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Dual-Screw Fixation for Chronic Syndesmotic Injury: A Case Report

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Learning Point of the Article:

Stability of chronic syndesmotic injury is better restored with dual-screw fixation, especially in high, physically demanding patients.

Abstract

Introduction: Ankle syndesmotic injuries present a major challenge due to their high biomechanical complexity and high risk of instability if not properly managed. There remains a controversy between the use of single versus double-screw fixation, Tight Rope fixation, arthrodesis, and ligament reconstruction, particularly in chronic or high physical demand cases.

Case Report: A 25-year-old male presented to our trauma center after sustaining a bimalleolar fracture of the left ankle with chronic syndesmotic injury, lasted for 5 months, after a motorcycle accident. Initially, open reduction with internal fixation and single syndesmotic screw fixation was done. However, anterior subluxation of the syndesmotic joint was evident on computed tomography scan post-operatively, which necessitated revision surgery, after 1 week, with dual screw fixation to restore joint alignment.

Conclusion: Dual-screw syndesmotic fixation provided superior outcomes in comparison to single-screw in patients with chronic injury and high-instability risk. This approach, if routinely done in selected cases, may reduce the incidence of recurrent instability and therefore the need for revision surgeries, as well as improve long-term functional outcomes.

Keywords: Chronic syndesmotic injury, ankle injury, tibiofibular syndesmosis, Dual-screw fixation, case report.

Introduction

Ankle fractures involving syndesmotic disruption account for approximately 10–20% of all ankle fractures, with the incidence rising with high-energy trauma and young athletic populations [1]. Such injuries present a major challenge due to both their biomechanical complexity and potential for long-term instability if not properly addressed. The syndesmotic ligaments, particularly the anterior inferior tibiofibular ligament, contribute significantly to ankle stability. When disrupted, even subtle diastasis can lead to altered load transmission, early osteoarthritis, and impaired functional outcomes [2].

The syndesmotic screw stabilization method remains one of the most commonly used fixation techniques. However, the optimal number of screws required for syndesmotic fixation remains controversial, with ongoing debate in orthopedic literature over whether a single screw provides sufficient stability or if dual-screw fixation offers better long-term outcomes [3].

An alternative gaining popularity is suture-button fixation, commonly referred to as Tight Rope fixation. This technique offers advantages, such as allowing physiological micromotion at the syndesmosis, reducing the need for routine implant removal, and providing quicker rehabilitation timelines [1, 2]. Despite its

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Figure 1: Pre-operative anteroposterior (a and b) and lateral (c) X-rays of the left ankle showing a bimalleolar fracture and bent medial malleolar screws with fracture non-union from previous fixation.

advantages, this technique can be more technically challenging, incur higher costs, and may lead to issues, such as soft tissue discomfort or displacement of the implant [2]. Compared to screws, Tight Rope may be especially beneficial in dynamic syndesmotic instability, but long-term outcomes remain under active investigation.

Chronic syndesmotic injuries (CSIs), defined as syndesmotic disruptions lasting longer than 6 weeks after the initial trauma with ongoing pain, functional impairment, or mechanical instability, are particularly vulnerable to fixation failure if not properly fixed during primary surgery [4]. This definition aligns with the European Society for Sports Traumatology, Knee Surgery and Arthroscopy (ESSKA) – Ankle and Foot Associates consensus guidelines, which emphasize imaging-confirmed diastasis and persistent functional impairment, with chronic instability typically detected after the acute phase using stress radiographs, computed tomography (CT), or magnetic-resonance imaging (MRI) [5].

In this case report, we present a 25-year-old male with a history of prior medial malleolar fixation who sustained a bimalleolar fracture with CSI following a motorcycle accident. His initial single-screw syndesmotic fixation failed post-operatively, necessitating revision surgery with the addition of a second screw. This case highlights the clinical implications of underestimating syndesmotic injury severity and questions whether dual-screw fixation should be considered more routinely in chronic or high-risk cases.

Case Report

A 25-year-old male with a history of left medial malleolar fracture, previously fixed with two screws in February 2025, presented to the Emergency Department 5 months later following a motorcycle accident that resulted in a new bimalleolar fracture of the left ankle. On examination, there was moderate swelling and a limited range of motion (ROM) of the left ankle. Distal neurovascular status was intact, and all compartments were soft. A superficial abrasion was noted over the medial aspect of the left foot.

An X-ray of the left ankle revealed a bimalleolar fracture along with non-union of the medial malleolar fracture (Fig. 1). A CT scan showed evidence of a bimalleolar fracture of the left ankle and increased diastasis of the syndesmotic joint, seen using a side-to-side comparison of the tibiofibular clear space with the contralateral side (Fig. 2). The patient was admitted under the orthopedic and trauma surgery team, kept nil per os, and started on analgesics and intravenous cefuroxime due to leukocytosis noted on complete blood count. A plan was made to perform surgical fixation the following day.

The patient underwent open reduction and internal fixation the next day. Using a lateral ankle approach, the fibular fracture site was exposed, and callus from previous injury was debrided. Intraoperative findings suggest that the syndesmotic injury is chronic, with evident ligament fraying and fibrotic tissue consistent with longstanding instability. A disrupted syndesmosis with shortening of the distal fibula was confirmed. Reduction was performed and secured using a lateral plate with multiple screws, and a single 3.5 mm quadricortical syndesmotic screw was inserted under fluoroscopic guidance (Fig. 3).

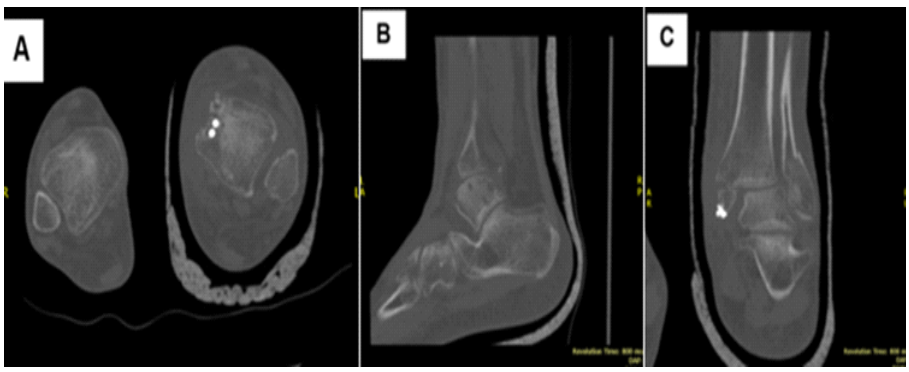

Figure 2: Preoperative axial (a), sagittal (b), and coronal (c) Computed tomography scans of the left ankle showing a bimalleolar ankle fracture and syndesmotic joint injury.

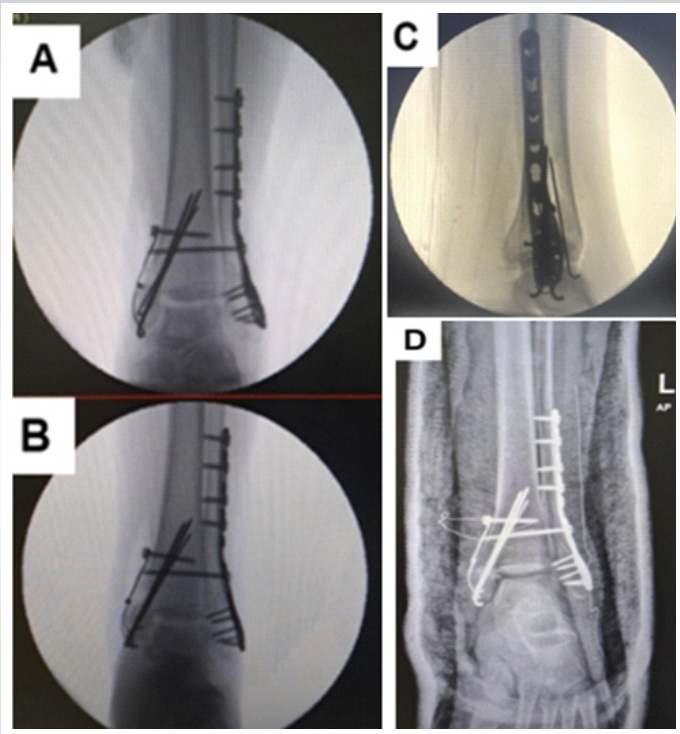

Figure 3: Fluoroscopic images showing initial single 4-cortex syndesmotic screw fixation following open reduction with internal fixation. Mortise (a), Anteroposterior (b), and Lateral (c) views. (d) Post-operative X-ray showing bimalleolar fixation with a single syndesmotic screw in situ.

Subsequently, through a medial ankle approach, the bent medial malleolar screws were removed. Debridement of fibrous tissue and periosteum from the fracture site was performed. Fixation was achieved using a tension band technique with additional K-wire stabilization. The surgical site was washed, wounds closed in layers, and a below-knee slab was applied post-operatively.

However, follow-up imaging 1 week later demonstrated anterior subluxation of the syndesmosis (red arrow) (Fig. 4). As a result, the patient underwent revision surgery. Intraoperatively, the initial syndesmotic screw was found to be suboptimally positioned and was removed. Two new 3.5 mm syndesmotic screws were then placed.

Post-operative management included pain control, regular wound care, dressing changes every 72 h, a 5-day course of antibiotics due to compromised local tissue conditions around the ankle, and non-weight-bearing mobilization. A post-operative X-ray confirmed proper alignment of the ankle joint and internal fixation of the fibula and medial malleolus (Fig. 5). A CT scan revealed proper alignment of the syndesmotic joint (red arrow) (Fig. 6).

The patient was discharged with instructions for pain management, regular wound care, non-weight-bearing ambulation, and ankle elevation with intermittent cryotherapy.

Full weight bearing was planned to be initiated in 8–12 weeks after surgery, with possible elective removal of the syndesmotic screws.

Eight weeks post-operatively, the patient came in without walking difficulty with only mild swelling reported. Physical examination showed well-healed medial and lateral scars, soft compartments, and a full ROM of the left ankle joint. Subsequent follow-ups were carried out virtually, as the patient returned to his home country, and no pain or new complaints were reported.

Discussion

A syndesmosis is a fibrous joint defined as the connection of two adjacent bones by ligaments or a tough membrane [4]. Syndesmotic injury occurs in approximately 10–20% of ankle fractures, with an increase in incidence in high-energy trauma and young athletic populations [1]. The syndesmosis naturally widens about 1 mm when moving from full plantarflexion to dorsiflexion, as the joint is naturally dynamic. However, due to an injury, it can widen up to 7.3 mm and externally rotate an additional 10.2° from baseline [6].

Assessment of the syndesmotic widening can be done using conventional weight-bearing radiographs, CT scans, or MRI. MRI or CT scans were suggested to be used in post-traumatic conditions as they are more sensitive for detecting minor degrees of syndesmotic injury [7]. Persistent syndesmotic injury should be evaluated using intraoperative 3-D imaging or

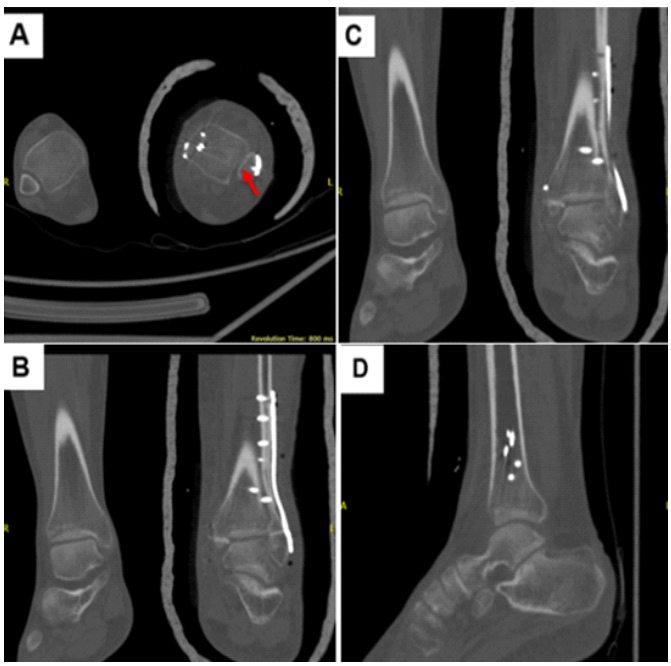

Figure 4: Follow-up computed tomography scan showing anterior subluxation (red arrow) of the syndesmosis. Axial (a), coronal (b and c), and sagittal (d) views.

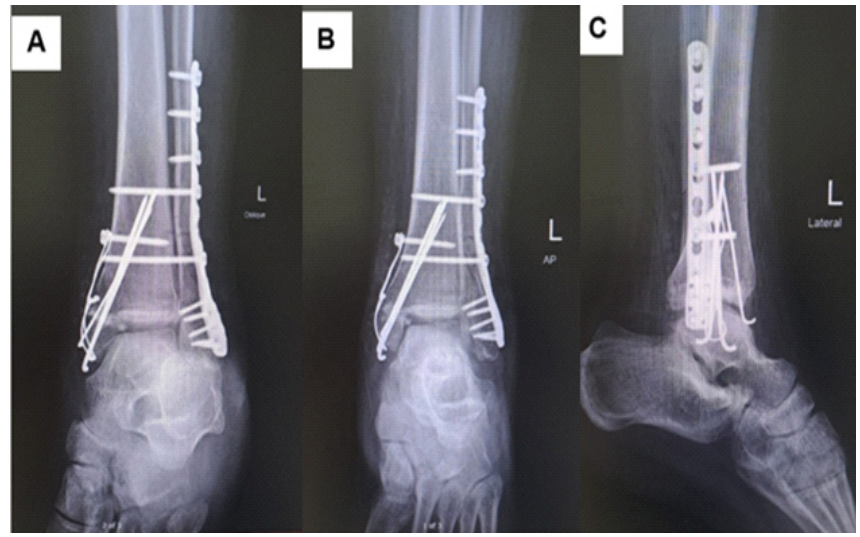

Figure 5: Post-operative oblique (a), anteroposterior (b), and lateral (c) X-rays showing dual syndesmotic screw fixation and confirming restored ankle joint.

post-operative CT scans, after reduction and syndesmotic screw fixation of unstable syndesmotic injuries [8].

The most widespread protocol for managing acute syndesmotic injuries without instability is the three-phase conservative approach. This includes rest, ice, and non-weight-bearing immobilization as the first phase, physiotherapy and walking with a functional brace in the second phase, and finally training of neuromuscular control and proprioception until full recovery in the third phase [2]. Surgical management for unstable syndesmotic injuries includes open/arthroscopic debridement and either static cortical screw fixation, dynamic fixation using suture-button devices, or ligament reconstruction [9]. Screw fixation is used primarily in subacute injuries (6 weeks–6 months) [2]. No consensus exists currently on the treatment of CSI, but evidence demonstrates favorable outcomes for the different types of management [9, 10].

A meta-analysis comparing suture-button fixation with syndesmotic screw fixation in acute syndesmosis disruption reported that the suture-button technique resulted in improved joint function and a lower rate of implant failure compared with syndesmotic screws. This difference is related to the physiological motion of the syndesmosis, which can place mechanical stress on the screw, unlike the suture-button, which maintains adequate reduction and stability while allowing controlled micromotion [11]. This concept may be reflected in our case, where early post-operative joint subluxation occurred following initial fixation with a single syndesmotic screw, which highlights the mechanical stress placed on rigid fixation constructs. Interestingly, the combined usage of suture-button and syndesmotic screw has been proposed for highly physically demanding individuals, as it may provide enhanced protection of the syndesmosis while allowing quicker restoration of the biomechanical action of the ligament complex [9]. In the present case, the injury resulted from high-energy trauma and was associated with a complex ankle fracture pattern, factors that may increase mechanical stress across the syndesmotic complex.

There are arguments surrounding screw fixation with regard to the number of screws, screw size, and the number of cortices engaged. In acute and otherwise healthy patients, studies have shown no significant difference in clinical outcomes, patient satisfaction, or complication rates between single and double screw fixation [3]. Nevertheless, several studies suggest that although a single 3.5 mm tricortical screw may provide satisfactory initial fixation, dual-screw constructs may offer greater biomechanical stability in situations where increased mechanical stress is anticipated [2,12]. Moreover, a retrospective study also reported that screws with a diameter of 3.5 mm were more prone to breakage than screws measuring 4–4.5 mm and therefore recommended to use two 4.5 mm quadricortical screws as they offer greater resistance than a single screw and are easier to remove than a 3.5 mm screw if screw failure occurs [2, 13]. In our case, early post-operative syndesmotic subluxation was observed following initial fixation with a single 3.5-mm quadricortical syndesmotic screw. Intraoperative findings during revision revealed that the initial screw was suboptimally positioned, which may have contributed to the loss of

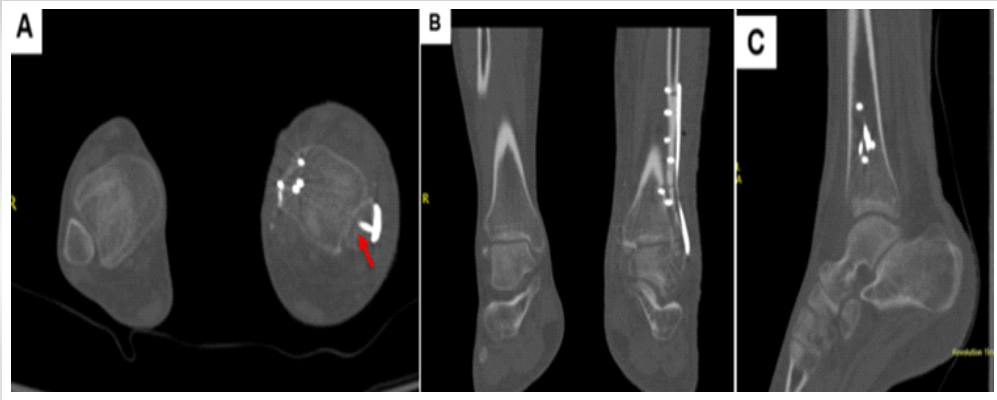

Figure 6: Computed tomography scan showing proper alignments of the fibular and medial malleolar fixations. Axial (a), coronal (b), and sagittal (c) views.

reduction. However, the CSI resulted in persistent posterior instability, making stabilization with a single screw insufficient even if placed optimally; therefore, the revision with a dual-screw construct provided improved rotational and translational stability in this complex setting. The successful outcome of the revision procedure may reflect both improved screw positioning and the use of a stronger fixation construct.

Other methods recommended for treating CSI include tibiofibular fusion, but this procedure should be reserved for patients with degenerative changes of the tibiofibular joint [14]. The majority of published studies on CSI describe a wide range of management techniques, with very few studies specifically examining the syndesmotic screw approach [14].

Conclusion

Multiple approaches with favorable outcomes have been suggested for the management of syndesmotic injuries. Despite this, little evidence exists on the gold-standard approach to the use of syndesmotic screw fixation in chronic injuries. In our report, we presented a case of a 25-year-old male who sustained a left ankle bimalleolar fracture along with CSI. The bimalleolar fractures were fixed using a plate laterally and a tension band, along with Kirschner-wire stabilization medially. The initial single-screw fixation of the syndesmosis resulted in anterior subluxation of the joint, based on CT findings, which necessitated revision surgery for a dual-screw fixation. Full ankle ROM was achieved in addition to satisfactory patient outcomes.

The post-operative failure in our case highlights the need to carefully consider stronger fixation methods in selected patients with high-instability risk. While a single-screw may be sufficient in acute or low-risk cases, it may not provide the necessary support in high, physically demanding individuals or chronic injury cases that might need extra reinforcement, such as dual-screw fixation or the combined usage of suture-button along with the syndesmotic screw to provide better restoration of normal biomechanical function of the ligament complex.

Clinical Message

This case highlights the critical importance of recognizing fixation failure in chronic syndesmotic injuries. It demonstrates that dual-screw fixation can restore stability where single-screw constructs fail, thus, highlighting a gap in current orthopedic guidelines and emphasizing the need to reconsider fixation protocols for high-demand or chronic cases to prevent recurrent instability and improve long-term outcomes.

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

Conflict of interest: Nil **Source of support:** None

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