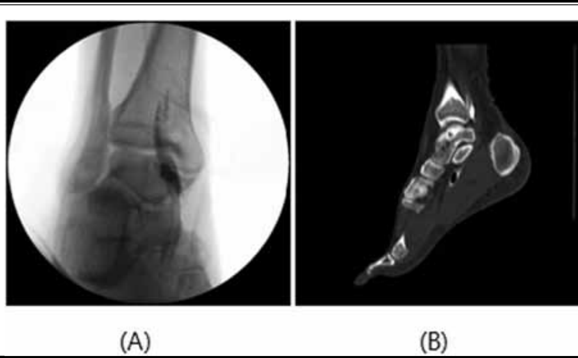

Fig. 3. Postoperative images showed filling of bone cement in the defect. (A) Fluoroscopic Mortise view. (B) Computed tomography.

osteochondral talar dome, lateral talar process, calcaneal anterior process, lateral malleolar, posterolateral distal fibular flake, fifth metatarsal base, and the navicular bone or injuries of the Achilles, peroneal, posterior tibial, anterior tibial, and flexor hallucis longus tendons. If the primary problem is ankle pain, a concentrated effort should be made to rule out occult fracture of the foot or ankle. A bone scan is an excellent screening test to rule out occult fractures and to guide further treatment. If the bone scan reveals increased uptake in a discrete area, a spot radiograph or CT scan is useful to further identify the exact location of the fracture. Occult or associated injuries of the tendons of the foot and ankle should also be considered, and MRI is the most useful exam to identify and confirm these injuries (8). Both CT and MRI are useful for the diagnosis of OLT. However, bone analysis is more precise with CT, and articular analysis can be superior with MRI (6).

The updated term "osteochondral lesion" replaces the terms osteochondritis, osteonecrosis, and subchondral fracture. Traditionally, the Bernt and Harty classification (9) of OLT was used, based on anatomic and evolving variations of an injury lesion. Our case falls in stage I (subchondral impaction) according to their classification and stage V (cystic lesions) according to the revised classification (10). The Anderson and Crichton classification based on MRI revealed a stage 2a lesion (subchondral cysts) (11). FOG radiological classification revealed a geode form based on the lesional aspect and the relation of the lesion with the talus body (situation in relation to the surface, condensation around the fragment), as proposed by Doré and Rosset (6).

When symptoms persist after a 6-month trial period of conservative treatment for OLTs ≤ 15 mm in size, debridement and drilling/microfracturing is recommended. When the lesion is cystic and > 15 mm in size, cancellous bone grafting, use of the osteochondral autograft transfer system procedure, or autologous chondrocyte implantation with cancellous bone should also be undertaken (2). In the current study, preoperative MRI revealed an abnormal high signal area surrounded with marrow edema (6.57 mm x 12.21 mm x 12.31 mm). Although the size of the lesion was < 15 mm in diameter, bone cement insertion after aspiration of the bone cyst was considered mandatory given the continuous pain felt on weight bearing. Large bone defects remaining after resection and curettage of benign bone tumors are traditionally filled with a substitute as soon as possible. When the length of the cortical defect exceeds 75% of the cortical diameter, the "open-section effect" results, and this can greatly reduce the load-carrying capacity of the cortical bone, particularly under torsional loading. Because bone substitutes can act as a scaffold for new bone formation, bone filled with substitute can gradually become stronger and withstand more mechanical stress than a bone defect that is left empty (12).

Many would favor the use of osteochondral autografts for the treatment of large osteochondral defects. Autologous bone grafts have the advantages of a low risk for disease transmission and good osteoinduction. However, it may be difficult to obtain the quantity of bone graft required, particularly when the tumor is large or if the patient is a child. In addition, the surface area that can be covered is limited, leaving the dead space between grafts to be filled by fibrocartilage. There may also be irregularities of the surface due to differing thickness of the cartilage transplant. The risk of pain, infection, and nerve damage at the donor site are also potential problems (12).

Alternative choices include cortico-cancellous autograft, cortical or cancellous allograft, composite graft, ceramics, polymethyl methacrylate bone cement, bone marrow, and demineralized bone matrix. The ideal bone substitute must be easily fabricated and preserved, biocompatible, and biodegradable. Hydroxyapatite was chosen in this case, because porous and granular hydroxyapatite implanted into bony defects has been proven to provide a suitable framework for osteogenesis, and compares well with allografts and xenografts. Both short- and long-term follow-up studies have demonstrated the biological and mechanical benefits of implanted hydroxyapatite (12,13).

Conclusion

When chronic ankle pain and focal tenderness on physical examination persist after various conservative treatments have failed, an OLT should be ruled out through imaging studies such as bone scans, CT, and MRI. In the present case, arthroscopic and fluoroscopic guidance was used for aspiration of an OLT and for performing percutaneous osteoplasty with hydroxyapatite for the defect; this treatment decreased pain on weight bearing and enabled a return to work without any restrictions one week after the procedure.

References

1. Zengerink M, Struijs PA, Tol JL, van Dijk CN. Treatment of osteochondral lesions of the talus: A systematic review. *Knee Surg Sports Traumatol Arthrosc* 2010; 18:238-246.
2. van Bergen CJ, de Leeuw PA, van Dijk CN. Treatment of osteochondral defects of the talus. *Rev Chir Orthop Reparatrice Appar Mot* 2008; 94:398-408.
3. Kreuz PC, Steinwachs M, Erggelet C, Lahm A, Henle P, Niemeyer P. Mosaicplasty with autogenous talar autograft for osteochondral lesions of the talus after failed primary arthroscopic management: A prospective study with a 4-year follow-up. *Am J Sports Med* 2006; 34:55-63.
4. Chew KTL, Tay E, Wong YS. Osteochondral Lesions of the talus. *Ann Acad Med Singapore* 2008; 37:63-68.
5. Naran KN, Zoga AC. Osteochondral lesions about the ankle. Radiol Clin North Am 2008; 46:995-1002.
6. Laffenêtre O. Osteochondral lesions of the talus: Current concept. *Orthop Traumatol Surg Res* 2010; 96:554-566.
7. Wolfe MW, Uhl TL, Mattacola CG, McCluskey LC. Management of ankle sprains. *Am Fam Physician* 2001; 63:93-104.
8. Hockenbury RT, Sammarco GJ. Evaluation and treatment of ankle sprains: Clinical recommendations for a positive outcome. *Phys Sportsmed* 2001; 29:57-64.
9. Berndt L, Harty M. Transchondral fractures (osteochondritis dissecans of the talus). *J Bone Joint Surg Am* 1959; 41:988-1020.
10. Loomer R, Fischer C. Osteochondral lesions of the talus. *Am J Sports Med* 1993; 21: 13-9.
11. Anderson BF, Crichton KJ. Osteochondral fractures of the dome of the talus. *J Bone Joint Surg* 1989; 62:1143-1152.
12. Matsumine A, Myoui A, Kusuzaki K, Araki N, Seto M, Yoshikawa H, uchida A. Calcium hydroxyapatite ceramic implants in bone tumour surgery. A long-term follow-up study. *J Bone Joint Surg Br* 2004; 86:719-725.
13. Yamamoto T, Onga T, Mariu T, Mizuno K. Use of hydroxyapatite to fill cavities after excision of benign bone tumours: Clinical results. *J Bone Joint Surg* 2000; 82:1117-1120.