Evaluating success rate and comparing complications of operative techniques used to treat chronic syndesmosis injuries

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ABSTRACT

Purpose: To assess the success rate and complications of the surgical interventions used to manage chronic syndesmosis injuries.

Methods: Multiple online databases were queried to identify studies reporting operative intervention for chronic syndesmosis injuries.

Results: Modalities of operative fixation include suture-button fixation, arthroscopy and debridement, as well as arthrodesis. The use of operative treatment is effective; however, more direct comparison studies are necessary to evaluate the efficacy of each treatment.

Conclusion: Various operative procedures have been used for the management of chronic syndesmosis injuries but further prospective studies are necessary to determine the type of treatment that should be indicated.

1. Introduction

Ankle injuries, particularly sprains, are one of the most common musculoskeletal injuries sustained by both athletes and the general population. It is estimated that incidence of ankle sprains is 2.15 per 1000 person-years in the United States alone.¹ Furthermore, it has been estimated that upwards of 18% of soft tissue injuries involving the ankle are syndesmosis injuries,² which are commonly known as “high ankle” sprains. The distal tibiofibular syndesmosis provides stability to the ankle mortise, and is composed of the anterior inferior tibiofibular ligament (AITFL), posterior inferior tibiofibular ligament (PITFL), interosseous membrane, and the inferior transverse tibiofibular ligaments (TL).³ Although syndesmosis sprains can occur due to a number of mechanisms, it is believed that they most commonly occur as a result of sustained forceful external rotation with abduction and dorsiflexion.⁴ The spectrum of injuries to the syndesmosis ranges from a simple sprain to frank diastasis, both of which can occur with or without an associated fracture.⁵ Though not necessary for diagnosis, this injury is frequently accompanied by some type of rotational ankle fracture, such as pronation-external rotation and pronation-abduction fractures, and supination-external rotation fractures less frequently.⁶ Furthermore, Maisonneuve fractures, which is a rotational ankle injury with a high fibular fracture, has been well known to have a high rates of

syndesmosis injuries.⁷ Though syndesmosis injuries can be diagnosed acutely (defined as an injury present for less than 4 weeks⁴), diagnosis is often difficult to make, due to the subjectivity of physical examination maneuvers and occasional unreliable radiologic studies. Gardner et al.⁸ maintained that no optimal radiographic measurement exists for assessing syndesmosis integrity. Takao and colleagues⁹ have reported on the sensitivity, specificity, and accuracy of radiography and magnetic resonance imaging (MRI) in comparison to arthroscopy for detection of ligament rupture, showing MRI to be more sensitive and accurate than radiography when compared to arthroscopic evaluation (Table 1).

Moreover, syndesmosis injuries that are misdiagnosed or inadequately treated with nonoperative management in the acute stage can lead to a chronic syndesmosis injury. The annual incidence of syndesmosis injuries is approximately 15 cases per 100,000 individuals in the general population, with a higher incidence in athletes, particularly sports with foot planting and pivoting, as well as direct blows to the lateral foot.⁴ There is currently limited data on the prevalence of chronic syndesmosis injuries, however, it is estimated that the incidence is underestimated.^{10,11} This is best reflected by the work of Vincelette et al.,⁵ who observed that late calcifications of the distal tibiofibular syndesmosis were present in 32% of professional football players, reflecting a prior undetected syndesmosis lesion, suggesting

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Table 1

The sensitivity, specificity, and accuracy (all %) of standard AP and mortise radiography and MRI of the anterior (AITFL) and posterior (PITFL) inferior tibiofibular ligaments in comparison to arthroscopy of the ankle for detection of ligament disruption, as reported by Takao et al.⁹

Imaging modality	Sensitivity	Specificity	Accuracy
Standard AP radiograph	44.1	100.0	63.5
Mortise radiograph	58.3	100.0	71.2
MRI of AITFL	100.0	93.1	96.2
MRI of PITFL	100.0	100.0	100.0

that the actual prevalence of chronic injury was indeed larger than currently reported.

Chronic syndesmotom injuries are defined as having been present for a minimum of 3 months.⁴ Complications include chronic joint pain, accelerated arthritic degeneration, and deltoid insufficiency, a marked cause of instability and morbidity. The key goal of treatment of chronic syndesmotom injuries is to re-establish anatomic alignment with long-term stability. A recent retrospective study found that of operatively treated patients at two-year follow-up, mean scores on the Lower Limb Core modules were 94.6 for overall function and 98.0 for pain.¹² However, numerous procedures have been employed as a means to treat chronic syndesmotom injuries, including screw fixation, suture button technique, arthroscopy with debridement, and arthrodesis. Reports on which operative technique is the best and most appropriate for the treatment of chronic syndesmotom injuries are controversial. Although there have been direct comparisons of screw and suture-button fixation, there are few comprehensive studies that have discussed all four techniques. Therefore, this paper aimed to clarify the different indications for and report on the outcomes and complications of each technique while systematically querying multiple online databases, including PubMed, Embase, Cochrane, Google Scholar, and Web of Science.

2. Screw fixation

One means of operatively reducing syndesmotom injuries is by employing a screw fixation technique. Historically, the use of syndesmotom screw fixation was very common in Weber B and C fractures, approximately 40% and 80%, respectively.¹³ Often regarded as the gold standard, syndesmotom screw fixation entailed the placement of a screw (s) across the syndesmosis from the lateral aspect of the fibula into the tibia. Proper techniques dictate that screws should be inserted parallel to the level of the tibiotalar joint, 2 cm proximal to the joint, and in a 25-degree oblique anterior direction.¹⁴ Reduction of the syndesmosis should be maintained with forceps while the screw is being inserted; the foot should be held in mild dorsiflexion. Performing the insertion under fluoroscopy enables the surgeon to perform an external rotation test and ensure that the joint does not open.¹⁵ The screws may be removed at 16-weeks postoperatively if symptomatic or at the patients request.

There has been recent controversy over the relative effectiveness of utilizing screws of varying size and/or number. Currently, there is no gold standard for the precise size of the screw for ankle diastasis, and either 3.5 or 4.5 mm cortical screws have been commonly used.^{13,16} In a recent study performed by Bava et al.,¹⁷ orthopaedic trauma and foot and ankle fellowship directors, along with members of the Orthopaedic Trauma Association (OTA) and the American Orthopaedic Foot and Ankle Society (AOFAS) were surveyed nationwide and reported that just over 50% use 3.5 mm cortical screws, while the other half used either 4.5 mm cortical screws or a suture fixation device. However, despite this lack of uniformity across equipment, both 3.5 and 4.5 mm cortical screws exhibited similar biomechanical characteristics, and there did not seem to be any superiority of the 4.5 mm over the 3.5 mm cortical screw in fixation of the syndesmosis.¹⁸ Cadaveric studies, however, have compared the use of a single diastasis screw versus two

cortical screws, and their results supported the use of two screws, as they provided a better construct biomechanically.¹⁹ Recent studies comparing the engagement of three versus four cortices did not show any clinically significant differences between the two groups at 1 year in terms of pain and function.^{16,20} Table 2, adapted from Magan et al.,¹³ summarizes the numerous studies analyzing the different variables in screw fixation.

When measuring the efficacy or success rate of syndesmotom injury repair, one can rely on radiological evaluation of joint integrity to compare pre- and postoperative findings, as well as the objective and subjective clinical findings. Radiological variables measured include tibiofibular overlap, total clear space, and medial clear space. Clinical variables include the Baird-Jackson scoring system and range of motion. In a retrospective study performed by Yan et al.,²¹ the aforementioned radiological parameters, as well as clinical signs were measured in a group 20 patients (21 ankles) who were treated with screw fixation. The study followed patients for a mean of 1.3 years and demonstrated a significant improvement in mean radiographic parameters for postoperative tibiofibular overlap (7.14 ± 0.62 mm), total clear space (3.28 ± 0.39 mm), medial clear space (3.12 ± 0.33 mm), and mortise tibiofibular overlap (2.91 ± 0.30 mm).

This study showed a mean Baird-Jackson score of 86.24 (range, 62 to 98). At final follow-up, of 21 ankles, 13 had no pain, 16 had no reported instability, 11 had normal walking ability, 8 could run normally, and 11 could return to work without limitation.²¹ Other advantages of the screw fixation technique included avoidance of persistent diastasis, early weight bearing, which prevents disuse atrophy, promotes proprioception training, and hastens return to normal activities.⁴

An additional study conducted by Gennis et al.²² further corroborated the findings of Yan et al.²¹ Gennis et al.²² reported on 166 patients who had ankle fractures with concomitant syndesmotom injuries were treated with reduction and screw fixation. After reduction was achieved, immediate postoperative radiographs were taken with additional radiographs immediately following hardware removal and at 3-months post initial fixation. The study demonstrated that the fibula shifted an insignificant amount on postoperative mortise radiographs after elective syndesmotom screw removal and at 3 months or more after initial fixation, the medial clear space did not change from preoperative to postoperative screw removal, only very mild widening (0.5 mm) of the tibia-fibula clear space occurred after weightbearing following syndesmotom fixation. The removal of syndesmotom screws at 3 months resulted in a slightly reduced tibia-fibula overlap (< 1 mm) and increased medial clear space widening (0.5 mm) on mortise radiographs than screw retention.²²

Although numerous studies have been done that demonstrated the effectiveness of screw fixation, complications can occur, which may adversely affect the outcomes. Some of the reported complications associated with this conventional treatment have included screw breakage and hardware pain, the need for an additional surgery for hardware removal, and the risk of subsequent diastasis if the screws are compromised prior to healing.¹⁵ Screw breakage has been reported to occur in 7–29% of patients who have had fixation. Stuart and Panchbhavi²³ found that 3.5 mm screws were significantly more likely to break than were 4 mm or 4.5 mm screws. Additionally, rigid screw fixation eliminated most, if not all, of the normal tibiofibular motion, potentially resulting in pain or decreased range of motion. Pereira et al.²⁴ showed that screw fixation limited the tibiotalar contact area throughout the range of motion of the ankle by locking the fibula and preventing the normal fibular motion. Furthermore, authors have suggested that asymptomatic screw failure, or routine screw removal should be avoided due to the patient enduring a second procedure.²⁵

3. Suture-button technique

Although the screw fixation method of treating syndesmotom injuries

Table 2
A summary of studies reviewing various parameters related to screw fixation for syndesmotic injuries, adapted from Magan et al.¹³

Screw Feature	Reports	Year	# Subjects	Follow-Up (months)	Study Goals	Outcomes
Screw Size	Hansen et al. ⁴³	2006	18	Cadaveric	Analyze shear stress (axial loading) for 3.5 mm and 4.5 mm quadricortical syndesmotic screws	4.5 mm screws may provide better resistance under shear stress force application to the syndesmosis
Number of Screws	Thompson and Gesink ¹⁸	2000	24 (12 paired legs)	Cadaveric	Compare biomechanical syndesmosis fixation between 3.5 mm vs. 4.5 mm stainless steel screws	No biomechanical advantage of 4.5 mm over 3.5 mm found
	Xenos et al. ¹⁹	1995	25	Cadaveric	Evaluate syndesmotic fixation methods	Two-screw fixation of the syndesmosis is superior to one diastasis screw
	Kureti et al. ⁴⁴	2005	36	35	Compare placement: trans-syndesmotic vs. just above the syndesmosis	No significant difference in clinical and radiological outcomes
Number of Cortices	Karapinar et al. ⁴⁵	2007	46	≥12	Compare 3- vs. 4-cortex syndesmotic fixation in Weber C fractures	No difference at 1-year; suggest 3-cortical fixation due to reduced syndesmotic space obliteration postoperatively
	Moore et al. ¹⁶	2006	120	5	Comparing 3 vs. 4-cortical screw fixation without hardware removal	Supports use of three or four cortices for syndesmotic fixation
	Holness and Strømsoe ²⁰	2004	64	12	Evaluate short-term functional results of two syndesmotic screw fixation methods: traditional rigid quadricortical screw vs. dynamic tricortical	Two tricortical screws for fixation are safe and improve early function; no difference at 1-year follow-up
Screw removal and weightbearing	Hsu et al. ⁴⁶	2011	52	19	Retrospective study of syndesmotic diastasis treatment	Removal of syndesmotic screws at 6-weeks may avoid breakage but potentially result in recurrence of diastasis
	Manjoo et al. ⁴⁷	2010	76	15	Determine how functional and radiographic outcomes following ankle fracture are impacted by syndesmosis screw status	Intact syndesmosis screw was associated to inferior functional outcomes when compared to loose, fractured, or removed screws
	Bell et al. ⁴⁸	2006	30	15	Syndesmotic screw removal prior to weightbearing vs. leaving screws in-situ indefinitely	Screw breakage risk was reduced by removing screws prior to weightbearing
Screw Materials	Moore et al. ¹⁶	2006	120	5	Comparing three vs. four cortices screw fixation without hardware removal	No difference between removed or retained screws was found
	Hu et al. ⁴⁹	2010	47	6	Comparing clinical impact of poly-D,L-lactic acid absorbable screws vs. titanium metallic screws in ankle diastasis	Poly-D,L-lactic acid screws were effective and reliable
	Kaukonen et al. ⁵⁰	2005	28	35	Metallic vs. Bioabsorbable syndesmotic screws	Polylevolactic screws performed as well, or slightly better, than metallic screws
	Thordarson et al. ⁵¹	2001	32	3	Bioabsorbable vs. Stainless Steel screws for syndesmosis fixation	No wound complications in either group; no differences in functional outcomes

has long been the standard of care, newer techniques have gained interest as possible alternatives. One such possible alternative currently being implemented is the suture button technique. The suture-button hardware consists of an implant with two metallic buttons, one round and one oblong, surrounded with thick FiberWire sutures (FiberWire®, Arthrex, Naples, Florida). Its stabilization relies on compression of the two buttons on opposite sides of the syndesmosis provided by the FiberWire suture.²⁶ The fixation is accomplished by drilling through all four cortices in the transmalleolar axis, pulling the needle, with its FiberWire and oblong button, from the lateral to the medial side. Once the oblong button emerges, the surgeon flips it parallel to the bone surface and exerts lateral tension to hold it flush. On the lateral side, the surgeon draws the round button tight against the fibula and tightens the sutures.¹⁵ It was designed to allow physiologic motion at the syndesmosis, while at the same time, preventing diastasis. The suture-button fixation has gained popularity over screw fixation for its many advantages, which include: physiologic motion at the syndesmosis, a lower risk of hardware pain, eliminate the potential for screw breakage, no hardware removal, and can possibly permit an earlier return to motion and activity.¹⁵

Coetzee and Ebeling²⁵ described the preliminary results of a randomized clinical trial where 12 patients received screw fixation and were compared with 12 patients who had fixation with the Arthrex Tightrope technique to repair syndesmotom injuries at a mean follow-up of 2.3 years. They found that the mean AOFAS ankle and hindfoot scores for the screw group were lower compared to the Tightrope technique group, but this was not statistically significant (88 vs. 94 points, $P = .149$). In addition, in the screw fixation group, 1 screw was removed for prominence and 1 for failure, while 1 device was removed in the Tightrope group for infection.²⁵

In another study, Thornes et al.²⁷ directly compared syndesmosis fixation using screw fixation and suture-button fixation, with respect to AOFAS score and return to work time. In this study, 16 patients who had syndesmotom injuries that were treated with suture-button fixation were compared to a control group of the same size with similar injuries who were treated with screw fixation. The mean AOFAS scores were significantly better in patients who had suture-button fixation compared to the screw fixation group at both 3- (91 vs. 80 points) and 12-months (93 vs. 83 points).²⁷ In addition, they found that the suture-button fixation allowed patients to return to work sooner than with screw fixation (2.8 vs. 4.6 months). This study concluded that suture-button fixation is both safe and effective for patients, without the need for a second procedure.²⁷

However, others have found that the Tightrope fixation may require additional procedures. In a systematic review, Schepers²⁸ reported on 253 patients and compared the Tightrope system to syndesmotom screw fixation, and found that the AOFAS score for the Tightrope fixation group was marginally, albeit not significantly, better compared to the screw group (89.1 vs. 86.3 points).²⁸ The implant removal rate for Tightrope was 10% and for the screw fixation removal rate was 51.9%.²⁸ The studies reviewed in the study by Schepers²⁸ are summarized in Table 3.

When comparing outcomes of syndesmotom injuries, the most important prognostic factor is anatomic reduction. Mechanical studies simulating physiologic cyclic loading of both syndesmosis disruptions repaired with one tricortical 3.5 mm screw or Tightrope fixation demonstrated no significant differences in the syndesmotom gapping.²⁹ Though trans-syndesmotom screw fixation exhibited improved stiffness and a higher load to failure, clinical observational studies demonstrated no significant differences in outcomes between screw fixation and suture-button methods.²⁹

As with all new techniques, follow-up studies need to be performed to assess for risks and complications. Although the short-term literature for suture-button fixation of syndesmotom injuries seems encouraging, there have been reports of complications. One such study, by Willmott and David,³⁰ described six patients who were treated with suture-

button fixation, and although the fixation was successful at reducing the joint (mean medial clear space reduction was 4.0 mm); two patients required removal of the tightrope hardware, both of which were due to soft tissue swelling and irritation.³⁰ While suture-button fixation aims to be a promising treatment for syndesmotom injury, further studies are necessary to assess the efficacy and complications from the procedure.

4. Arthroscopy with debridement

Delayed diagnosis of syndesmotom injuries may lead to chronic ankle pain, instability, and accelerated arthritic degeneration. Conventional treatment of chronic syndesmotom injuries involves open or arthroscopic debridement of disorganized scarred tissues (most commonly involving the ligaments making up the syndesmosis), anatomic reduction of the joint space, and stable trans-syndesmotom fixation in an attempt to achieve stable fixation of the syndesmosis.²⁹ Arthroscopy is indicated for patients who have failed nonoperative methods for at least 3–6 months.³¹ Although arthroscopy with debridement cannot directly reduce joint injuries, it does offer adjunctive treatment of chronic syndesmotom injuries, along with diagnostic purposes and treatment of complications associated with chronic injuries.

Arthroscopy with debridement alone is not an adequate choice of treatment when it comes to chronic syndesmotom injuries because of its inability to fix and reduce the joint. However, it is frequently utilized prior to fixation and reduction of the joint as an adjunct therapy. Ankle arthroscopy is commonly performed prior to internal fixation during the same operative setting to remove inflamed synovium, unstable cartilage, loose bodies, fibrosis, and impinging osteophytes.³¹ This step is crucial to allow for proper implantation of hardware, and to obtain adequate range of motion postoperatively. Yang et al.³² demonstrated the benefits of arthroscopic exploration and debridement in a prospective study of 34 patients who had Weber type C ankle injuries and concomitant syndesmotom injuries. There were 22 patients who were treated with open reduction and internal fixation only and the remaining 12 patients were treated with open reduction and internal fixation plus direct syndesmosis exploration and debridement. They reported that all of the fractures healed at a mean of 13 weeks, and compared to the open reduction internal fixation only group, the group that had direct syndesmosis exploration and debridement had better mean AOFAS scores (86.7 vs. 79.9 points, $P < .05$) and better Olerud and Molander scores (86.7 vs. 77 points, $P < .05$).³²

In addition to its benefit as an adjunctive therapy, arthroscopy with debridement can be used to assess joint instability, even if it has been previously shown to be stable on radiological evaluation. In a case series performed by Takao et al.,³³ 38 patients who had Weber type B distal fibular fractures were evaluated to determine if syndesmotom disruption was also present. Antero-posterior images of the joints identified 16 of 38, mortise images identified 21 of 38, and ankle arthroscopy identified 33 of 38 patients who had syndesmotom disruption.

Arthroscopy can be an invaluable tool for diagnosing and treating chronic syndesmotom injuries. This is especially true in cases of previously diagnosed stable symptomatic syndesmosis injuries that were found to be unstable via arthroscopy and debridement.³⁴

Although arthroscopy with debridement is not effective for the stabilization of the syndesmosis, it can be beneficial for treating symptoms associated with chronic syndesmotom injuries, specifically osteoarthritis. In a study by Carpenter et al.,³⁵ 12 patients who had at least grade II osteoarthritis were treated with arthroscopic debridement and had a median follow-up of 14 months. This group demonstrated significant improvements in pain scores from the pre-to postoperative periods (8–3 points, $P = .002$). In an additional study performed by Richardson et al.,³⁶ a total of 20 ankles diagnosed with arthritis were treated with arthroscopic debridement, of which 80% (16 patients) reported an initial resolution of their pain following the procedure. It is interesting to note that in a prospective cohort study of 26 patients, Baums et al.³⁷ showed no significant differences in clinical outcomes

Table 3

Summary of studies included in the systematic review by Schepers,²⁸ which sought to evaluate treatment of unstable ankle fractures with concomitant syndesmotom injury treated with suture-button device.

Study	Year	Level of Evidence	Patients, Controls (n, n)	Follow-Up (months)	Score (maximal score)	Points (Patient vs. Control)	Implant Removal (months: Patient vs. Control)	Complications	Implant Failure
Naqvi et al. ⁵²	2011	IV	49, none	24	AOFAS (100) FADI (100)	85.6 81.2	3 (prior to technical alteration)	2	None
Qamar et al. ⁵³	2011	IV	16, none	26	AOFAS (100)	86.9	1	2	None
DeGroot et al. ⁵⁴	2011	IV	24, none	20	AOFAS (100)	94	6	None	None
Willmott et al. ³⁰	2009	IV	6, none	5	–	–	2	None	None
Treon et al. ⁵⁵	2009	IV	18, none	4–41	=	–	4	6	2
Rajkumar et al. ⁵⁶	2009	III	12, 12	14	OMAS (100) SB earlier mobilization and return to work	86	–	–	–
Gadd et al. ⁵⁷	2009	IV	38, none	14–42	–	–	3	2	None
Coetzee and Ebeling ²⁵	2009	I	12, 12	28	AOFAS (100)	94 vs. 88	1 vs. 1	–	None
Cottom et al. ⁵⁸	2009	III	25, 25	10	modAOFAS (63) SF12	51 vs. 54 102 vs. 102	0 vs. 17	–	None
McMurray et al. ⁵⁹	2007	IV	16, none	5	AOFAS	87	2	1	None
Thornes et al. ²⁷	2005	III	16, 16	12	AOFAS (100) SB earlier return to work	93 vs. 83	0 vs. 12	None	None

after 2 years between patients who underwent anterior soft tissue debridement compared to anterior bony debridement, with a 96% success overall. Further research is needed in order to determine the specific injuries that would benefit from which arthroscopic debridement.

Despite the benefits, ankle arthroscopy can be associated with a number of complications including injuries to nerves, vessels, tendons, ligaments, or cartilage, as well as, deep and superficial infections. Additional complications could be scarring and reflex sympathetic dystrophy/complex regional pain syndrome.³⁸

5. Arthrodesis

Stabilizing a chronic syndesmotom injury utilizing arthrodesis is a relatively uncommon procedure. It is often performed as a last resort for patients who suffer from chronic tibiotalar arthritis who have failed other operative or nonoperative measures.^{16,39} The goal of ankle arthrodesis is to relieve pain and maintain or improve function. There are conflicting opinions among orthopaedists, as well as limited evidence to suggest the optimal condition and patients for this procedure. The clinical efficacy of using arthrodesis to fix the ankle mortise is still controversial.⁴⁰

Katznelson et al.⁴¹ reported on 5 patients who were treated with ankle arthrodesis, that included using a bone plug from the tibia and fibula, and they found that fusion occurred within 10 weeks of the procedure. All of the patients were pain free one year after surgery.⁴¹

An additional study performed by Olson et al.⁴⁰ enrolled 10 patients who underwent ankle syndesmosis arthrodesis at a mean of 9 months after their initial injury, and were followed for a mean of 3.4 years. They found that the mean AOFAS score improved (37–87 points, $P < .05$) and the mean pain score also improved (17–31 points, $P < .05$); however, the ankle motion score did not significantly change. There were a number of complications, including malunion, removal of hardware, and a re-operation rate of 50%.⁴⁰

Additionally, in a meta-analysis, Parlamas et al.,⁴² reported on the treatments for chronic syndesmotom injuries, and they found that the treatment success rates were 87.9% for screw fixation, 79.4% for arthrodesis, and 78.7% for arthroscopic debridement.

6. Conclusion

Syndesmotom ankle injuries are common, and while they are

typically diagnosed around at the time of injury, those syndesmosis injuries that are misdiagnosed or inadequately treated within the acute stage can lead to chronic syndesmosis injuries. Chronic syndesmotom ankle injuries can cause significant morbidity and can be associated with pain and poor function. Various operative treatment options have been used; however, controversy exists as to whether one is superior over the other. Screw fixation is still regarded as the gold standard surgical technique for the management of chronic syndesmotom injuries, despite a continuous debate over the size of screws and the number of cortices purchased. Suture-button fixation has been associated with better functional scores and quicker return to work, which may therefore constitute a plausible future alternative. The advantage of ankle arthroscopy and debridement stems mainly from its adjunctive therapeutic value prior to the joint's fixation and reduction in the context of lesions associated with chronic syndesmotom injuries. Patients diagnosed with chronic tibiotalar arthritis who do not benefit with conservative and surgical treatment may elect for an ankle arthrodesis; however, this operative modality is performed as a last resort. While this study reviewed the current evidence for these various procedures for the treatment of chronic syndesmotom injuries, further prospective studies are necessary to determine the type of treatment that should be indicated for specific ankle syndesmosis injuries.

Declaration of competing interestCOI

The Authors declare that there are no conflicts of interest.

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