Early Protected Weightbearing in Patients who Underwent Ankle Fracture Open Reduction and Internal Fixation with Syndesmotic Fixation: A Retrospective Case Series

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Statement of Purpose

The purpose of this retrospective review was to determine the morbidity of early protected weightbearing in patients who underwent ankle fracture open reduction internal fixation (ORIF) with screw stabilization of the syndesmosis.

Methodology & Hypothesis

The Kaiser Permanente Northern California Institutional Review Board approved this study. A retrospective review was conducted on consecutive patients who underwent ankle fracture ORIF with syndesmotic stabilization using syndesmotic screw(s), bore weight in a cast or removable walking boot within 15 days after the operation, and had a minimum of 12 months of continuous health plan membership and post-operative follow-up. The inclusion criteria were acute, closed ankle fractures that underwent ORIF. Patients were excluded if they were unable to bear load on the ankle within 15 days after surgery. Medical charts, operative reports, and radiographs were reviewed by two authors not involved in patient care.

- Demographic information included patient age, gender, BMI, current tobacco use and medical comorbidities.
- Operative reports determined fracture pattern, dislocation, posterior malleolus involvement, operative side, the number of screws implanted and cortices purchased for syndesmosis fixation. Fracture pattern was classified based on initial injury films according to the Lauge-Hansen scheme. Time to weightbearing in a short leg cast or removable walking boot and ambulation in regular shoes were recorded. Orthogonal radiographs at 2 weeks, 6 weeks, 12 weeks, 6 months, and 12 months postoperatively were reviewed. Maintenance of correction was determined by evaluating tibiofibular overlap, ankle mortise alignment, and reduction of the medial clear space according to standard methods. Complications and the incidence of hardware removal were also recorded.
- Radiographs were evaluated electronically via digital imaging (Stentor Intelligent Informatics, I-site version 3.3.1, Phillips Electronics; Andover, MA) with measurements obtained by digital calipers.

We hypothesize that early protected weightbearing after ankle fracture ORIF with syndesmotic fixation will not lead to increased complication rates.

Procedures

All ankle fractures were fixed with conventional implants: fully threaded cortical and/or cancellous screws, 1/3 semitubular plates, and tension-banding. Syndesmotic screw size, number, and cortices were determined by the primary surgeon.

Literature Review

Ankle fractures are a common injury, with over 2 million new cases per year in North America (1). Trauma of the distal tibiofibular syndesmosis is present in 23% of all ankle fractures (2). Unstable ankle fractures typically require ORIF with a period of immobilization and non-weightbearing. The conventional standard of post-operative care is cast immobilization of the fracture for 6 weeks with non-weight bearing.

This accepted post-operative protocol is thought to reduce the risk of fracture displacement and wound complications (3-5). Alternatively, early and active mobilization and protected weightbearing assists in prevention of fracture disease, deconditioning, and may promote earlier return to function (3). More recently, studies have examined early weightbearing after ORIF in acute ankle fractures (4,5). We are not aware of any studies examining the morbidity of early cast or boot protected weightbearing after acute ankle fracture ORIF with syndesmotic screw stabilization. Furthermore, the influence of early protected load on patients with posterior malleolar fractures who undergo stabilization of the syndesmosis has not been evaluated.

In a randomized controlled trial of 110 patients by Dehghan et al. (4), a group of patients who underwent acute ankle fracture ORIF with early weightbearing and range of motion were compared to a group who remained non-weightbearing and immobilized. There were 56 patients in the early weightbearing group, who began range of motion exercises and full weightbearing as tolerated in a removable boot at the 2 week postoperative visit. At 6 weeks postoperatively, they were weaned out of the boot and back into shoe gear. Patients in the early weightbearing group reported improved ankle range of motion, ankle function scores, and SF-36 scores. There were no differences between the groups regarding wound complications. No loss of reduction or fixation failure occurred in either group.

Starkweather et al. (5) examined the complications and loss of reduction in 126 patients who bore weight within 15 days after acute ankle fracture ORIF. Patients began weightbearing at an average of 8 days postoperatively. There were 14 total complications (9.5%) which included delay in wound healing, nerve paresthesia and hardware migration. Patients that were 60 years and older had a greater overall complication rate and those who walked on postoperative day 1 had more wound complications. Only 1 patient had a loss in reduction.

Cimino et al. (6) examined the effect of early mobilization and weight bearing with a cast or ankle-foot orthosis in patients who underwent ankle fracture ORIF for unstable ankle fractures. Fifty-one patients were included with a mean follow-up of 8 months. No loss of reduction occurred and there were no significant complications.

Figure 1
Patient Comorbidities

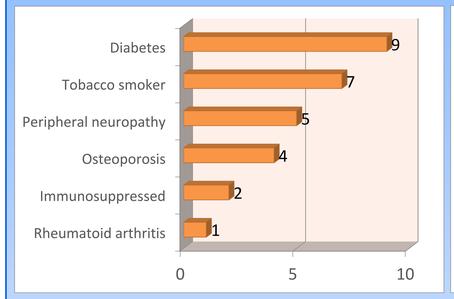

Figure 2
Lauge-Hansen Ankle Fracture Pattern

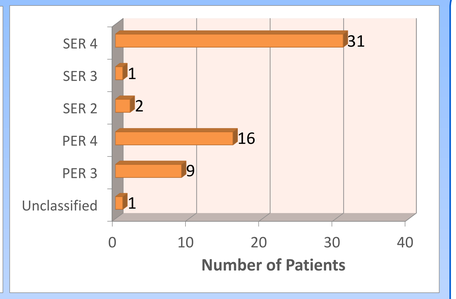

Table 1
Syndesmotic Screw Fixation

Number of Screws	Screw Size	Percentage Removed
1 (N=19)	3.5mm (N=1) 4.0mm (N=17) 4.5mm (N=1)	42% (8/19)
2 (N=33)	4.0mm (N=29) 4.5mm (N=4)	42% (14/33)
3 (N=7)	4.0mm (N=7)	43% (3/7)
4 (N=1)	4.0mm (N=1)	0% (0/1)

Table 2
Postoperative Complications

Complication	Number of Patients	Percentage
Superficial infection	3	5%
Neuritis	2	3.3%
Revision surgery	2	3.3%

Figures 4a, 4b
Injury X-Rays

Figure 5
Postoperative X-Ray

Figures 6a, 6b
Postoperative WB X-Rays

Results

Of the 89 consecutive patients who underwent ORIF with syndesmotic screw stabilization, 60 patients met inclusion criteria.

The cohort consisted of 31 male and 29 female patients. Thirty-two occurred on the left side, and 28 on the right side. The mean age was 46 years (range 15 to 85). Nineteen patients (32%) were age 60 and older. Mean BMI was 30.4 (range 17.6 to 45.2). Average time to weightbearing was 10.3 days (range 1 to 15). Comorbidities are shown in Figure 1. Ankle fracture patterns included supination external rotation and pronation external rotation. The number of patients with each fracture pattern is shown in Figure 2. There were 8 ankle dislocations. Thirty fractures (50%) involved the posterior malleolus. At the first post operative visit 58 patients were transitioned to a short leg walking cast, while 2 were treated with a CAM boot. The number of screws and screw size used for syndesmotic stabilization is shown in Table 1. This table also shows the percentage of syndesmotic screws removed. In total, 25 patients (42%) had hardware removed. Thirteen (52%) of those patients were symptomatic and 12 (48%) were removed secondary to surgeon/patient preference. Postoperative complications are depicted in Table 2. There was a total of 7 complications (11.7%). Four of the seven (57%) complications occurred in patients age 60 and older. One revision was due to a loss of reduction after a fall postoperatively while the other occurred after the patient sustained a new distal tibial fracture within 3 months of original surgery. For the patients who experienced complications, the average time to weightbearing was 10 days. There were no deep vein thromboses or deep infections.

Fracture reduction was maintained on all patients at 12 months after surgery as determined by radiographic evaluation and chart review.

Analysis & Discussion

This retrospective study demonstrates that patients with acute ankle fractures who underwent ORIF with syndesmotic screws are able to bear weight in a short leg cast or boot early in the postoperative period with a low complication rate while maintaining fracture reduction.

While there are multiple studies that evaluate early postoperative weight bearing in ankle fractures, to date there are no prospective or retrospective studies examining early weightbearing in patients who underwent acute ankle fracture ORIF with syndesmotic screw stabilization.

Analysis & Discussion

Prolonged non-weightbearing can be detrimental to patients, particularly the elderly. In some cases, non-weightbearing is simply unrealistic. Early ambulation after ankle fracture surgery helps minimize deconditioning and is inherently appealing to patients. In patients whose health is compromised by comorbidities or advanced age, this protocol holds great benefit.

This study demonstrates low morbidity with early protected load in a cast or boot, including those patients with fracture-dislocations and those with posterior malleolar fractures. The total complication rate was 11.7%, which is similar to prior studies with early weightbearing in ankle fractures without syndesmotic stabilization (4). The most common complications were superficial infection and nerve injury. There was a similar distribution of complications in patients over 60 years and those under 60 years. Discounting 2 patients with loss of reduction after falls who ultimately required revision, ankle reduction was maintained and there was no fixation compromise.

Many surgeons have not embraced early weightbearing postoperatively due to concerns for wound dehiscence, superficial and deep infection, and hardware migration. While some studies evaluating postoperative protocols of ankle fracture ORIF have revealed an increased complication rate with early weightbearing, others have shown no difference in complication rates or loss of reduction and show improved functional outcomes and range of motion (5, 7-8). Cast or boot immobilization minimizes the potentially detrimental rotational forces that could compromise ankle stability after the operation. This is evidenced by maintenance of reduction throughout the postoperative period in all but 2 patients, where reduction was lost due to falls.

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