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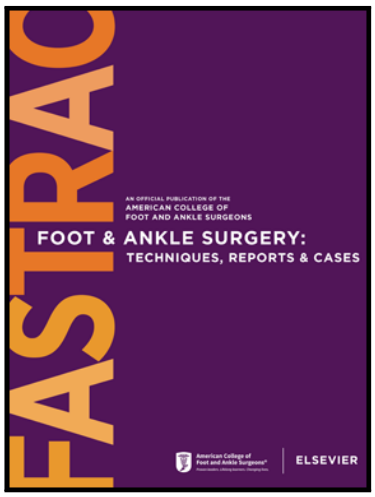

Early Weightbearing After Dynamic Stabilization of the Ankle Syndesmosis: A Retrospective Case Series

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Case Reports and Series

Early Weightbearing After Dynamic Stabilization of the Ankle Syndesmosis: A Retrospective Case Series

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Abstract

Ankle fractures with syndesmosis disruption present a challenge for foot and ankle surgeons. After open reduction internal fixation (ORIF), conventional postoperative treatment requires a period of immobilization and non-weightbearing, which if prolonged, can be detrimental to patients. The purpose of this case series is to present outcomes of early weightbearing after ankle fracture ORIF requiring syndesmosis stabilization using a dynamic fixation device. Thirty consecutive patients from August 2019 to July 2021 were included.

Medical records and radiographs were reviewed to determine patient and surgical characteristics, postoperative complications, and reduction maintenance. Surgical treatment consisted of ORIF of malleolar fractures and stabilization of the syndesmosis with a Tightrope® XP (Arthrex Inc., Naples, FL). The mean age was 49 years. Mean BMI was 28.8. There were 24 supination-external rotation and 6 pronation-external rotation injuries. Twenty-six patients had syndesmosis fixation with a single implant, and 4 patients had syndesmosis fixation with two implants. The average time to weightbearing in a walking boot was 9.7 days. Average follow up was 13 months. One patient developed early postoperative saphenous neuritis, which resolved with conservative measures. There were no infections, malunions or nonunions, and all patients maintained fracture and syndesmosis reduction. In conclusion, the Tightrope® XP provides a safe and effective method for treatment of ankle fractures with syndesmosis disruption and supports early weightbearing after ORIF in an active healthy population. The results of this study are comparable to prior studies and show there is a low risk of complication and need for routine removal of implants.

Keywords

ankle fracture, dynamic fixation, flexible fixation, syndesmosis

Introduction:

Ankle fractures are common injuries encountered by foot and ankle surgeons. Many fractures can be treated non operatively. However, unstable ankle fractures with syndesmotic disruption require operative treatment (1). Syndesmotic disruption has been reported to occur in 10-23% of ankle injuries and leads to poorer outcomes and risk of early arthritis (1-5). Traditionally, after surgical treatment, patients have been immobilized for several weeks to months in a cast or boot with a prolonged period of non-weightbearing. Extended immobilization and nonweight bearing protocols can potentially reduce risk of complications,

but can lead to stiffness, decreased range of motion and strength. While this practice may be necessary in certain cases, early weightbearing and mobilization can be beneficial for patients (6-7). Several studies have identified the benefits of early weightbearing and/or range of motion in ankle fracture ORIF with similar complication rates (8-18)

Traditionally, syndesmosis fixation has been achieved with screws, although these were earlier iterations of dynamic fixation devices. Several reports have noted screw breakage, loosening, loss of reduction, pain, and additional surgery for screw removal (19-25). Screw removal has been reported as high as 42.4% (26). While patients with broken or loose syndesmotic screws have been reported to have similar results to those with intact screws, Schepers et al. found a complication rate of 22.4% with screw removal (27-28). In addition, a static screw does not allow for physiologic motion required for the dynamic function of the syndesmosis (21, 29-30). Due to these potential complications, flexible, or dynamic fixation devices have more recently been developed. The design of these devices is to allow physiologic motion while maintaining reduction, decrease hardware breakage and loosening, and decrease the risk of an additional surgery for hardware removal. Many reports have demonstrated these benefits of dynamic fixation of the syndesmosis (31-39).

To date, there is no study directly examining early weightbearing in ankle fractures with dynamic syndesmosis fixation. The purpose of this study is to report the results of early weightbearing in ankle fracture ORIF and syndesmosis repair using the Tightrope® XP (Arthrex Inc., Naples, FL). The Tightrope® XP is a flexible, non-absorbable, knotless suture that is secured by two metal suture buttons.

Methods:

The medical charts were reviewed of consecutive patients who sustained a closed ankle fracture requiring ORIF performed by the senior author (M.D.D.) from August 2019 to July 2021. Inclusion criteria were the use of syndesmosis fixation with a Tightrope® XP device and weightbearing in a walking boot within 14 days after the operation. A minimum of 6 months of postoperative follow-up was required for inclusion. The exclusion criteria were patients with poorly controlled diabetes and peripheral neuropathy, posterior malleolar fixation, and minimally invasive fixation techniques.

All surgeries were performed with the patient in the supine position. All had general anesthesia administered. A well-padded thigh tourniquet was placed on the ipsilateral thigh. The surgical technique for internal fixation was dictated by the fracture pattern and consisted of a lateral neutralization or bridge plate fixated with cortical and cancellous screws for the fibular fracture. Fractures of the medial malleolus were fixated with two screws, either fully threaded cortical or partially threaded cannulated. The fibula fracture was fixated first, followed by the medial malleolus if indicated. After fracture fixation, an external rotation stress test and hook test were performed to evaluate instability/disruption of the syndesmosis under fluoroscopy. If there was decreased tibiofibular overlap or excessive widening of the medial clear space, it was determined that syndesmotic fixation was needed. In addition, direct visualization was performed, as described by Miller et al. (40). The syndesmosis was manually reduced and pinned, which was confirmed with intraoperative fluoroscopy. A reduction clamp was not used in any cases. Syndesmosis stabilization consisted of one or two Tightrope® XP devices (Figures 1A and B). The number of Tightropes was at surgeon discretion. None of the posterior malleolus fractures were fixated. At the first postoperative visit, the patients were placed in a walking boot in neutral position and instructed to bear full weight. Some patients were placed

into a walking boot immediately after surgery and were allowed to bear full weight starting on the day of surgery. All patients began sagittal plane ankle range of motion exercises after the first postoperative visit. At 6 weeks post operatively, patients were advanced to a lace up ankle brace. Patients began formal physical therapy at 6 weeks post operatively.

Medical charts, operative reports, and radiographs were reviewed by the senior author (M.D.D.). Demographic characteristics including patient age, sex, body mass index, current tobacco use, and comorbidities were recorded. Operative reports and the initial injury radiographs were evaluated to determine the operative side, fracture pattern, and presence of dislocation at time of injury. The fracture pattern was classified based on initial injury films according to the Lauge-Hansen classification scheme (41). Orthogonal non-weightbearing radiographs were taken immediately postoperatively and compared with the weightbearing radiographs taken at 6 weeks, 12 weeks, 3 months, and 6 months. If patients were still seen by their surgeon after this period, these radiographs were evaluated as well. Maintenance of correction was determined by evaluating tibiofibular overlap, ankle mortise congruence, and reduction of the medial clear space according to standard methods (42-47). The radiographic parameters were measured with digital calipers (Stentor Intelligent Informatics, I-site version 3.3.1, Phillips Electronics, Andover, MA).

Medical charts were reviewed to determine the time to weightbearing in a walking boot and the time ambulation began in regular shoes. Postoperative complications were recorded including wound dehiscence, superficial or deep infection, neuritis, and loss of reduction.

Results:

Thirty patients met the inclusion criteria. Patient demographics are shown in Table 1. There were 20 male (66.6%) and 10 female (33.3%) patients. Twenty-two occurred on the left side (73.3%), and 8 on the right side (26.7%). The mean age was 49 years (range 19 to 69). BMI was 28.8 (range 15.4 to 41.0). Average follow up was 12.5 months (range 12-13 months).

The injury characteristics were stratified by fracture pattern shown in Table 2. Ankle fracture patterns included supination external rotation (SER) and pronation external rotation (PER). There were 24 SER, which were fixated with a lag screw and neutralization plate. There were 6 PER injuries, fixated with a lag screw if the fracture pattern allowed, followed by a neutralization plate (Figure 1-2). The other PER injuries were fixated with a buttress or bridge plate technique. There were no Maisonneuve fractures. There were 8 (26.6%) ankle fracture dislocations. The posterior malleolus was fractured in 12 (40.0%) of the cases. Twenty-six patients had syndesmosis fixation with a single implant, and 4 patients had syndesmosis fixation with two implants. Post operatively, 22 patients were placed into a non-weightbearing plaster splint until the first post-operative visit. Eight patients were placed into a walking boot and were allowed to bear weight the day of surgery. Those 8 patients had an SER injury with an isolated fibula fracture and intraoperative testing confirming syndesmosis instability. The average time to weightbearing in a walking boot was 9.7 days (range 0-14).

One patient developed early saphenous neuritis, which resolved with conservative measurers. There were no cases of malunion, nonunion, or infection. Correction was maintained in all cases. There were no deep vein thromboses. There were no cases of medial clear space or syndesmosis widening. No patients required revision surgery. Four patients returned to the operating room for removal of symptomatic lateral hardware after 3 months.

Discussion:

Ankle fractures with syndesmosis disruption are difficult injuries, and accurate reduction and stabilization is important to improve long term outcomes and decrease the risk of arthritis. It has been reported that 10% of all ankle injuries and 23% of all ankle fractures include the syndesmosis (1-2). These injuries typically occur with external rotation mechanisms.

Commonly, patients with these ankle fractures and syndesmosis disruption were immobilized and non-weightbearing for 1-2 months, likely to prevent loss of reduction and decrease risk of any other complication. For young, active patients, as well as elderly patients, long periods of non-weightbearing can be detrimental (14, 48). Early weightbearing after ankle fracture with syndesmosis stabilization can decrease deconditioning and improve early outcomes (8-18). The results of this study demonstrate that patients with unstable ankle fractures and syndesmosis disruption can be fully weightbearing within 14 days after ankle fracture ORIF without an increased complication risk or routine need for further surgery. Several patients were also allowed to bear weight immediately without any complications. There was only 1 case of saphenous neuritis which resolved with conservative measures. No other complications or loss of reduction occurred in our case series. Four patients had removal of hardware, which was attributed to a prominent lateral plate that caused pain. The results in this study are comparable to several other studies that involve early weightbearing in cases with and without involvement of the syndesmosis (11-16, 18). It should also be noted that loss of syndesmosis integrity is not increased with early weightbearing using the Tightrope® XP.

The standard treatment of syndesmosis injuries is still not well defined. Traditionally, screws have been used purchasing 3 or 4 cortices. Screw size, number, and cortices purchased varies between surgeons. It has been noted that syndesmosis malreduction is as high as 52%

using traditional screws, which leads to worse functional outcomes (49-50). Improving reduction in these cases requires an additional surgery for screw removal. More recently, dynamic fixation devices have been described in the literature with good functional outcomes (31-39). Many of these studies have discussed the benefits of dynamic fixation including the decreased need for removal, no hardware breakage, physiologic healing of the syndesmosis, improved patient satisfaction and maintenance of reduction (31-39). Several studies have demonstrated that there is a lower risk of malreduction using these implants. Furthermore, for surgeons using reduction clamps prior to syndesmosis fixation, dynamic devices allow some natural motion and can aid in reducing syndesmotic malreduction (51). Two recent studies have demonstrated better reduction accuracy using dynamic devices (35, 39). Other studies have reported some complications including deep infection and the need for the removal due to knot irritation, although these were earlier devices (33-34). The Tightrope XP® is a knotless system, which eliminates knot irritation. We only had one case of saphenous which resolved early on. However, it has been reported that this is a possible complication in 10% of patients (52).

There are several limitations of this study that are inherent to the retrospective nature. It was a retrospective analysis with a small cohort without randomization. A comparison group with syndesmotic screws would be valuable. There was no functional outcome scoring system. In addition, we were not able to confirm the extent of weightbearing in the walking boot and it is possible that some patients did not assume weightbearing as instructed. Lastly, this was a short-term follow up and we cannot predict long-term outcomes based on these findings.

In conclusion, ankle syndesmosis injuries are complex and can be difficult to treat. Adequate reduction and stabilization of the syndesmosis is paramount for long term functional outcomes. The results of the present study demonstrate that early weightbearing in patients

undergoing ankle fracture ORIF with dynamic syndesmosis stabilization using the Tightrope® XP is a viable treatment option in an active, relatively healthy population. Furthermore, this technique has a low complication rate and reduces the need for a routine second surgery for syndesmotic hardware removal. Further randomized controlled studies with longer follow-up are needed.

Informed Patient Consent

Complete informed consent was obtained from the patient for the publication of this study and accompanying images.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Table 1 – Patient Demographics and Comorbidities (n = 30)

Demographic	Value
Body mass index (kg/m2)	28.8 ± 4.3
Age (yr)	49.0 ± 19.2
Sex	
Male	20 (66.6%)
Female	10 (33.3%)
Comorbidities	
Diabetes	6 (20.0%)
Osteoporosis	5 (16.6%)
Current smoker	1 (3.3%)

Data are mean ± standard deviation or n (%).

Table 2 – Injury and Fracture Characteristics (n = 30)

Characteristic	n	%
Dislocation	8	26.6
Posterior malleolus fracture	12	40.0%
Lauge-Hansen Type		
Supination-external rotation 4	24	80.0%
Pronation-external rotation 3	3	10.0%
Pronation-external rotation 4	3	10.0%