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Effective and Sustainable Syndesmotic Injury Repair using Endobutton and Fiber wire, in Bimalleolar Fractures

Vaibhav J. Koli[1], Prakash D. Samant[1], Rohit M. Sane[1], Maitreya J. Patil[1], Pankaj K. Singh[1]

Abstract

Ankle fractures are the most frequent fractures accounting for 10% of all fractures, having an incidence of about 184/100,000 per year. Moreover, after external rotation or dorsiflexion injuries, syndesmotic disruption typically occurs at the ankle. The physiologic normality of the joint gets affected after a transverse syndesmotic screw fixation, which decreases the magnitude of motion at the lower extremes of the tibia and fibula, reducing contact forces between bones, and increasing stress on the crural interosseous membrane (which may lead to screw breakage). With this concern, we thus suggested to achieving a semi-rigid dynamic stabilization of the syndesmosis, using an endobutton and transosseous suture. We present a case of a 22-year-old active male who had a Lauge-Hansen pronation-abduction type injury. He was managed with an eight holes anatomical plate for lateral malleolus, two 65 mm CC screws with a washer for medial malleolus, and two endobuttons (one on the tibial and other on the fibular side) with transosseous sutures to provide stabilization of the syndesmosis. With this concern, we thus suggested achieving a semi-rigid dynamic stabilization of the syndesmosis, using an endobutton and transosseous suture; which can help in early mobilization, is cost effective, and prevent a second surgery for the removal of the syndesmotic screw.

Keywords: Endobutton, transosseous suture, suture anchor, syndesmotic injury, bimalleolar fractures.

Introduction

Ankle fractures are the most frequent fractures seen at major trauma centers [1]. They account for 10% of all fractures, having an incidence of about 184/100,000 per year [1]. As the amount of participation in sports-related activities rises, the incidence is likely to increase as the average age of the population rises [2, 3]. Moreover, syndesmotic disruption typically occurs at the ankle after external rotation or dorsiflexion injuries [4, 5]. People aged 18–34 years are at the greatest risk for sustaining an ankle syndesmotic injury, with the incidence falling between 10% and 20% [4]. About 10% of ankle fractures have a distal tibiofibular syndesmosis (DTFS) instability [6]. The anterior inferior tibiofibular ligament, the posterior tibiofibular ligament, the tibiofibular interosseous ligament, and the transverse tibiofibular ligament make the DTFS [7]. Instability of the ankle and change of contact load between tibia and fibula during walking state is brought on by inconsistency of ankle surface due to injury of DTFS [8]. Finally, ankle arthritis can be caused by injury of DTFS. Therefore, to prevent posttraumatic degeneration and improve functional outcomes, anatomical restoration and stabilization of DTFS is essential [9].

Post-operative weight-bearing protocols have not been well documented, even though operative guidelines are fairly well established, and controversy exists regarding optimal time to weight-bearing [10]. A transverse syndesmotic screw can transfix the tibia to the fibula [11]. However, the physiologic normality of the joint gets affected after a transverse syndesmotic screw fixation, which decreases the magnitude of motion at the lower extremes of the tibia and fibula, reducing contact forces between bones, and increasing stress on the crural interosseous membrane (which may lead to screw breakage) [11, 12, 13]. Ideally, the implant should not only stabilize the syndesmosis but also allow physiologic micro-motion and early mobilization [14]. With this concern, we thus suggested to achieving a semi-rigid dynamic stabilization of the syndesmosis, using an endobutton and transosseous suture.

Case Report

A 22-year-old active male, student by profession, presented to the outpatient

[1]Department of Orthopaedics, D Y Patil University School of Medicine, Navi Mumbai, Maharashtra, India

Address of Correspondence
Dr. Rohit M Sane,
Department of Orthopaedics, D Y Patil University School of Medicine, Nerul, Navi Mumbai, Maharashtra, India.
E-mail: dr.sanerohit@gmail.com

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Figure 1: X-rays shows a Danis-Weber type C, Lauge-Hansen pronation-abduction type injury, and AO/OTA 44C type of injury

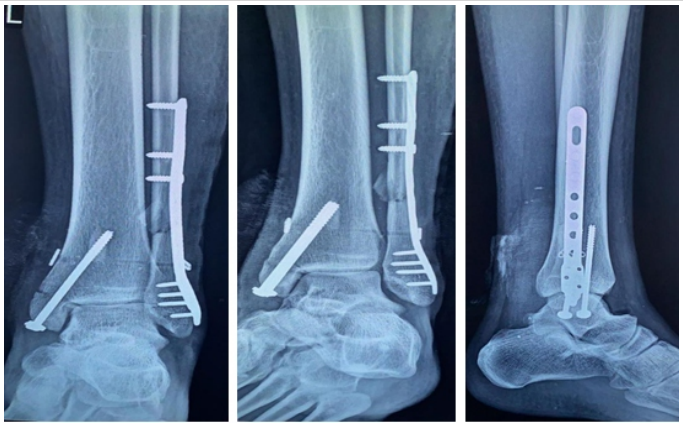

Figure 2: Post-operative X-rays

department of this hospital with the complaints of pain and deformity of the left ankle for 2 days. Pain was sudden in onset, sharp shooting in nature, throbbing in character, not associated with any other injuries, aggravated by movements, and partially relieved by rest. The patient experienced this trauma, by being involved in a road traffic accident while riding a motorcycle. He was taken to a local hospital where primary treatment was provided in the form of a below knee (B/K) slab; after which the patient refused further treatment and went home. Two days later, he came to this tertiary level hospital with pain, for further management. There was no history of trauma to the head, chest, or abdomen. No loss of consciousness or vomiting. No history of diabetes mellitus, hypertension, tuberculosis, asthma, thyroid diseases, or COVID-19 infection.

On examination, the patient was vitally stable with no signs of pallor, icterus, cyanosis, clubbing, lymphadenopathy, or generalized edema. There was swelling diffusely around the ankle; tenderness was over both malleoli. Skin over medial malleolus showed abrasions. There was no local rise of temperature. Crepitus was present. Ankle range of motion (ROM) could not be elicited due to pain. Distal pulses were present.

X-rays showed a Danis-Weber type C, Lauge-Hansen pronation-abduction type injury, and AO/OTA 44C type of injury (Fig. 1). The patient was advised surgical intervention to fix the lateral malleolus with a plate, medical malleolus with CC screws, and repair of the syndesmotic injury.

Surgery was performed with an eight holes anatomical plate for lateral malleolus, two 65 mm CC screws with washer for medial malleolus, and two endobuttons with transosseous sutures (fiber wire of size 2) to provide stabilization of the syndesmosis (Figs. 2 and 3). The patient was then kept in a B/K slab for the first 3 weeks. Mobilization of hip and knee was started on the post-operative day 1. Nil weight-bearing walking was started on the post-operative day 14. Sutures were removed on post-operative day 14. The patient was then followed up every week to assess recovery. Ankle ROM was started on the post-operative day 21. Partial weight-bearing walking was initiated on the post-operative day 35. Full weight-bearing walking was initiated on the post-operative day 42 (Figs. 4). The patient was asymptomatic for the remainder of the period.

Figure 3: Intraoperative pictures

Discussion

Surgical fixation with an anatomical plate for lateral malleolus, CC screws with washer for medial malleolus, and

Figure 4: ROM and squatting on follow-up

endobutton with transosseous sutures to provide stabilization of the syndesmosis are an upcoming option for the management of such injuries. In this case, we did not opt for a standard transverse syndesmotic screw fixation. Our patient was a young active male who wanted to get to his routine life earlier.

Transverse syndesmotic screw fixation does hold a few drawbacks, breakage and loosening occur at a frequency of 7–29% [15]. However, Moon et al. [16] showed significant recurrence of diastasis of ankle, in the group in which screws removed within 3 months. In such instances, weight-bearing too cannot be started. Thus coming to no consensus on removal of the screw before weight-bearing ambulation. In our study, we eliminated transverse syndesmotic screw fixation.

The use of suture anchor fixation is an upcoming technique; having fewer complications, lesser complication rates, and earlier time to functional recovery, without the need for a second surgery to remove the transverse syndesmotic suture anchor, unlike for the screw [17]. However, Ræder et al. [17] found that fixation with a transverse syndesmotic screw was a relatively inexpensive option. In our case too, we decided to not go with a suture anchor fixation, keeping in mind the cost burden to the patient.

We decided to use a technique that had the benefit of the suture anchor but was rather inexpensive. Thus, we used double-looped fiber wire no. 2's on two endobuttons in a cross-fashion, to provide adequate strength and compression to the healing syndesmosis construct. This construct helped us to omit the second surgery for the screw removal. It also helped the patient for earlier mobilization and functional recovery.

This case did have a few drawbacks. There was no long-term follow-up to assess long-term functional outcomes. The technique was comparatively challenging for a beginner. This case was a technical note sharing a potent surgical technique, rather than randomized control trials (RCTs). Thus, larger RCTs are warranted to establish results.

Conclusion

Endobuttons and transosseous sutures provide a semi-rigid dynamic stabilization of the syndesmosis, which can help in early mobilization, is cost effective, and prevent a second surgery for the removal of the syndesmotic screw.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflict of Interest: NIL; **Source of Support:** NIL

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