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# Isolated syndesmotic injury: treatment with suture button system—retrospective cohort study

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**Abstract**

**Background:** Ankle injuries, often involving the syndesmotic complex, are common and may lead to acute instability. The syndesmosis, comprising several key ligaments, provides critical support for ankle function. This study assesses the efficacy and safety of the suture button system for isolated syndesmotic injuries, a treatment method that is gaining popularity over traditional transsyndesmotic screws.

**Methods:** A retrospective review was conducted on patients treated surgically with the suture button system for isolated syndesmotic injuries from January 2018 to December 2023. Key outcomes measured included time to full weight-bearing, returning of daily activities, and complications. The study also compared these outcomes with historical data from screw fixation methods.

**Results:** Thirty-two patients (20 men, 12 women; mean age 41.66 ± 16.57 years [range 16–72 years]) were analyzed over an average follow-up of 9.94 ± 5.49 months (range 3–28 months). Patients achieved full weight-bearing at 1.23 ± 0.31 months postoperatively, resumed daily activities with restrictions at 3 ± 1.09 months, and without restrictions at 6.67 ± 2.55 months. No major complications were reported; minor complications included implant removal due to irritation in two patients (6.25%) and minor wound issues in one patient (3.13%).

**Conclusion:** The suture button system demonstrated good outcomes in allowing physiological motion, low malreduction rates, and minimizing reoperation needs. The present results indicate a promising safety profile and functional recovery, despite limitations such as small sample size and lack of patient-reported outcome measures.

**Keywords:** isolated syndesmotic injury, suture button system, 'syndesmotic injury', ankle

## Introduction

Ankle injuries are common injuries of the lower limbs, with 25% of these presenting with an acute instability of the syndesmosis.[1,2] The syndesmotic complex offers essential dynamic support to the ankle, playing a crucial role in its normal function.[3,4] The tibiofibular syndesmosis includes: anterior inferior tibiofibular ligament, posterior inferior tibiofibular ligament, interosseous ligament, inferior transverse ligament, and the interosseous membrane.[3,5,6] The mechanisms of injury for syndesmotic lesions include external rotation and dorsiflexion of the ankle, as well as a combination of ankle dorsiflexion with adduction or abduction of the foot.[7-9] On the physical examination patients may present with anterolateral ankle pain, difficulty bearing weight, tenderness on palpation of the syndesmosis, a positive squeeze test (Hopkin's), a positive external rotation stress test, a positive cotton test, and a positive fibular translation test.[9-11] In terms of imaging, X-ray, ultrasound, computed tomography, and magnetic resonance imaging (MRI) can all be used to assess syndesmotic injuries, being MRI the preferred imaging modality.[10,12] One of the most common classification systems used to classify pure ligamentous syndesmotic injuries is the West Point Ankle Grading System.[13] The treatment for this type of injury can be either conservative or surgical.[12] Syndesmotic sprains without instability generally heal with conservative treatment and should be managed nonoperatively, whereas acute ruptures with either frank or latent ankle instability necessitate surgical intervention.[14] Within surgical options, we can choose between a screw or a suture button system.[1,13,15-17] Complete ligamentous injuries are uncommon without an accompanying fracture, but these are typically treated surgically.[7,16] Stabilization with transsyndesmotic screws is the most common fixation method.[3,12] The suture button system has been gaining importance and has shown a promising safety profile and functional outcomes.[15-17]

Our aim was to verify the efficacy and safety of a dynamic fixation system in the treatment of acute syndesmotic injuries without fracture.

## Methods

A retrospective study was conducted by reviewing the medical records of patients with isolated syndesmotic injuries who

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were surgically treated using the suture button system (INVISIKNOT from Smith & Nephew). We included patients submitted to surgery, with suture button system, from January 2018 to December 2023, and followed them until discharge. The primary focus of the evaluation was on several key outcomes: the duration required for patients to achieve full weight-bearing, the time taken to resume daily activities with restrictions, the period needed to engage in daily activities without restrictions, and any complications associated with the suture button system treatment. In addition, data on age, sex, and follow-up duration were collected and analyzed. In addition, the postoperative recovery process was closely monitored, including the timeline for returning to normal function and any deviations from the expected recovery pathway. The study also assessed the effectiveness of the suture button system in maintaining syndesmotic stability over time, comparing these outcomes with literature data from patients treated with traditional transsyndesmotic screws.

Patient follow-ups were scheduled at regular intervals to capture data on the progression of recovery and to identify any late-onset complications or failures of the elastic system. These follow-ups included physical examinations and radiographic evaluations.

Data were described using average and standard deviation; the statistical analyses were performed using IBM SPSS Statistics v.29.

Ethical approval for this study was provided by the administration board of Unidade Local de Saúde de Barcelos/Esposende on August 19, 2024.

## Results

The diagnosis was made through X-ray and computed tomography scan, with MRI used when necessary, and was intraoperatively confirmed by arthroscopy (Fig. 1). The diagnosis is made on the day the patient visits the emergency department, and if MRI is necessary, it may be delayed up to one week. Treatment is then performed between 7 to 15 days after the injury.

Figure 2 shows a stress radiograph of the right ankle demonstrating increased medial clear space, increased tibiofibular clear space, and decreased tibiofibular overlap. Figure 3 presents a radiograph of the same ankle after syndesmosis repair (syndesmopexy) using two suture button systems, demonstrating proper reduction and fixation.

Thirty-two patients were evaluated, including 20 men and 12 women, with a mean age of 41.66 ± 16.57 years (range 16–72 years). The mean follow-up period was 9.94 ± 5.49 months (range 3–28 months), with no loss of follow-up. On average, patients achieved full weight-bearing at 1.23 ± 0.31 months postoperatively, began daily activities with restrictions at 3 ± 1.09 months, and resumed daily activities without restrictions at 6.67 ± 2.55 months.

No major complications were observed. Two patients (6.25%) underwent elective implant removal due to medial button irritation. Only one patient experienced minor surgical wound complications, which was resolved with standard wound care without the need for further surgical intervention (3.13%) (Table 1).

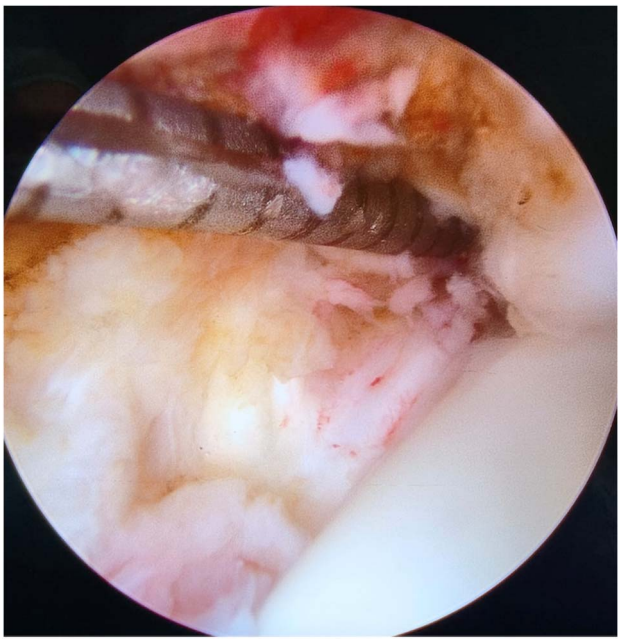

**Figure 1.** Arthroscopic view of the ankle showing a syndesmosis injury, with evident ligamentous disruption.

**Figure 2.** Stress radiograph of the right ankle demonstrating increased medial clear space, increased tibiofibular clear space, and decreased tibiofibular overlap.

**Figure 3.** Radiograph showing syndesmosis repair (syndesmopexy) using two suture button systems, demonstrating proper reduction and fixation.

## Discussion

The treatment of the syndesmotic injuries can be either conservative or surgical, with the surgical being the most used.[12]

A proper reduction and fixation of the syndesmosis is imperative, as it is an essential step to achieving good clinical and functional outcomes.[2,8,16,17] A good reduction can be achieved through manual reduction, assisted by a clamp, when necessary, with fluoroscopic and arthroscopic control to ensure proper positioning. Ensuring accurate alignment and stable fixation of the syndesmotic complex is crucial for restoring normal ankle mechanics, minimizing pain, and preventing long-term complications such as chronic instability or arthritis.[8,16,17] So, a good reduction and fixation of syndesmotic injuries directly influences the patient's recovery pathway and overall quality of life postinjury.[8,16,17]

**Table 1**

**Patient demographics and clinical outcomes**

| Variable | Value |
|---|---|
| Total patients evaluated | 32 |
| Gender distribution | 20 men (62.5%), 12 women (37.5%) |
| Mean age (y) | 41.66 ± 16.57 |
| Mean follow-up period (mo) | 9.94 ± 5.49 |
| Full weight-bearing (mo) | 1.23 ± 0.31 |
| Daily activities with restrictions (mo) | 3 ± 1.09 |
| Daily activities without restrictions (mo) | 6.67 ± 2.55 |
| Major complications | None |
| Elective implant removal | 2 patients (6.25%) |
| Minor surgical wound complications | 1 patient (3.13%) |

There are primarily two methods of fixation: a transsyndesmotic screw or a suture button system.[15-17] The screw fixation is the most used, and it was first described by Burwell in 1965 for emergency management of ankle fractures.[3,12]

The main problem with the transsyndesmotic screw is the rigid fixation it provides.[16] If the syndesmosis is malreduced before the screw is placed, it will remain malreduced after the screw is inserted. Thus, patients who undergo reduction with the transsyndesmotic screw exhibit higher rates of malreduction, greater rates of implant failure (screw breakage), heterotopic ossification, and poorer clinical outcomes compared with those treated with the suture button system.[3,15,17]

On the other hand, fixation with a suture button system allows for a more dynamic fixation, allowing some movement of the fibula within the tibial incisura, making this method more anatomical, and more accommodating to perioperative malreduction.[8,15-17] This system was first reported in 1991 and also has the advantage of rarely needing to be removed, and the main indication for unplanned surgery in these patients is knot irritation; however, the latest systems no longer require knots, which will be an advantage.[1,12,15,16] In addition, the suture button's flexibility better mimics natural joint mechanics, potentially leading to improved functional outcomes and a quicker return to normal activities.[3,16,17]

In terms of costs, the suture button system is more expensive than the transsyndesmotic screw. However, if the patient with screws requires hardware removal (which is not always necessary), the overall costs between the two options become comparable.[16] Since the suture button system requires less frequent removal, its use is more cost-effective.[18]

In the patient-reported outcome measures (PROMs), it was found that patients treated with the suture button had a higher American Orthopaedic Foot & Ankle Society (AOFAS) and Olerud–Molander Ankle scale scores in comparison to those treated with screws.[2,15,16] In addition, these patients experienced less pain while walking at the 2-year follow-up and a lower incidence of ankle osteoarthritis.[3,15,16]

Sanders et al.[19] reported that patients with the suture button system had lower rates of malreduction compare with the screw fixation (15% vs 39%), and lower rates of implant removal (3.73% vs 40.30%), he additionally showed that the rate of unplanned reoperation was also lower (4% vs 15%).

This study supports the findings reported in the existing literature regarding the efficacy of the suture button system in syndesmotic injuries. With no major complications observed and a low rate of minor complications, the results align with previous research, indicating the safety and reliability of this surgical approach. In addition, the quick return to activities of daily living underscores the functional benefits afforded by the suture button fixation method. These collective outcomes provide further validation for the utilization of the suture button system as a viable treatment option for syndesmotic injuries, offering both favorable clinical outcomes and a quick postoperative recovery.

Limitations of this retrospective study include a small sample size, the use of a single system (same brand), lack of comparison with a control group, and the absence of PROMs. PROMs were not included in this population due to the fact that it was a retrospective study with a small sample size and no comparative group. These constraints underscore the need for further research employing larger sample sizes and comprehensive outcomes assessments to more robustly evaluate the effectiveness of the suture button system in syndesmotic injuries management.

## Conclusion

To conclude, the evaluated button suture system demonstrates an excellent safety profile, providing dynamic stabilization and exhibiting a low rate of complications. The utilization of this system aims to facilitate a more physiological motion of the distal fibula relative to the tibia while ensuring sufficient stability. These findings emphasize the potential of button suture system as a reliable treatment option for syndesmotic injuries, offering both safety and functional benefits to patients.

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