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Musculoskeletal

Talar insufficiency fracture complicating ankle cheilectomy

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ABSTRACT

Ankle cheilectomy as surgical treatment for anterior ankle impingement has high rates of procedural success and low rates of complications when performed before the onset of significant osteoarthritis. We present 3 patients who developed insufficiency fractures of the talar neck following cheilectomy for anterior ankle impingement. Due to the high risk of avascular necrosis associated with displaced talar neck fractures, the recognition of talar insufficiency fractures by the radiologist can aid in the timely diagnosis and initiation of intervention. Because radiographic findings of stress fractures often require weeks to manifest, maintaining a high index of suspicion in the postcheilectomy setting allows the radiologist to suggest appropriate further imaging when appropriate.

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Introduction

Anterior ankle cheilectomy is a surgical procedure in which osteophytes are resected from the anterior margin of the tibiotalar joint for the treatment of anterior ankle impingement syndrome refractory to conservative management. Cheilectomies may proceed via an open or arthroscopic approach, and high rates of success have been reported for both approaches when surgery is performed before significant osteoarthritis has occurred [1,2]. Low complication rates are reported for ankle cheilectomy, and we were unable to find previous published cases of talar insufficiency fractures as complications of ankle cheilectomy. In this report, we present 3 patients who underwent ankle cheilectomies for anterior ankle impingement syndrome and subsequently developed talar

neck insufficiency fractures within 4-6 weeks after the initial surgery.

Cases

Case 1

A 45-year-old woman with a history of a previous gastrocnemius slide and Lapidus surgeries 1 year ago initially presented with symptoms of right anterior ankle impingement. The preoperative radiograph demonstrated a mild bony prominence at the dorsal talar neck (Fig. 1). The patient subsequently underwent an open right ankle anterior talar cheilectomy and hardware removal. After surgery, the patient was placed in a pneumatic walking boot with instructions to increase weight

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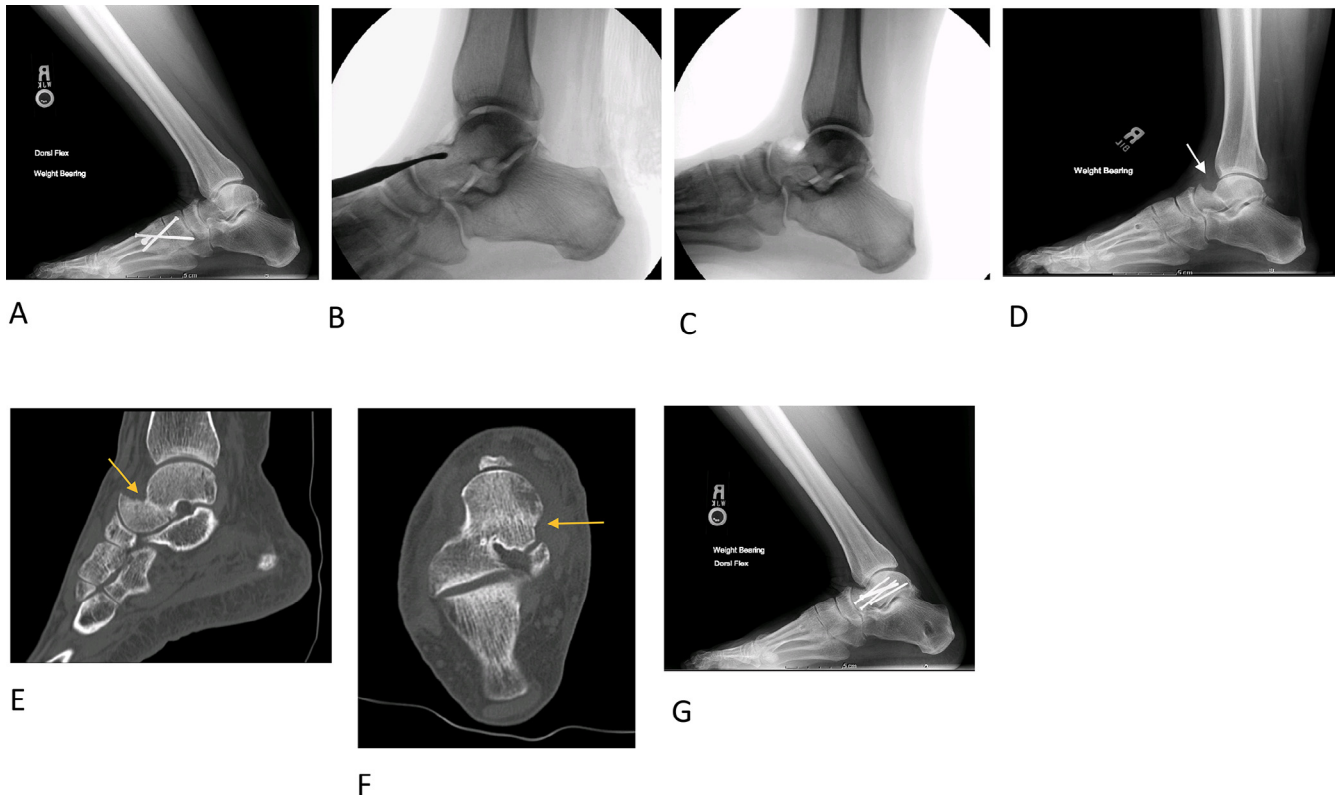


Fig. 1 – A 45-year-old woman with right ankle cheilectomy complicated by a talar neck insufficiency fracture. (A) The preoperative lateral radiograph of the ankle in dorsiflexion demonstrates surgical screws transfixing the first tarsometatarsal joints and the first 2 metatarsals from a prior Lapidus procedure for hallux valgus. There is no radiographic evidence of motion restriction. The patient subsequently underwent open ankle cheilectomy based on a clinical diagnosis of anterior ankle impingement and hardware removal (see the 2 intraoperative fluoroscopic images in B and C). (D) Lateral view of the radiograph of the right ankle 6 weeks after surgery demonstrates a sclerotic line below the talar cheilectomy site, concerning for a fracture. This was confirmed by computed tomography with sagittal (E) and axial (F) images demonstrating a sclerotic line at the talar neck extending from the site of prior talar cheilectomy to the middle facet of the subtalar joint, consistent with a subacute talar neck insufficiency fracture (arrows). The patient subsequently underwent open reduction and internal fixation of the talar neck fracture (G). In both E & F, the arrows are pointing to the sclerotic line at talar neck.

bearing and was weaned off the boot by week 3. During her clinical visit approximately 6 weeks after surgery, the patient complained of a generalized aching discomfort in the anterior aspect of the ankle. Radiography performed on the same day demonstrated linear sclerosis at the talar neck, concerning for a minimally displaced talar neck fracture, which was new compared with the prior radiography. Computed tomography (CT) was performed for further evaluation, which confirmed the minimally displaced fracture extending from the cheilectomy site to the middle facet of the subtalar joint. The patient subsequently underwent open reduction internal fixation (ORIF) of the left talar neck fracture with calcaneal bone graft.

Case 2

A 45-year-old man with a history of bilateral gastrocnemius slide surgeries for gastrocnemius equinus presented with symptoms of left anterior ankle impingement (Fig. 2). Preoperative radiographs demonstrated anterior tibiotalar osteophytosis

and a bony prominence at the dorsal talar neck. The patient subsequently underwent left ankle cheilectomy. After surgery, the patient developed increased pain at the anterior ankle after initiating a more forceful ambulation in a boot. During the follow-up appointment 4 weeks after the initial surgery, the radiograph demonstrated a fracture through the talar neck, which was confirmed by CT performed on the same day. The patient subsequently underwent ORIF of the left talar neck fracture with calcaneal bone graft.

Case 3

A 55-year-old woman presented with symptoms of anterior ankle impingement including anterior ankle pain (Fig. 3). The preoperative radiograph demonstrated tibiotalar osteoarthritis and osteophytosis of the talar neck. The patient underwent right ankle cheilectomy. At the 6-week postoperative visit, the patient complained of 10/10 pain, worse with progressive weight bearing. The radiograph on the same day demonstrated a sclerotic line at the talar neck, concerning for a minimally displaced

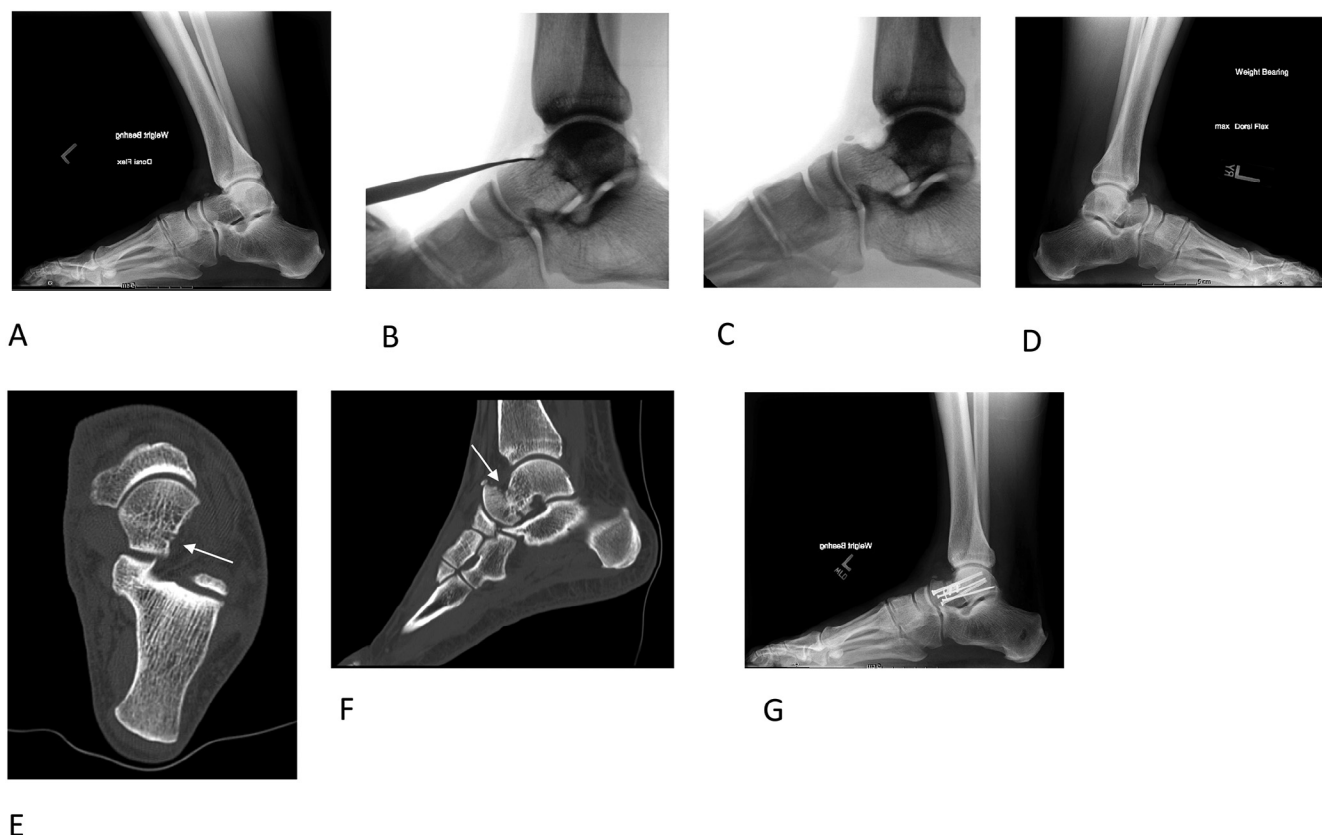


Fig. 2 – A 45-year-old man with cheilectomy complicated by a talar neck insufficiency fracture. (A) The lateral radiograph of the ankle in dorsiflexion demonstrates tibiotalar osteoarthritis with osteophytosis at the talar neck. There is no significant motion restriction with dorsiflexion. The patient subsequently underwent ankle cheilectomy with a removal of the osteophyte at the talar neck, demonstrated by the 2 intraoperative fluoroscopic images (B and C). Four weeks after the ankle cheilectomy, a lateral radiograph of the ankle in dorsiflexion (D) demonstrates a fracture through the neck of the talus. This was confirmed by computed tomography with axial (E) and sagittal (F) images demonstrating a fracture through the talar neck extending from the cheilectomy site to the middle facet of the subtalar joint (arrows). The patient subsequently underwent open reduction and internal fixation of the talar neck (G).

talar neck fracture. No further imaging was obtained. The patient was placed in a controlled ankle movement boot. Subsequent radiographs demonstrated healing of the talar neck fracture without complications.

Discussion

In this case report, we present 3 patients who underwent open ankle cheilectomies for anterior ankle impingement syndrome who subsequently developed talar neck insufficiency fractures during the initial stage of increased weight bearing between 4 and 6 weeks after the initial surgery. To our knowledge, there are no previously published cases of talar neck insufficiency fractures following ankle cheilectomy.

Impingement occurs when there is an abnormal contact of structures, resulting in pain, discomfort, and motion restriction. Ankle impingement encompasses a number of syndromes and is categorized according to its anatomic relationship to the tibiotalar joint [3]. In all 3 of our cases, the patients suffered from anterior impingement syndrome, in which damage to the

anterior tibiotalar cartilage rim results in osteophyte formation and scar tissue proliferation along the anterior joint margin. Anterior impingement classically occurs in patients who sustain a repetitive microtrauma from forced plantar and dorsiflexion, such as in ballet dancers and soccer players. Initial conservative management of anterior ankle impingement includes NSAIDs, physical therapy, bracing, shoe modification, and local corticosteroid injection [2]. Persistent cases may require open or arthroscopic cheilectomy, which involves debridement of the impinging bone or soft tissue. For the open surgical approach, favorable clinical outcomes have been reported as long as surgery is performed before the onset of osteoarthritis, with satisfactory symptom control achieved in 88%-92% of the patients [1,4]. Reported complications for open surgery include cutaneous nerve entrapment, wound dehiscence, tendon injury, and formation of a hypertrophic scar tissue. Good outcomes have also been described for arthroscopic cheilectomy in a systemic review by Zwiers and colleagues [2] with an overall complication rate of 5.1% over 19 included studies and 905 total patients. The most commonly reported complications were mild nerve symptoms and infection, and no cases of insufficiency fracture were

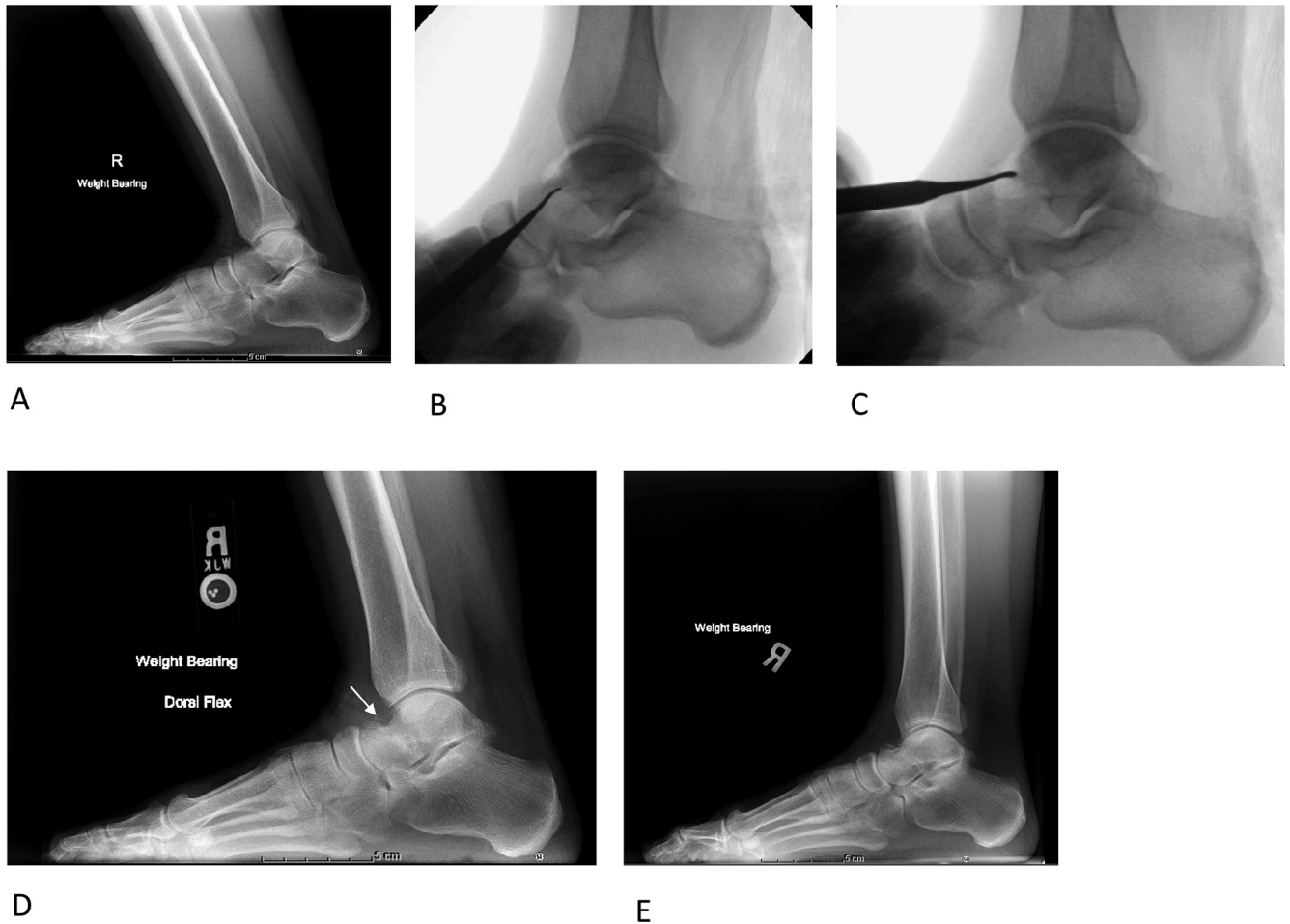


Fig. 3 – A 55-year-old woman with cheilectomy complicated by a talar neck insufficiency fracture. The preoperative lateral ankle radiograph in dorsiflexion (A) demonstrates tibiotalar osteoarthritis and osteophytosis of the talar neck. The patient subsequently underwent cheilectomy of the talar neck with the intraoperative fluoroscopic images (B and C) demonstrating the resection of the osteophyte at the dorsal aspect of the talar neck. Six weeks after the ankle cheilectomy, a lateral foot radiograph in dorsiflexion (D) demonstrates a sclerotic line at the talar neck (arrow), concerning for a fracture. The patient was subsequently placed in a controlled ankle movement boot. Lateral view of the foot radiograph 10 months later (E) demonstrates a decreased conspicuity of the fracture line, consistent with interval healing.

reported in this systematic review. In all 3 of our cases, cheilectomy was performed using an open approach, which likely reflects a combination of surgeon preference and anticipated scope of debridement, and talar insufficiency fracture was the only complication.

Talar fractures account for approximately 3% of all foot fractures [5], and the talar neck is the most common site within the talus [6], accounting for up to 50% of fractures [7]. Typically the result of high-energy trauma [8], it is an important fracture to recognize due to its associated complications. In a systematic review of 102 traumatic talar neck fractures at a level 1 trauma center, Vallier and colleagues reported a high rate of postoperative complications [9]. Among 39 patients who underwent ORIF for talar neck fracture in Vallier and colleagues' study, 49% developed osteonecrosis and 54% developed post-traumatic arthritis. The timing of ORIF after injury was not associated with the rate of complications, although the rate of osteonecrosis did correlate the most with the degree of dislocation. In another retrospective study of 50 patients with talar

fractures by Stake and colleagues, post-traumatic osteoarthritis and avascular necrosis developed in 80% and 79% of the patients, respectively [10]. In all 3 of our cases, the fractures were minimally displaced and there were no complications such as avascular necrosis after ORIF.

Stress fractures of the talar neck are far less common than acute traumatic fractures. Although tarsal stress fractures are common overall, the navicular and the calcaneus account for nearly all tarsal stress fractures [11]. Fatigue fractures of the talar neck, in which abnormal stresses are placed on normal bone, have specifically been reported in runners and in ballet dancers [12,13]. Reports of talar neck insufficiency fractures are rare in the literature but have been shown to occur in the setting of osteoporosis and rheumatoid arthritis [14,15]. None of our patients had osteoporosis or other systemic bone diseases.

Similar to imaging of other insufficiency fractures, radiography is almost always the first modality employed, although sensitivity is limited and the test is often more useful for ruling out alternative pathologies. If no fracture line is visible, scle-

rosis, periosteal reaction, and cortical thickening are secondary signs that take weeks after the symptom onset to manifest [16]. Negative radiography should therefore prompt further workup when clinical suspicion is high. Magnetic resonance imaging without contrast is the most sensitive and specific modality for insufficiency fracture and is the study of choice when the radiography result is negative [17]. CT and technetium-99m scintigraphy are adjunctive modalities that may provide complementary information or may be used in patients for whom magnetic resonance imaging is contraindicated. In all 3 of our patients, talar neck stress fractures were visible on plain radiography, and CT was used for preoperative planning purposes in 2 of the 3 patients.

In summary, we present 3 cases of talar neck insufficiency fractures as a complication of ankle cheilectomy. Due to the high risk of further complications associated with talar neck fracture, such as avascular necrosis, the radiologist should promptly recognize this rare but important cause of ankle pain. Awareness of this entity in the post-cheilectomy setting allows the radiologist to suggest appropriate further workup when the index of suspicion is high and plain radiography is negative, which is common early in the course of disease.

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