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Case Reports and Series

Arthroscopically Assisted Anterior Treatment of Symptomatic Large Talar Bone Cyst

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ABSTRACT

Symptomatic cystic lesions of the talus are rare. The traditional operations usually do not provide visualization to reveal the deep structure of the lesion and could cause cartilage damage or other severe traumatic injury. We report an operative technique to reach the cystic lesion without talar cartilage damage, remove the lesion, and fill defect with a bone graft assisted by anterior arthroscopy and evaluate its safety and reliability for future study. Seven cases of talar bone cyst were included. The patients were placed in the supine position after anesthesia induction and noninvasive ankle traction was applied. Standard anteromedial and anterolateral portals were established to observe the ankle; the distal end of the medial approach was moderately enlarged to 2 to 3 cm. The biopsy specimen of the cyst was obtained under arthroscopic guidance; the cyst wall was abraded and the sclerotic rim drilled. Arthrocare radiofrequency ablation was performed to prevent recurrence. The defect was tightly impacted with autologous or allograft cancellous bone. All cysts in these cases were located in the medial talus; anteroposterior radiographs and computed tomographic coronary scan showed a cyst diameter of >1 cm. Intraoperative inspection showed a tiny chondral gap on the talar dome in 1 case and on the medial wall of talus in 1 case; no cartilage injury was found in the remainder. Two cases were impacted with grafted autogenous iliac bone into the talar defect and 5 cases with allograft cancellous bone. Computed tomography confirmed that the cysts had healed, with no signs of recurrence found in any patient at 1 year postoperatively. The mean American Orthopaedic Foot and Ankle Society ankle-hindfoot scale score increased from 65 preoperatively to 91 points postoperatively, a statistically significant difference ($p < .01$). No complications developed and no reoperations were required postoperatively. Arthroscopically assisted anterior treatment with autologous or allograft bone graft is an effective method for symptomatic large talar bone cysts.

Symptomatic cystic lesions of the talus are rare and commonly diagnosed as simple bone cysts, aneurysmal bone cysts, intraosseous ganglia, and giant cell tumors (1–5). The traditional treatment is debridement (i.e., drilling the cystic wall and the surrounding sclerotic bone). An autologous bone graft or allograft has been recommended to provide mechanical stability and consolidation of the defect (6,7). Because most of the area of the talus is covered with articular cartilage, it is rather difficult to conduct surgical procedures without damaging the cartilage of the talus. To improve efficacy and reduce complications, Ogut et al (8) reported a treatment of posterior arthroscopy, which showed satisfactory outcomes at the short-term follow-up point. However, the posterior approach was close to some important anatomic structures, and the instruments can unavoidably damage the posterior articular cartilage.

The neck of talus is not covered with cartilage, and it lacks important anatomic structures except for the arteria dorsalis pedis. The purpose of the present study was to determine the efficacy and complications using arthroscopically assisted anterior treatment of symptomatic large talar cysts. We hypothesized that the anterior arthroscopic approach would be a safe, simple, and effective method to treat symptomatic large talar cysts.

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Patients and Methods

We reviewed 401 ankle arthroscopic surgeries between March 2010 and December 2014 in our department. The inclusion criteria were (1) a primary diagnosis of talar cyst; (2) systematic collection of the preoperative data from ankle radiographs, computed tomography (CT) and magnetic resonance imaging (MRI); and (3) pain still present after conservative treatment (e.g., injections, braces, crutches, or nonsteroidal antiinflammatory drugs) for ≥6 months. The exclusion criteria were (1) osteochondral damage of the talus on MRI; (2) a history of ankle surgery; (3) abnormal alignment of the lower extremity; (4) ankle joint and/or subtalar joint osteoarthritis; and (5) a talar cyst found as an incidental finding. Seven cases (four females and three males) were selected; all the patients underwent CT and MRI examination. Because the bone edema shown on the MRI can influence the result, we determined the size of the bone cysts using 3-dimensional CT reconstruction, and the cyst diameters shown on the CT scans in all patients were >1 cm. All the patients had unilateral lesions and denied any obvious history of trauma. The cyst volume of 2 cases was found to be increasing by comparing the same area on MRI examination within the 1-year follow-up period.

The patients were informed preoperatively that the procedure would be changed to osteochondral transplantation if obvious articular cartilage injury of the talar dome was found. The arthroscopic procedures were performed by the same senior orthopedic surgeon (D.X.J.). One of us (Z.X.Z.) conducted the data abstraction, radiographic measurements, outcome assessments, and statistical analyses, and 1 of us (Y.L.) arranged the participant recruitment. The medical ethics committee of the Southwest Hospital approved the present study, and all patients provided informed consent before inclusion in the study. All procedures involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Operative Technique

The surgery was performed arthroscopically with the patient under spinal or epidural anesthesia with a thigh tourniquet in place. The patient was placed in the supine position, and noninvasive ankle traction was implemented (Fig. 1). The standard anteromedial and anterolateral portals were established at the ankle in full dorsiflexion, and a 2.7-mm arthroscope (Smith & Nephew, London, UK) with a 30° viewing angle was introduced to inspect the articular cavity and determine whether talar cartilage injuries or other lesions were present. Next, the soft tissue debridement was completed. After it was confirmed that no obvious cartilage was present, the ankle traction was removed. The distal end of the medial incision was moderately enlarged to 2 to 3 cm, and the anterior tibial tendon was retracted toward the lateral side. A window was created from the neck of the talus to the lesion. The process was guided using a 2.0-mm Kirschner wire. Localization of the lesion was determined from the preoperative CT and MRI studies and confirmed by intraoperative C-arm radiography (Fig. 2). The window was opened at the distal end of the cartilage surface without passing through the articular cartilage to preserve the integrity of the articular surface. Next, the window was enlarged with a 4.5-mm cannulated drill. The entry to the cyst was confirmed by the extrusion of viscous gelatinous contents from the cyst. If the contents were not observed clearly, the 2.7-mm arthroscope was inserted to confirm the presence of the lesion. The window could be enlarged further to 1 cm in diameter if necessary.

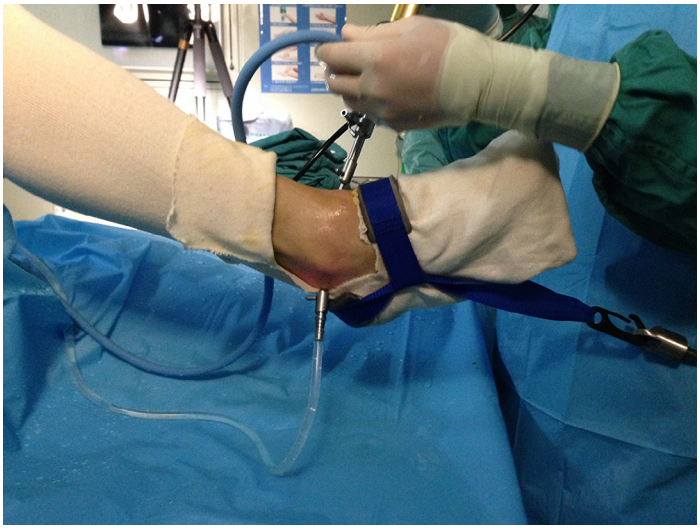

Fig. 1. View showing patient in the supine position, with the arthroscope and noninvasive ankle traction in place.

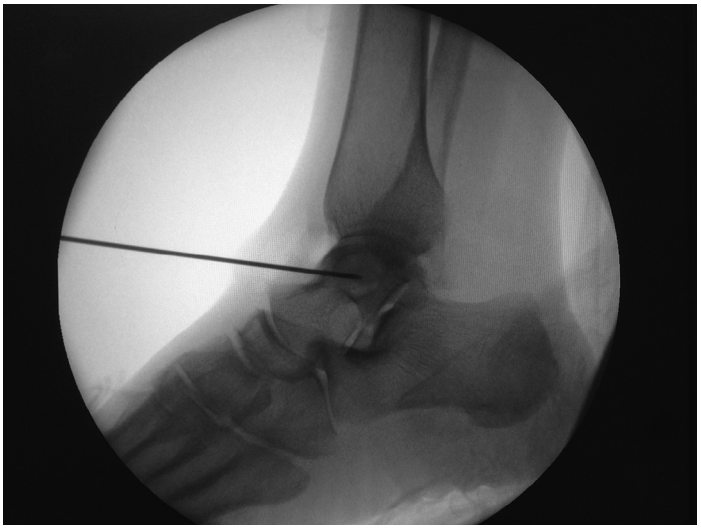

Fig. 2. Arthroscopic view showing the Kirschner wire used to confirm the cyst position before enlarging the bony operation channel.

The arthroscope was introduced inside the cyst to take biopsy specimens of the tissues from the lesional membrane (Fig. 3). During abrasion of the cyst wall with the curette, we ensured complete removal of the lesional tissue. A burr was used to drill the sclerotic rim of the wall. Arthrocare radiofrequency ablation of the cystic wall was performed to prevent recurrence of the cystic wall lesions (Supplemental Video S1). The cyst wall was drilled using a 1.2-mm Kirschner wire for the infiltration of bone marrow. Finally, the bone defect was impacted tightly with autologous cancellous bone harvested from the iliac crest or allograft cancellous bone for union. Next, we checked the graft to determine whether it had moved during ankle motion. A drain was placed into the joint after irrigation. The portals were closed with simple interrupted sutures.

After surgery, the patients were given intravenous antibiotics for 24 hours. Immobilization was required for 2 weeks in a short leg cast without any weightbearing. Partial weightbearing was allowed after the sutures had been removed. At 4 to 6 weeks postoperatively, mobilization with full weightbearing was allowed. A functional evaluation was performed using the American Orthopaedic Foot and Ankle Society (AOFAS) ankle-hindfoot scale (9,10) at the last follow-up visit and a

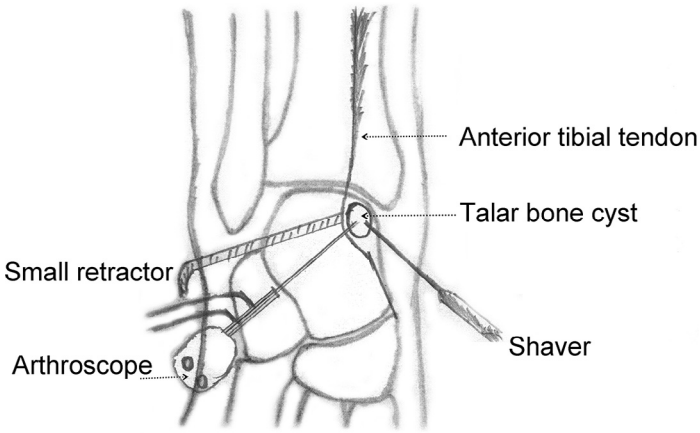

Fig. 3. Schematic diagram of arthroscopic procedure. (Drawn by X.D.)

radiologic assessment at 1 day, 4 weeks, and 1 year postoperatively. CT was used to observe whether the cysts had healed at 1 year postoperatively.

Statistical Analysis

Statistical analysis was performed using the SPSS, version 11.0, software package (IBM, Armonk, NY). The Student *t* test was used to determine the significance of intragroup differences, and a probability of $p < .05$ was considered statistically significant.

Results

The median age was 49 (range 37 to 62) years. Of the 7 patients, comorbidity with localized pigmented villonodular synovitis was found in 1 that resolved after removal of the villonodular synovitis. The other 6 patients did not receive any other treatment. During intraoperative inspection, a tiny chondral gap was found on the talar dome in 1 patient and on the medial wall of the talus in another; no cartilage injury was found in the remaining 5 patients. All the cysts in this group were located in the medial talus; the anteroposterior radiographs and CT coronary scans showed a cyst diameter of >1 cm.

The mean operation time was 92 ± 9 (range 81 to 118) minutes. The first 2 patients underwent grafting with autogenous iliac bone and the subsequent 5 with allograft cancellous bone. Postoperative histopathologic examination confirmed the primary diagnosis of a talar bone cyst. The mean follow-up period was 26 ± 2 (range 24 to 31) months. At 1 year after surgery, the CT scan confirmed that the cysts had healed and no signs of recurrence were found in any of the 7 patients (Figs. 4 and 5). The mean AOFAS ankle-hindfoot scale score increased from 65 ± 3.4 (range 46 to 70) points preoperatively to 91 ± 2.2 (range 78 to 100) points postoperatively, with a statistically significant difference ($p < .01$). No complications developed and no reoperations were required postoperatively. In addition, talar fracture or ischemic necrosis of talus was not found during the follow-up period, and all the patients were satisfied with their results (Table).

Discussion

Large talar cystic lesions might not be combined with obvious cartilage injury (11). The symptomatic cystic lesions of the talus are rare and difficult to differentiate from aneurysmal bone cyst, intraosseous ganglia, and giant cell tumors. Usually, the patient will have a history of trauma in the talar cartilage, which is located in the medial or lateral part of the talus. However, no obvious trauma history has been associated with formation of a bone cyst, which usually occurs in the central part of the talus and then develops to the adjacent articular surface. Thus, the diagnosis is mostly dependent on surgeon experience and pathologic examination, and intraoperative exploration is

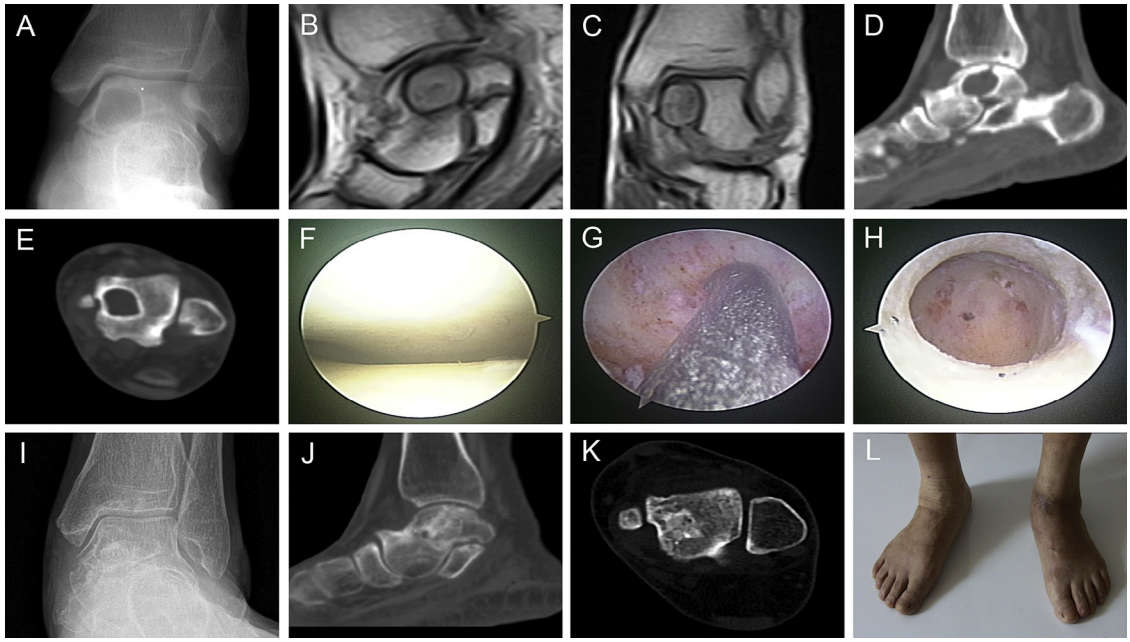

Fig. 4. Typical case 1: 59-year-old female, with a diagnosis of a talar cyst in the left extremity. The preoperative examinations included (*A*) radiography, (*B,C*) magnetic resonance imaging examination, and (*D,E*) computed tomography evaluation. Intraoperative images showing (*F*) integrity of articular cartilage, (*G*) removal of the lesion tissue with curettage, and (*H*) the drilled defect before bone grafting. The 1-year postoperative examinations included (*I*) radiography and (*J,K*) computed tomography. (*L*) View showing performance of the left ankle without swelling or pain.

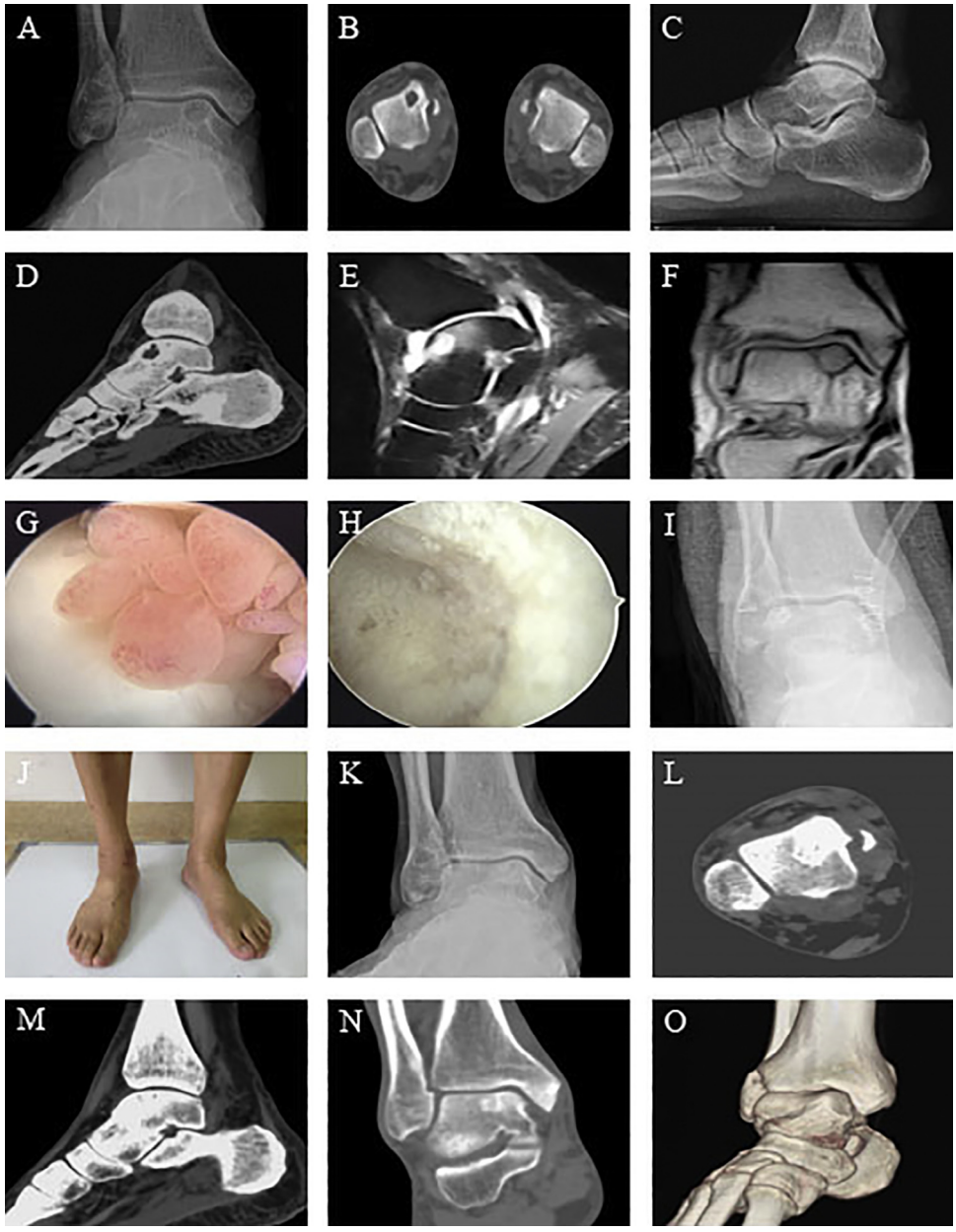

Fig. 5. Typical case 2: 48-year-old male, with a diagnosis of a talar cyst in the right extremity. The preoperative examinations included (*A*) radiography, (*B–D*) computed tomography evaluation, and (*E,F*) magnetic resonance imaging examination. Intraoperative images showing (*G*) synovitis, (*H*) lesion tissue after curettage, (*I*) radiographic examination 1 day postoperatively, and (*J*) the small incision, which had healed 6 weeks postoperatively. The 1-year postoperative examinations included (*K*) radiography and (*L–O*) computed tomography.

the reference standard option for the primary diagnosis. The pathogenesis of a talar cyst remains controversial, although some have supported the valve mechanism of the damaged cartilage (12). Klammer et al (13) reported conservative treatment and close observation were recommended to treat mild symptoms of a small cyst owing to its slow progression. When the talus is extensively destroyed, the absence of timely surgery will increase the risk of pathologic fracture and damage to the articular cartilage, leading to persistent swelling and pain of the subtalar joint and ankle joint. Open curettage and bone grafting can require extensive soft tissue dissection or even different types of malleolar osteotomy to access the lesion (14) and would likely result in a longer postoperative hospitalization time and increased risk of wound complications. Uysal et al (15) recommended debridement and bone grafting through the osteochondral lesion; however, this can result in further increasing the risk of iatrogenic cartilage injury.

Ankle arthroscopy, which could reduce surgical trauma and offer a clear view, has become more and more popular in recent years (16–18). The arthroscopic method for treatment of talar cysts has also been given increasing attention (19–22). Ogut et al (8) reported good outcomes for posterior talar cysts with and without flexor hallucis longus tendinitis, symptomatic triangular bone, and pigmented villonodular synovitis using hindfoot endoscopy. However, the posterior approach will encounter complex anatomic structures, and the instruments will inevitably damage the partial articular cartilage when the cyst is revealed (15). Although many methods available, such as

Table
Patient data

Pt. No.	Sex	Age (y)	Affected Extremity	Concomitant Disease	Complications	Implantation	AOFAS Ankle-Hindfoot Scale Score	
							Preoperatively	Postoperatively
1	Male	57	Left	Diabetes	None	Autogenous iliac bone graft	68	98
2	Female	59	Left	Localized pigmented villonodular synovitis	None	Autogenous iliac bone graft	48	86
3	Female	41	Right	None	None	Allogeneic bone graft	64	86
4	Male	48	Right	Diabetes; cartilage injury	None	Allogeneic bone graft	68	88
5	Female	62	Left	None	None	Allogeneic bone graft	64	88
6	Female	39	Right	Cartilage injury	None	Allogeneic bone graft	68	88
7	Male	37	Left	None	None	Allogeneic bone graft	78	100
Mean	NA	49	NA	NA	NA	NA	65.43 ± 3.40	90.57 ± 2.21

Abbreviations: AOFAS, American Orthopaedic Foot and Ankle Society; NA, not applicable; Pt. No., patient number.
Paired t test was performed in 2 groups ($t = 10.05$; $p < .01$).

micro-fractures and osteochondral grafts to treating articular cartilage defects, these technologies still have significant deficiencies. In the anatomic structure of the talus, only the talar neck is not covered with articular cartilage. Thus, in theory, manipulation through this area will minimize damage to the articular cartilage.

From on our experience with the 7 presented patients, we believe that the establishment of the bony canal of the talar neck under arthroscopic guidance can achieve effective debridement and bone grafting with satisfactory short-term follow-up results. However, the present study had some limitations, including the small sample size, short follow-up period, and lack of a control group. However, these limitations could not be overcome owing to the rareness of talar cysts. In the future, multicenter studies could be used to compensate for these deficiencies.

The approach we have described provides the following significant advantages: (1) avoidance of injury to articular cartilage; (2) avoidance of damage to the adjacent ligament tissue, peripheral blood vessel, and nerves; (3) convenience for treating the cyst, especially those located at the anterior ankle; and (4) shorter postoperative hospitalization time and less morbidity.

In conclusion, arthroscopically assisted anterior debridement with autologous or allograft bone graft is an effective treatment of symptomatic large talar bone cysts. It is easy to operate, less traumatic, and has no significant influence on the structure of the articular cartilage and ligaments.

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Supplementary Material

Supplementary material associated with this article can be found in the online version at www.jfas.org (https://doi.org/10.1053/j.jfas.2018.03.028).

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