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Lagged Syndesmotic Fixation: Our Clinical Experience

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A R T I C L E I N F O

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A B S T R A C T

Ankle fractures are very common, and although algorithms are in place for osseous management, consensus has not been reached regarding treatment of associated ligamentous injuries. Although tibiofibular syndesmotic stabilization can be done using different forms of fixation, the biomedical literature has long emphasized the risk of long-term restriction of ankle mobility with the use of lagged transfixation. However, when reduction cannot be maintained with positional fixation, we found that lagging the syndesmotic screw helped to maintain the reduction without causing functional restriction. In this report, we describe our experience with patients who had undergone lagged tibiofibular transfixation and were available for short- to intermediate-term follow-up to assess ankle function. A total of 31 patients (32.63% of 95 consecutive patients) were available at a mean of 34.87 (range 18 to 52) months to complete the American Orthopedic Foot and Ankle Society ankle-hindfoot questionnaire. The mean score was 88.38 (range 42 to 100) points at a mean follow-up interval of 34.87 (range 18 to 52) months. Of 31 patients, 19 had an AOFAS score of 90 points, 9 an AOFAS score of 80 to 89 points, 2 an AOFAS score of 60 to 69 points, and 1 an AOFAS score of <60 points. Because all syndesmotic screws were placed using the lag technique, unrestricted motion compared with the uninjured limb was used as the endpoint. All subjects had unrestricted motion compared with the uninjured limb, refuting the assertion that lagged syndesmotic screw fixation confers more restriction in ankle kinematics than positional syndesmotic fixation.

According to the U.S. National Trauma Center Database (2007 to 2011), ankle fractures accounted for 55.67% of all foot and ankle fractures, and 24.38% of these involved open fractures (1). The concurrent presence of injury to the deep deltoid and syndesmotic ligaments has been shown to further destabilize the ankle mortise, increasing the incidence and importance of operative reduction (2–4). The incidence of syndesmotic injuries in Weber B and C fractures has been reported to be as high as 66%, and improved functional outcome of the ankle joint after anatomic restoration of the unstable mortise has been elucidated (5). The ankle joint functions in a constrained system that tolerates misalignment and instability poorly, the presence of which results in accelerated degeneration of the joint (6). Ligamentous instability of the ankle mortise is addressed with anatomic reduction and fixation with positional syndesmotic screw fixation. Biomechanical studies have noted the physiologic motion present within the syndesmosis, and, as a result, concern for restriction has been pointed to as the prime reason for the use of nonlagged fixation across the syndesmosis (2,7). Despite evidence to the contrary that compression of the syndesmosis is not associated with restriction of ankle motion, the published data have continued to advocate against it (8). We found that in certain instances the reduction achieved with the bone tenaculums could not be maintained with positional fixation intraoperatively. We also found cases of late syndesmotic widening during the postoperative course in which the mortise appeared widened despite no obvious hardware failure. We thus began inserting all screws across the syndesmosis using the lag technique. Based on our prior clinical experience, we found our technique to be associated with the radiographic reduction maintained throughout the postoperative course with no late widening. In addition, we observed no functional loss or subjective complaints in patients who underwent this technique and thus present our outcomes with this technique. We specifically sought to demonstrate that from our clinical experience with this technique. In an effort to objectively evaluate our clinical experience, we reviewed the outcomes of 95 patients on whom we had performed lagged tibiofibular transfixation, and we were able to obtain ankle-related quality of life outcome measurements on 31 (32.63%) of these patients with the American

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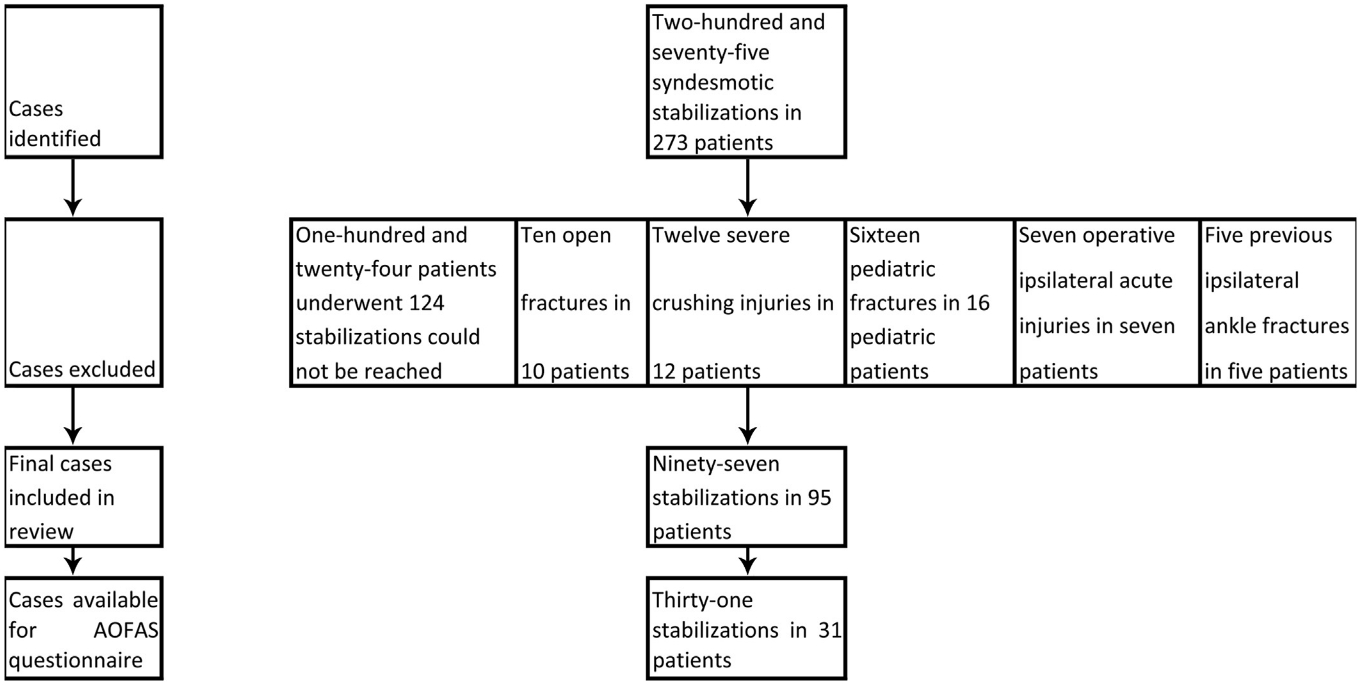

Fig. 1. Patient population of those initially identified and those who did not meet our search criteria.

Academy of Orthopaedic Surgeons (AOFAS) foot and ankle scoring system (9).

Patients and Methods

After receiving approval by the institutional review board, one co-author (T.S.), who was blinded to the results but took no part in patient care, performed a thorough medical record review of all consecutive ankle injuries requiring operative syndesmotic stabilization performed from January 2009 through December 2011 by the primary author (J.J.F.). These cases were identified using the Current Procedural Terminology (American Medical Association, Chicago, IL) code 27829, representing the open treatment of distal tibiofibular joint (syndesmosis). A total of 275 operations potentially eligible (for inclusion in our retrospective cohort) in 273 patients were initially identified using this search criterion. Our inclusion criteria were unstable syndesmotic injuries with or without operative fractures, syndesmotic stabilization only with screws placed using the lag technique, age ≥18 years, the ability to provide consent, closed injuries, and patient availability for evaluation using the AOFAS hindfoot questionnaire. *Unstable syndesmotic injuries* were defined as a tibiofibular clear space >6 mm and a medial clear space >5 mm (10–12). The exclusion criteria included any concurrent injuries beyond the identified ankle injury with the exception of osteochondral lesions identified intraoperatively, open fractures, syndesmotic screws placed using a nonlagged technique, any stabilization performed without screws, patients aged <18 years, patients with documented neuropathy, patients who were nonambulatory, patients lost to follow-up, patients with previous operatively or nonoperatively treated ankle fractures unrelated to the acute or index injury in question, and patients with previous complaints of ankle pain or instability as reported in the history and physical examination findings. Of the initial 275 operations, we excluded 12 (4.4%) patients who had sustained severe crushing high-energy injuries, 16 pediatric fractures (5.8%) in 16 patients, 7 fractures (2.5%) with concomitant fractures to the ipsilateral limb in 7 patients, 5 patients (1.8%) with 5 previous ankle fractures to the ipsilateral limb, and 10 open fractures (3.6%) in 10 patients (13). Four patients (1.4%) requiring 4 operations on the ipsilateral limb for concurrent injuries not involving the ankle joint were also excluded. Two patients requiring reoperation on postoperative day 0 and day 19 because of acute hardware failure, the first resulting from a fall and the second from gross ambulatory noncompliance, were included. These 2 patients, who had undergone 2 operations on the same limb, met our inclusion criteria, resulting in 97 operations in 95 patients. Thus, the total number of evaluated ankles equaled the same number of patients. An additional 124 patients (45%) were lost to follow-up, because they no longer resided at the addresses they had provided, the new residents had no recollection of the individual or how to reach them, and the telephone numbers provided had either been disconnected or assigned to another individual with no knowledge of the patient. The 97 operations (35.3%) in 95 patients of the initial 275 cases were available for medical record review and were included in the present study (Fig. 1). Finally, complications were defined as unplanned surgical intervention after the definitive open reduction and internal fixation.

Repair of the syndesmotic rupture was carried out in standard fashion. The surgical approach involved a lateral incision directly over the distal fibular and one over the medial malleolus when indicated (Fig. 2). In the presence of a concurrent operative posterior malleolar fracture, the standard lateral incision was moved posteriorly and placed halfway between the posterior border of the fibular and lateral border of the Achilles tendon to facilitate identification of the posterior malleolar fracture (Fig. 3). A posterior plafond fracture that extended medially into a medial malleolar fracture was approached posteromedially with a curvilinear J-shaped incision just posterior to the medial malleolus. Syndesmotic stabilization was performed with fully threaded cortical screws placed using the lag technique to 1 full turn above 2-finger tightness until the mortise was symmetric on fluoroscopy (Fig. 4). All intraoperatively identified osteochondral lesions were microfractured with a microfracture awl. None were >15 mm in diameter.

For the purposes of this investigation, we contacted 31 (32.63%) patients to invite them to complete the American Orthopedic Foot and Ankle Society ankle-hindfoot questionnaire. We sought to evaluate the patients from a long-term functional perspective to determine the presence of any impairment that could be attributed to this technique. Of these 95 patients, 31 (32.63%) were available for evaluation using the AOFAS hindfoot clinical rating system and questionnaire. The remaining 64 patients (67.4%) had relocated and could not logistically participate in this portion of the evaluation. We prioritized the patient subjective reports, focusing on the uninjured contralateral limb as our control and previously described anatomic radiographic parameters (10–12).

Postoperative management consisted of immobilization in a well-padded posterior splint with the ankle in neutral alignment. Range of motion exercises were begun when the wounds had "sealed" and the sutures and/or staples had been removed. Serial radiographs were obtained at weeks 2, 6, 10, 16, and 20 postoperatively unless the patient had been discharged from the practice before this time and then bimonthly until discharge if the patient required additional follow-up examinations. Progressive protected weightbearing was initiated when both radiographic and clinical union were present, as demonstrated by the absence of pain, edema, or erythema at the fracture sites.

Results

The mean follow-up period for the 95 patients was 18 (range 10 to 46) months. Of the 95 patients, 55 were male, with a mean age of 49.58 (range 19 to 84) years, and 40 were female, with a mean age of 46.1 (range 19 to 81) years.

Of our 95 patients, 39 (41%) had bimalleolar equivalent fractures, defined by the presence of an isolated fibular fracture with a medial clear space >5 mm, and 19 (20%) had trimalleolar equivalent fractures, defined by the presence of an isolated fibular and posterior malleolar fracture with a medial clear space >5 mm and without fracture of the medial malleolus. Twenty-six patients (27.4%) had trimalleolar