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Original Research

Takedown of Ankle Arthrodesis With Insufficient Fibula: Surgical Technique and Intermediate-Term Follow-Up

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ABSTRACT

Conversion of ankle arthrodesis to total ankle arthroplasty has recently gained popularity. However, technical challenges are present when treating patients without a sufficient fibular buttress. We describe a technique for restoration of an adequate fibular buttress using an iliac crest bone graft or malleolar relocation. The results of 10 patients with an average follow-up period of 56 (range 24 to 123) months are presented. Of the 10 patients, 3 underwent tricortical iliac bone augmentation of the fibula, 4 underwent repositioning of the remnant fibula, and in 3, the in situ fibula was used. The average interval from fusion to takedown was 15.1 (range 5 to 35) years, and the average age at takedown was 52.8 (range 33 to 75) years. The average improvement in the American Orthopaedic Foot and Ankle Society Ankle-Hindfoot scale and Buechel-Pappas scale scores was 35.8 (range 30 to 46) and 34 (range 25 to 42), respectively. Three patients underwent a total of 7 subsequent operations related to the ankle implant. Only 1 of the patients had any residual frontal plane deformity. None of the patients exhibited any component subsidence; however, 2 patients experienced asymptomatic lateral talar component overgrowth. The improvement in the clinical scores in this group of patients suggests that takedown of an ankle arthrodesis with an insufficient fibula is a viable option to improve function. Various techniques to restore the lateral buttress can be used even with complete absence of the distal fibula.

Ankle arthrodesis was long considered the reference standard surgical treatment of end-stage ankle arthritis. It provides good short-term outcomes regarding pain relief; however, intermediate- and long-term follow-up data have revealed decreasing patient function and satisfaction and the development of adjacent joint arthrosis (1–6). It has been shown that patient satisfaction decreases as the interval from fusion increases (5). As the incidence of adjacent joint arthrosis increases and symptoms can no longer be managed non-operatively, patients are left with the choices of additional arthrodesis, below-the-knee amputation, or takedown of the fusion. The functional outcomes of pantalar arthrodesis are not favorable (7). Physical impairments include difficulties with prolonged walking, climbing a hill, driving a car, and riding a bicycle and an inability to participate in most sports (8,9). Although amputation is effective in eliminating symptoms and might improve the patients' activities of daily living, it is poorly accepted by patients (10,11).

The lateral transfibular approach for ankle fusion has been a widely used technique in recent years because of the easy access to the articular surfaces, the presence of a healthy soft tissue envelope, and increased stability when the fibula is used as a strut graft (12–15). Some investigators have advocated complete removal of the distal fibula; however, most have suggested decortication of the medial one third to one half of the bone (12–15). Volumetric depletion of the distal fibula, coupled with decortication of the lateral distal tibia, reduces the width of the fusion mass and, cosmetically, is well-accepted by patients (14).

Takedown of an ankle arthrodesis to mitigate symptoms due to adjacent joint arthrosis, dampen suprastructural effects, and normalize gait is becoming more accepted. However, in the setting of an absent distal fibula, the technique has been contraindicated (16–18). Loss of the lateral buttress occurs, with a high rate of valgus failure of the implants when attempted in the setting of previous fibulectomy (16–18). Specifically, progressive lateral talar tilt and translation has been reported, despite good alignment present at

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surgery (17,19). Even in the setting of partial fibula preservation, valgus failure still ensues (17). Moreover, the reduced width of the fusion mass often precludes the insertion of standard components. Salvage has been reported in these valgus failure cases using an allograft fibula or a sliding fibular graft (17,18). Medialization and downsizing of the tibial component has also been used to help prevent valgus implant failure in the setting of an absent fibula (16,19).

To avoid pantalar arthrodesis or below-the-knee amputation in severely impaired patients with an insufficient fibula, we have performed a series of fusion takedowns by reestablishing a lateral bony buttress. The technique involves re-creation of the fibular buttress via a large, structural iliac crest autograft or relocation and grafting of the remnant fibula. The purpose of the present study was to describe the surgical strategy technique and report the intermediate-term results for a series of 10 patients with takedown of ankle fusion with an insufficient fibula.

Surgical Technique

In patients in whom the distal fibula has been excised and discarded, we perform a 2-stage reconstruction. The first stage involves reestablishment of a sturdy lateral bony buttress to contain the total ankle prosthesis and prevent valgus drift after implantation. The tricortical iliac crest autograft is well suited because the circumferential volume of the crest approximates the anteroposterior dimensions of the native fibula.

The ipsilateral iliac crest is harvested in standard fashion such that both the inner and outer tables of the ilium are retained. The graft must be long enough to simulate the lateral malleolus and allow for proximal adherence to the lateral aspect of the tibia. In most cases, 6 to 8 cm of crest will be sufficient (Fig. 1*A* and *B*). The required depth of the graft should be approximately 3 cm.

The lateral aspect of the ankle fusion mass is exposed through a vertical lateral incision. The peroneal tendons are reflected inferiorly, and the entire lateral aspect of the tibiotalar fusion mass is exposed. Bladed retractors are placed anteriorly and posteriorly to protect the soft tissues. The lateral aspect of the talus and tibia are decorticated down to a raw bleeding cancellous bone substrate slightly anterior to the position of the native fibula. The harvested iliac crest autograft is oriented longitudinally and positioned such that the raw exposed cancellous bone of the crest opposes the decorticated fusion mass (Fig. 1*C* and *D*). The depth of the autograft can be reduced if necessary such that the skin can be closed after fixation.

Two or three fully threaded 4.5-mm cortical screws are inserted from laterally to medially to secure the graft to the fusion mass. The screws should not be lagged to avoid crushing of the delicate superior cortex of the iliac crest. The heads of the screws should be countersunk very slightly to facilitate retrieval at implantation (Fig. 1*E* and *F*). Any other previously place hardware should be removed at this time to facilitate later placement of the prosthesis. Any additional procedures such as subtalar or talonavicular fusion are also performed at this time.

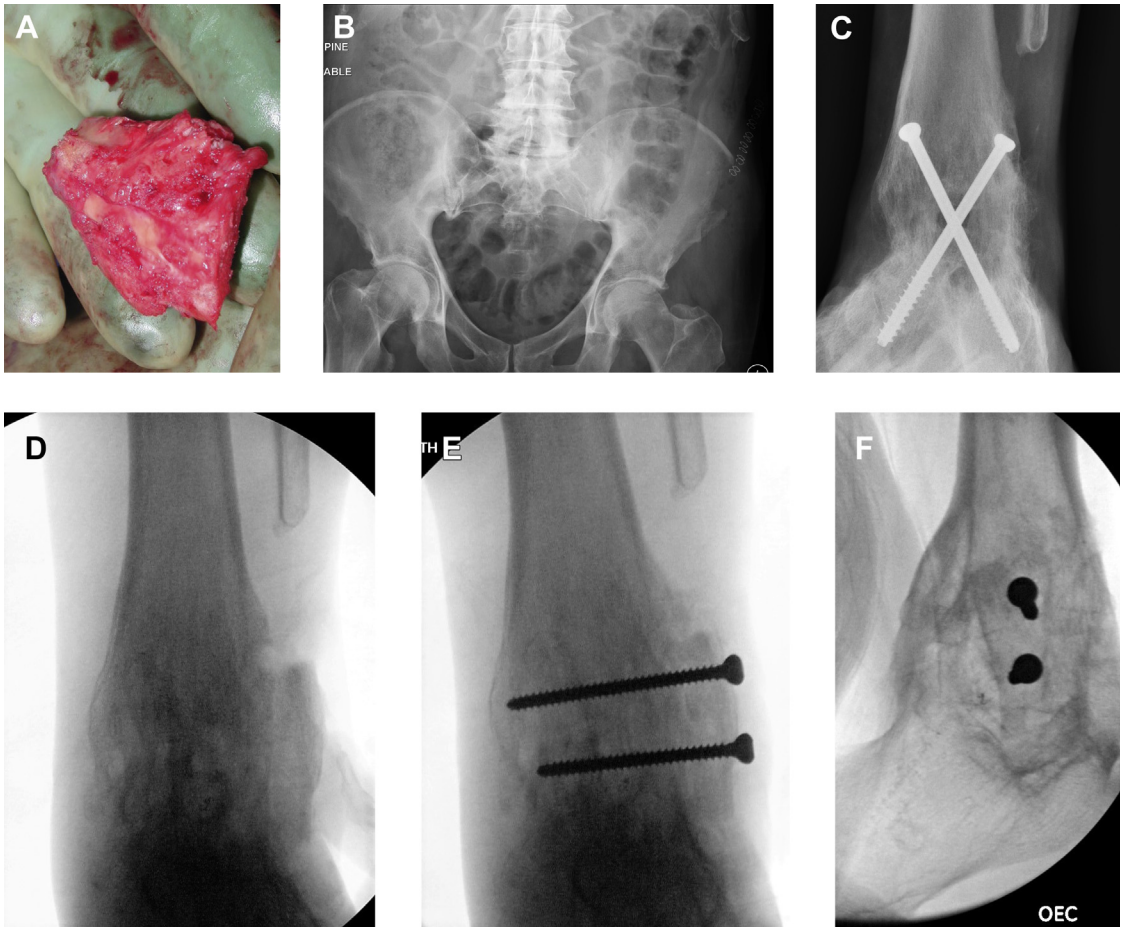

Fig. 1. (*A*) Harvested iliac bone graft. (*B*) Anteroposterior radiograph of pelvis showing defect after harvest. (*C*) Preoperative anteroposterior radiograph of ankle showing complete absence of distal fibula. (*D*) Remodeled iliac crest placed against lateral aspect of tibiotalar fusion mass. (*E*) Fixation of graft. (*F*) Lateral postoperative radiograph showing the graft extending to the lateral process of the talus.