Surgical Treatment of the Bilateral Osteochondral Lesions of the Talus - Case Report

Matej Črep[1], Alan Ivković[1,2,3], Marko Pećina[1,3]

[1] School of Medicine, University of Zagreb, Zagreb, Croatia
[2] Department of Orthopaedics and Traumatology, University Hospital „Sveti Duh“, Zagreb, Croatia
[3] Department of Medical Sciences, Croatian Academy of Sciences and Arts, Zagreb, Croatia

Abstract

Osteochondral lesions of the talus (OLTs) are significant injuries to the ankle joint, characterized by damaged articular cartilage and underlying subchondral bone. In 3/4 of the cases, OLTs are caused by traumatic events such as sprain or fracture. This case report presents the treatment of a 57-year-old female patient with bilateral OLTs. The patient initially reported persistent pain in her left ankle, with imaging revealing an OLT with an extensive subchondral cyst. An arthroscopic procedure debrided the cyst and initiated the healing response. One year later, she developed similar symptoms in her right ankle, necessitating a second arthroscopic intervention and spongioplasty. Shortly after the second surgery, the left ankle's condition deteriorated, requiring a more complex open surgery involving an osteotomy of the medial malleolus, debridement of the cyst, and instillation of the ready-to-use calcium phosphate paste for bone void filling. After the surgeries, the patient was included in a physical therapy program and reported significant pain relief in both of her ankles and successfully returned to her normal daily activities. A follow-up of 6 years for intervention on the right ankle and 5 years for the last (second) intervention on the left ankle shows a very satisfied subjective and objective status for both ankles. This case highlights the challenges with diagnosing and managing OLTs, emphasizing the need for a customized surgical approach based on individual lesion characteristics. Early detection and appropriate surgical interventions are beneficial for improving patient outcomes and the quality of life in individuals affected by these lesions.

Keywords: Talus; Osteochondral lesions; OLT; Osteochondral defects; Ankle; Cystic defects, Surgical treatment

Sažetak:

Kirurško liječenje obostranih osteohondralnih lezija talusa

Prikaz slučaja

Osteohondralne lezije talusa (OLT) značajne su ozljede nožnog zgloba, karakterizirane oštećenjem zglobne hrskavice i podležeće suphondralne kosti. U 3/4 slučajeva, OLT su uzrokovane traumatskim događajima kao što su uganuće ili prijelom. U ovom radu prikazujemo liječenje 57-godišnje bolesnice s bilateralnom osteohondralnom cističnom lezijom talusa. Pacijentica se u početku žalila na perzistirajuću bol u lijevom gležnju, a slikovna je obrada otkrila opsežnu subhondralnu cistu. Izveden je artroskopski zahvat kako bi se cista uklonila i pokrenuo odgovor na cijeljenje. Godinu dana kasnije pacijentica je razvila slične simptome u desnom gležnju, zbog čega je bila potrebna artroskopska

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Correspondence:
Alan Ivković
alan.ivkovic@gmail.com

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intervencija uključujući i spongioplastika. Ubrzo nakon operacije desnog gležnja, stanje lijevog gležnja se pogoršalo, zahtijevajući složeniju otvorenu operaciju koja je uključivala osteotomiju medijalnog maleolusa, debridman ciste i instilaciju gotove paste s kalcijevim fosfatom za popunjavanje šupljina u kosti. Nakon operacije, pacijentica je uključena u program fizikalne terapije nakon koje je došlo do značajnog ublažavanja bola u oba gležnja te se uspješno vratila svojim normalnim profesionalnim i dnevnim aktivnostima. Praćenje od 6 godina za intervenciju na desnom gležnju i 5 godina za posljednju (drugu) intervenciju na lijevom gležnju pokazuje vrlo zadovoljavajući subjektivni i objektivni status oba gležnja. Ovaj pikaz slučaja naglašava izazove u dijagnostici i liječenju OLT-a, naglašavajući potrebu za prilagođenim kirurškim pristupom koji se temelji na individualnim karakteristikama lezije. Rano otkrivanje i odgovarajuće kirurške intervencije korisne su za poboljšanje kvalitete života pojedinaca zahvaćenih ovim lezijama.

Ključne riječi: Talus, Osteohondralne lezije, OLT, Osteohondralni defekti, Gležanj, Cistični defekti, Kirurško liječenje

Introduction

Osteochondral lesions of the talus (OLTs) are characterized by damaged articular cartilage of the talus and its underlying bone (1). They are increasingly diagnosed and pose a challenge due to the difficulty of treatment. Up to 50% of acute ankle sprains and fractures may lead to an OLT. They primarily impact young, physically active individuals and damage the articular cartilage or subchondral bone (2,3). They often result in persistent deep ankle pain, swelling, stiffness, weakness, joint instability, occasional joint locking, and a reduction in sports participation and overall quality of life, which may ultimately progress to osteoarthritis (4–6). This case report aims to present a complex patient, operated on multiple times due to bilateral OLTs. By describing the surgical technique, postoperative management, and clinical outcomes, the case highlights the potential effectiveness and advantages of this type of individualized treatment for patients with OLTs.

Case Presentation

We present a 57-year-old female patient surgically treated due to bilateral OLTs. In 2017., at the age of 50 years the patient presented for an examination due to complaints in her left ankle, complaining of pain lasting for a year without a positive history of a traumatic event. The pain was progressing, the first clinical examination showed no signs of fluid outflow in the ankle joint, and the range of motion in her left ankle was slightly limited. Plain radiography of the left ankle joint showed oval thinning of the bone structure of the medial part of the head of the talus. The multislice spiral computed tomography (MSCT) revealed arthritic changes of the left ankle with subchondral sclerosis of the joint surface, defects, and deep cysts of the medial part of the trochlea of the talus (figure 1). The magnetic resonance imaging (MRI) confirmed an extensive osteochondral lesion of the medial part of the roof of the talus measuring 26x11 mm, denivelation of the medial part of the roof of the talus, and cystic zones up to 17 mm in size that spread towards the talocalcaneal articular surface with mild bone edema (figure 2). A smaller effusion of the anterolateral compartment of the foot and along the tendon of the posterior tibial muscle in the retrocalcaneal segment was also shown. After the preoperative assessment, in October 2017. an arthroscopic procedure of the left ankle was done during which the cyst of the medial part of the trochlea of the talus was debrided and sent for pathohistological analysis. The postoperative period was uneventful, and the patient was transferred to the rehabilitation ward where early active and passive physical rehabilitation was started under the supervision of a physiotherapist.

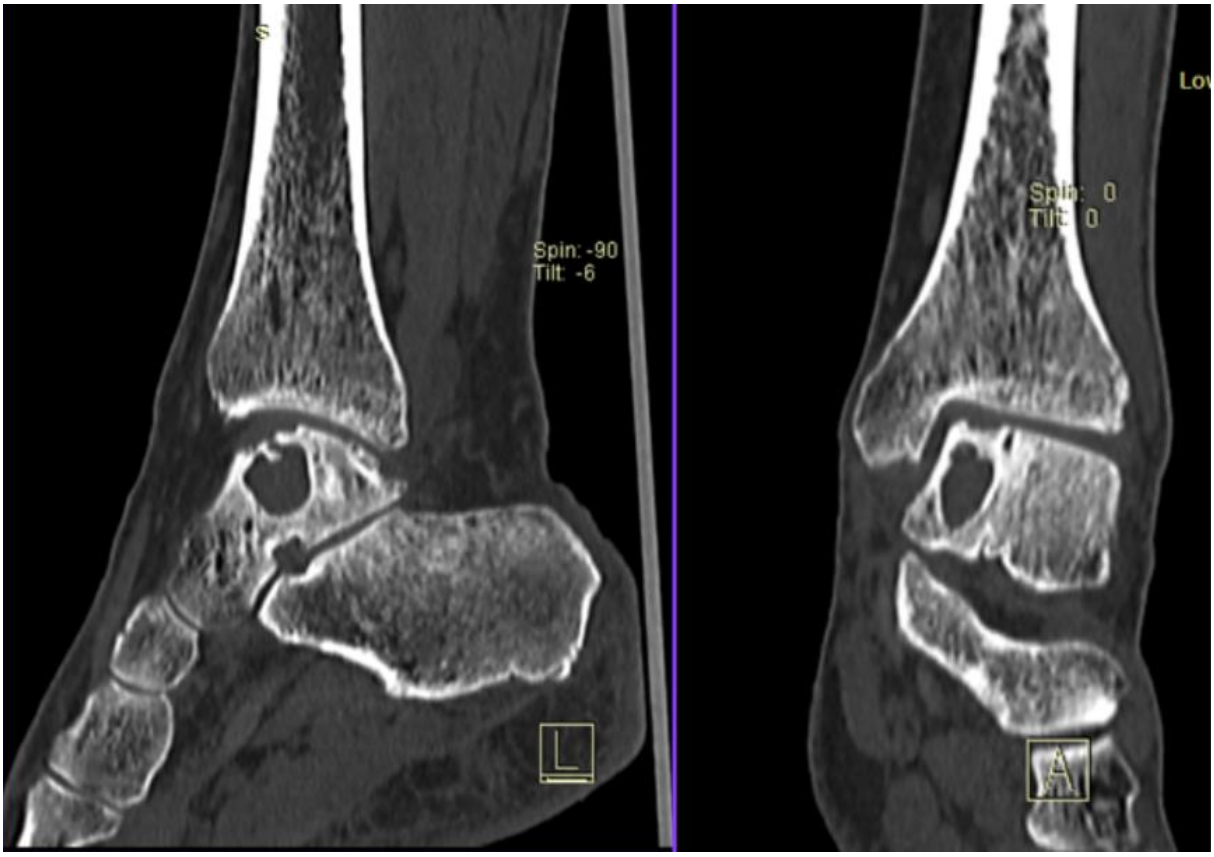

Figure 1. – Preoperative MSCT scans of the left talus in October 2017. revealing multiple cystic zones

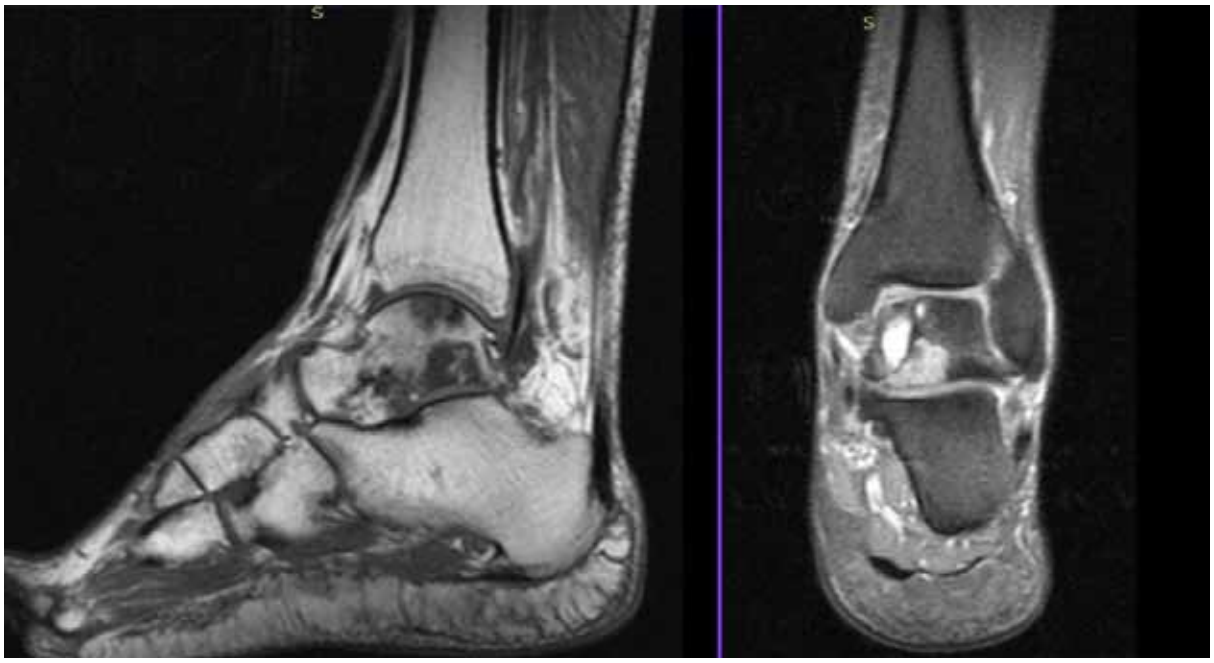

Figure 2. – Preoperative MRI T1/PD TSE FS scans of the left talus bone in October 2017 revealing multiple cystic zones

One year after the first arthroscopic surgery on the left ankle joint, the patient presented with the same symptoms, only this time in her right ankle joint. On physical examination, there was a limitation of the range of motion, and palpation pain during plantar flexion anteriorly in the projection of the talar dome of the right talocrural joint. The pain in the right ankle joint progressed, especially after long-term loading and standing. The patient was scheduled for surgery on the right ankle and the arthroscopic debridement of the subchondral cyst, which was previously MRI-confirmed, was performed (Figure 3).

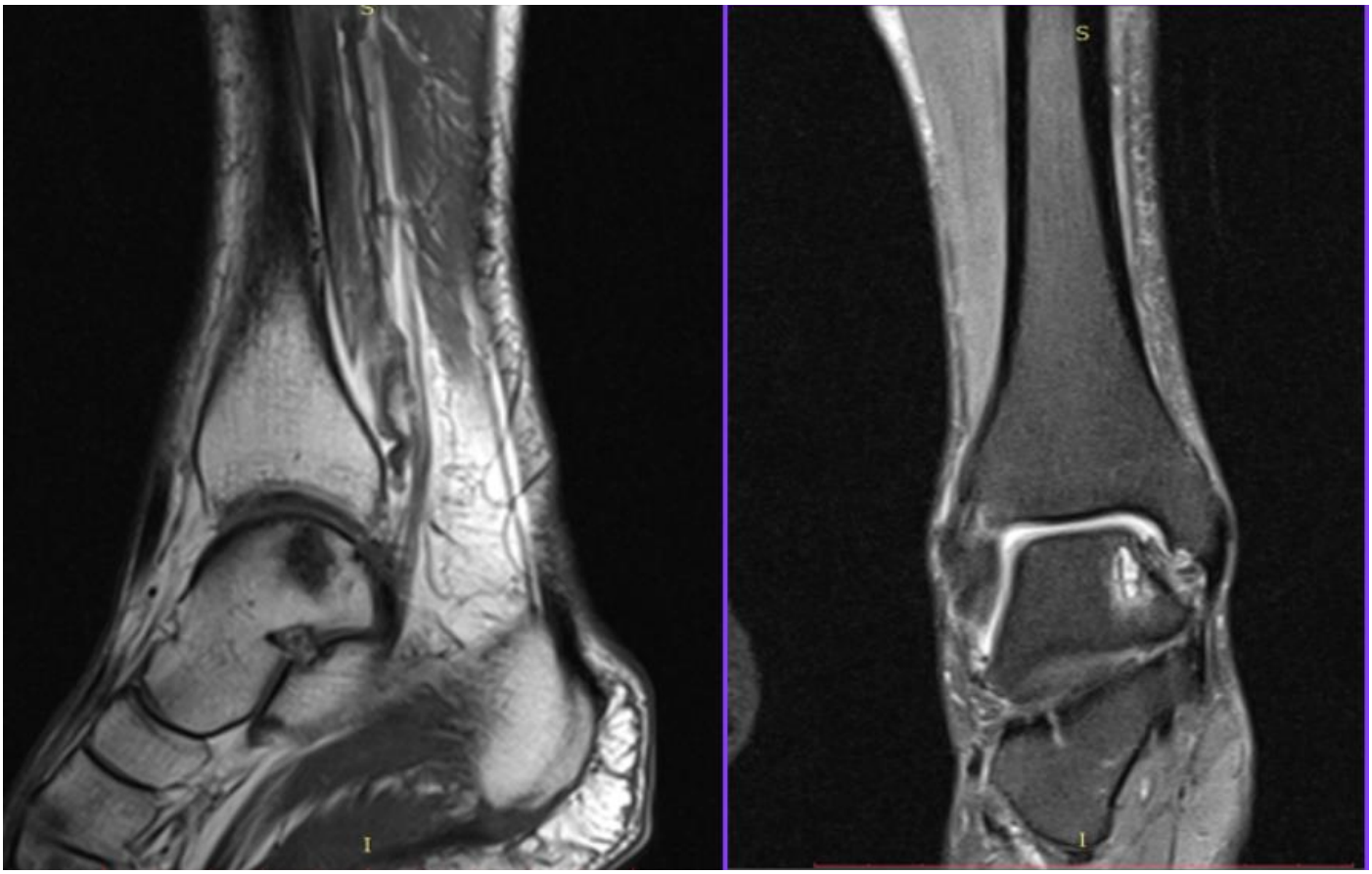

Figure 3. – Preoperative MRI T1/PD TSE FS scans of the right talus bone in November 2018. revealing subchondral cyst

In addition, retrograde drilling along with autologous cancellous bone spongioplasty was also performed. The early postoperative course was uneventful, and the patient was discharged one week after the procedure with a leg brace and crutches with instructions to relieve the operated leg, elevate it, and cool the joint at rest. One month after surgery, she was instructed to walk with a partial load of 50% of the body weight, and 2 weeks after that, full load on the operated side. The patient spent two weeks at the Department of Physical Rehabilitation, during which individual kinesitherapy, electrotherapy, and hydrokinesitherapy of the right ankle were performed. The range of motion after surgery and physical therapy was: 20° of dorsiflexion, 20° of plantar flexion, 20° of inversion, and 10° of eversion. In the first operated left ankle, one year after the surgery, the extent of dorsiflexion was 10°, and plantarflexion was 20°. About half a year after the right ankle surgery, the patient returns to the orthopaedic surgeon for a follow-up examination due to worsening pain in the left ankle. At the same time, there were no significant complaints of the right ankle. MRI and MSCT diagnosis of the left ankle revealed multiple subchondral cysts on the medial part of the trochlea talus (figures 4 and 5). The largest cyst was 14x7 mm with complete degeneration of the cyst roof, which was in communication with the ankle joint space.

Figure 4. – MSCT of the left talus bone in January 2020. before the second surgery showing multiple subchondral cysts

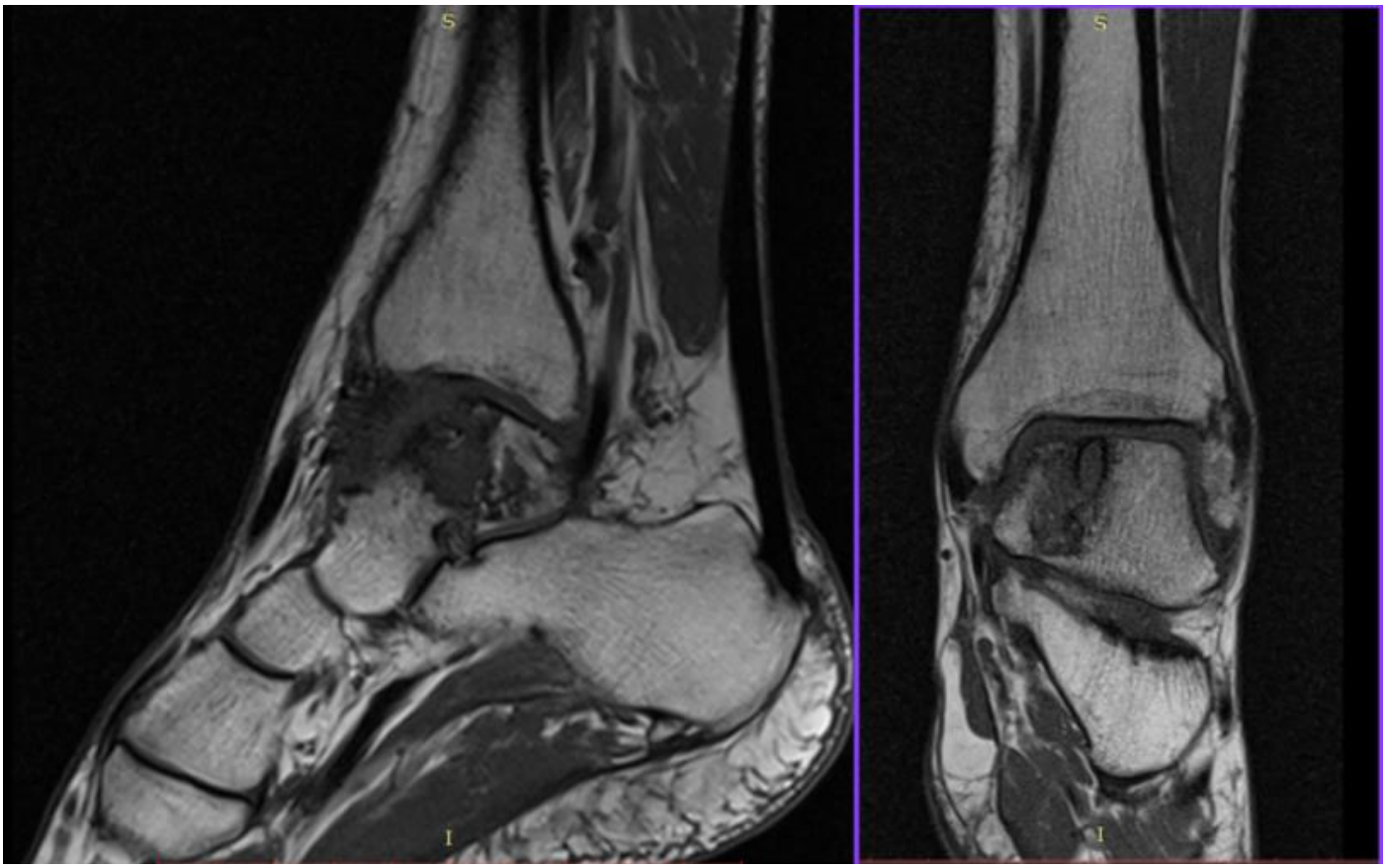

Figure 5. - MRI T1 scans of the left talus bone in January 2020. before the second surgery showing multiple subchondral cysts

Table 1. – Chronological order of the patients' surgeries

DATE	LOCALIZATION OF THE CYSTS	SURGERY PERFORMED
12.10.2017.	left talus, the medial part of the trochlea	arthroscopic excoriation of the cyst
22.11.2018.	right talus, the medial part of the trochlea	arthroscopic excoriation of the cyst and spongioplasty, retrograde drilling of the chondral lesion
26.1.2020.	left talus, multiple cysts of the medial part of the trochlea	open surgery with osteotomy of medial malleolus excoriation of the cysts and calcium phosphate cement instillation

A new, this time open, surgery of the left ankle was performed under spinal anesthesia with an open approach in the area of the medial malleolus under the control of an X-ray. An osteotomy of the medial malleolus was performed, exposing the talus. The cyst was approached from the medial part, which was then completely debrided, and ready-to-use calcium phosphate paste (Innotere Paste-CPC, Innotere GmbH, Radebeul, Germany), was instilled into the cyst cavity. A cancellous lag screw (Arthrex GmbH, Munich, Germany) was then placed to fix the osteotomized medial malleolus (Figures 6 and 7). The procedure went well and under the supervision of a physiotherapist, the patient was verticalized and discharged home with a lower leg brace and the use of crutches. The patient was instructed to bear up to 10% of the body weight on the operated side up to 6 weeks after the procedure, after which the load was gradually increased until complete recovery.

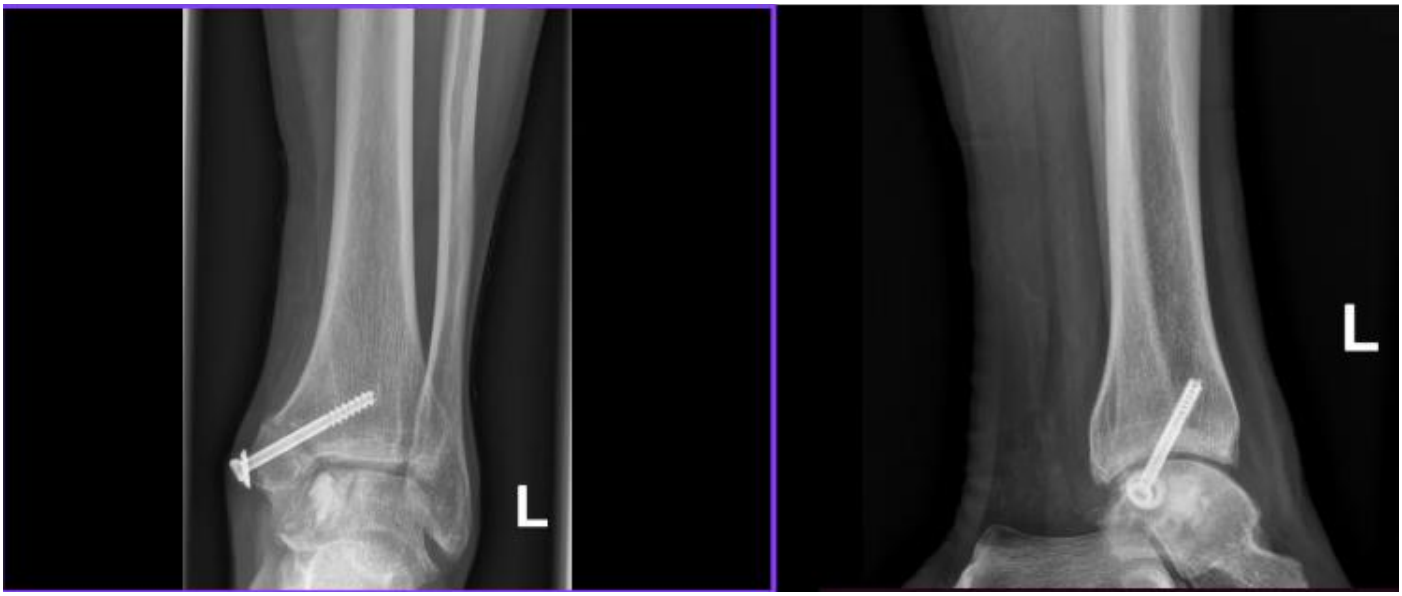

Figure 6. Postoperative x-rays of the left talus with osteosynthesis of osteotomized medial malleolus.

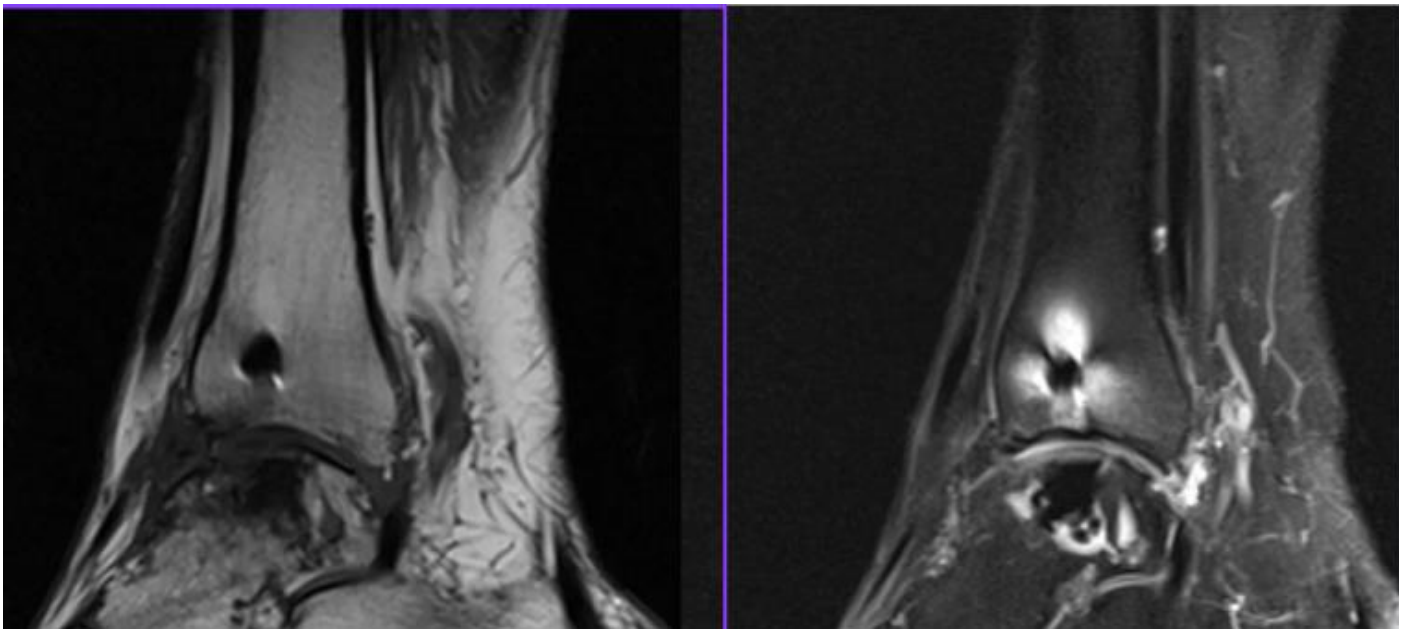

Figure 7. Postoperative MRI T1/PD TSE FS of the left talus after debrided cyst and instillation of calcium phosphate paste

The patient's symptoms in both ankles have regressed at regular check-ups by the orthopaedic surgeon. She has returned to her normal job as a cook in a kindergarten and has no difficulties in normal daily activities. (Figures 8 and 9.)

Figure 8. Native pictures of the ankle joints 5 years after the last surgery of the left ankle joint.

Figure 9. - Native pictures of the ankles 5 years after surgeries, range of motion of both ankle joints (dorsiflexion and plantarflexion)

Discussion

The causes and development of OLTs have been linked to various factors and are still under investigation. Although most OLTs result from trauma, which can be from an isolated single event or years of repetitive microtrauma, up to 24% may arise from nontraumatic causes. These lesions are more frequently observed in males, typically between 20 and 30 (2). Given that cartilage has a poor tendency to heal because it is avascular, as the population continues to be more active, it can be assumed that OLTs will become more prevalent (7). Vascular disruption has also been proposed as a cause of traumatic lesions. It's unclear if the vascular insufficiency was present before the injury or resulted from the fragmentation. In either case, this lack of blood flow is thought to reduce the ability to heal the cartilage. Various systemic issues have been linked to the development of OLTs, such as hypothyroidism, vitamin D deficiency, and problems with calcium and parathyroid levels. For nontraumatic lesions or patients with multiple joint diseases, it's important to check for endocrine imbalances. Additionally, systemic blood vessel problems that can cause localized avascular necrosis should always be included in the differential diagnosis (8).

Talar lesions are most commonly located posteromedially (57%) or anterolaterally (43%). More recently, in a series of 428 patients from Elias et al. (9), medial talar dome lesions were far more common and significantly larger than lateral lesions. They also established a novel, 9-zone anatomic grid system on the talar dome to depict lesion location accurately. The 9 zones on the talar dome articular surface have an equal 3 x 3 grid configuration. Zone 1 was the most anterior and medial, zone 3 was anterior and lateral, zone 7 was most posterior and medial, and zone 9 was the most posterior and lateral (7). Anterior lateral lesions occur when the ankle is forcefully dorsiflexed and inverted, leading to contact between the anterior lateral talar dome and the fibula. While posterior medial lesions can result from trauma, they are more likely to be idiopathic. These lesions are caused by plantarflexion and inversion of the ankle, where the posterior medial talar dome makes contact with the tibial plafond, causing lesions. OLTs often present as ankle pain and restricted movement of the joint. Patients often experience deep ankle pain that they associate with a specific injury or triggering event. These events might include increased weight-bearing activities, high-impact movements, or any action that raises pressure on the ankle joint through axial loading. (1) Persistent swelling, along with joint locking or instability occurring 4 to 5 weeks after an ankle injury, are key signs that further joint imaging is needed (2).

The primary imaging method for assessing OLTs involves standard anteroposterior (AP), lateral, and mortise radiographs of the ankle joint. Obtaining an AP or mortise view with the foot in plantar flexion can improve the visualization of the posterior talus. CT scans remain a valuable imaging modality in the evaluation of OLTs, especially for preoperative planning (8). While MRI is becoming the gold standard of imaging, it may overestimate the severity of injury. Lesion size has also been established as a predictor of outcome and may be useful in directing treatment. Lesions greater than 15 mm in diameter have shown a failure rate of 97% after arthroscopic bone marrow stimulation (2,10). Nevertheless, Deng et al. (4) demonstrated that both MRI and CT are reliable and valid in evaluating cystic osteochondral lesions of the talus. SPECT/CT delayed imaging is also advantageous for observing the location, classification, and repair of cystic lesions in the talus (11). Several classification systems for osteochondral lesions of the talus have been suggested, with the Berndt and Harty classification being one of the earliest and most widely used. This system is a 4-stage classification that assesses the lesion based on its appearance on plain X-rays, focusing specifically on transchondral fractures (8).

Treatment of OLTs can be conservative and surgical. A conservative approach includes rest, oral administration of medication, external application of medication, physical therapy, or intra-articular hyaluronic acid injections. However, conservative treatment has only been reported to be successful in approximately 54% of cases, and surgical intervention is frequently required (12–14). Surgical procedures include excision of the lesion, curettage, microfracture, autologous cancellous bone grafting, retrograde drilling, fixation of the osteochondral fragment, osteochondral transplantation, and autologous chondrocyte implantation (15,16). Small lesions under 150 mm^2 are suitable for arthroscopy and microfracture, which promotes fibrocartilage formation. In contrast, larger lesions of 150 mm^2 or more pose a risk of articular collapse and necessitate treatment strategies focused on reinforcing subchondral support with a bone graft or biomimetic material such as calcium phosphate paste (16,17). These larger lesions are challenging to treat arthroscopically and typically require open surgery, involving a medial or lateral malleolar osteotomy to access the affected area (18,19).

Bone marrow stimulation is commonly used as the first treatment option. It is cost-effective, straightforward, has a low risk of complications, and causes less pain after surgery compared to more invasive open procedures. This approach is mainly recommended for small, noncystic lesions. Bone marrow stimulation involves making small holes (microfractures) or drilling into the subchondral bone layer, allowing mesenchymal cells and growth factors to reach and help repair the area (7,16,17,20–22). Retrograde drilling is generally used for treating osteochondral lesions of the talus with a stable osteochondral fragment and normal articular cartilage surface (15). Autologous osteochondral transplantation (AOCT) involves transplanting one or more tubular units of cartilage and bone harvested from the ipsilateral knee to a defect site in the talus. Transplantation often involves an open technique and may even require a malleolar osteotomy for access to the defect (20,23–25). Autologous osteoperiosteal

transplantation (AOPT) is a type of AOCT, where the autografts are harvested from the iliac crest or ipsilateral tibia. It can be used for patients with chondral lesions of the patellofemoral joint that are unsuitable for autologous osteochondral graft transplantation. (26–30). Osteochondral allograft transplantation is a replacement procedure in which a cadaver graft of viable articular cartilage and its underlying subchondral bone are harvested and transplanted (20). Lastly, autologous chondrocyte implantation is also one of the options for treating such lesions. It is a procedure in which chondrocytes are harvested during the initial procedure, expanded in culture, and then reimplanted to the defect in a second procedure (8,20). True cysts in the talar body are uncommon, and no established treatment protocol exists. The typical approach for a large, symptomatic talar cyst involves debridement and bone grafting, which often needs extensive soft tissue dissection, potential damage to the talar cartilage, and occasionally a malleolar osteotomy. Alternatively, arthroscopic debridement with bone grafting can be performed, preserving the talar cartilage (21). A series of eight cases by El Shazly et al. (31) treated by arthroscopic curettage and bone grafting for large talar dome cysts of different etiologies reported significantly good results with no recurrence or complications during the follow-up period of two years. El Shazly et al. recommended arthroscopic curettage for cystic talar lesions >10mm in size (31).

Conclusion

This case report highlights the complexity and challenges associated with treating bilateral OLTs. Through individualized surgical interventions, including arthroscopic and open techniques with the addition of regenerative techniques, significant improvements in the patient's symptoms and functional outcomes were achieved. It also highlights the importance of early diagnosis and a customized surgical approach based on lesion size and location. As the prevalence of OLTs continues to rise, understanding effective treatment strategies will be crucial for improving the quality of life in affected patients.

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