

# Assessment of lateral malleolus weber C fractures' outcomes in patients undergoing syndesmosis-only fixation versus syndesmosis and fibular fixation

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## Introduction

Ankle fractures were associated with syndesmosis injuries, so it is very important to gain accurate anatomical reduction of the ankle mortise and good fixation of the disrupted syndesmosis.

## Aim

Aim of this study was to assess lateral malleolus Weber C fractures' outcomes in patients undergoing syndesmosis-only fixation versus syndesmosis and fibular fixation.

## Subjects and methods

The present study was designed as a randomized controlled clinical trial study that included all patients presenting to the emergency room at Suez Canal University hospital after an ankle twisting injury causing lateral malleolus Weber C fracture.

## Results

Patients who had performed syndesmosis-only were found to have significantly higher tibiofibular clear space (AP and mortise views) at 6 months only compared to those who had syndesmosis and fixation. Also, There was no statistically significant difference between syndesmosis-only and syndesmosis with fixation groups in regard to medial clear space, incidence of soft tissue infection, delayed union, Complex regional pain syndrome or all items of OMAS scale.

## Conclusions

There was a significantly stability and nearby functional outcomes with a minimally invasive technique in the group managed by syndesmosis-only fixation and the group managed by syndesmosis and fibular fixation. The results are optimistic regarding the benefits of syndesmosis-only fixation in patients with lateral malleolus Weber C fractures. However, more confirmatory studies need to be done.

## Keywords:

Plate, syndesmotic screw, tight rope

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## Introduction

Distal tibiofibular Syndesmotic injuries present in about 10% of ankle joint fractures, and such damage usually occurs by a twisting and external rotation force which leads to external rotation of the talus in mortise this in turn leads to cut of the ligaments of the distal tibiofibular syndesmotic joint. It may be associated with syndesmotic or supra-syndesmotic fibular fracture (Danis-Weber type B and C respectively) [1,2].

To ensure optimum functional outcomes in treating ankle fracture with syndesmotic joint disruption, it's important to restore ankle mortise and to fix the disrupted syndesmotic joint [2].

The single most important predictor of good functional outcome of ankle fractures with syndesmotic injury is the anatomic reduction of the syndesmosis, regaining the fibular length, and achieving the correct rotation of the fibula relative to the tibia [3–5].

The injury to distal tibiofibular syndesmosis is expected to be in cases with a fibular fracture high in the level of the syndesmotic joint. Traditionally, these syndesmotic injuries need internal fixation. However, it has been recently clarified that a screw of syndesmosis should be recommended for fibular fractures that are located above the ankle joint more than 3.5 cm with deltoid ligament injury, or above the ankle joint for 15 cm with concomitant medial malleolus fracture [5,6].

Despite the currently better understanding of the indications for syndesmotic screw, the role of fibula internal fixation in the case of supra-syndesmotic fracture is still unclear. When the diaphyseal fracture of the fibula is found in the proximal one-third or

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middle, putting an internal fixation could lead to some evitable risks, particularly if the soft tissue is affected. Thus, if anatomical reduction can be achieved, internal fixation might be unnecessary [7].

Several studies have assessed the role of syndesmosis-only fixation in lateral malleolus supra-syndesmotic Weber C fractures; however, the literature lacks a detailed comparison between the outcomes of syndesmosis-only versus syndesmosis and fibular fixation in these fractures.

**Aim**

The study aimed to obtain the best functional results with a minimally invasive technique; syndesmosis-only fixation in patients with lateral malleolus Weber C supra-syndesmotic fractures.

**Patients and methods**

**Study design**

Randomized controlled clinical trial.

Using coin method.

**Study setting**

The current study was carried out at the Orthopedics department.....

Study population: All patients presenting to the emergency room (ER) after a twisting ankle injury causing lateral malleolus Weber C fracture were enrolled in this study. Radiography with an AP, lateral, and mortise views were primarily requested, and syndesmosis disruption was determined by measuring the tibiofibular clear space (TCS), which corresponded to the horizontal area between the border of the fibular medial cortex and dense line of the notch of tibiofibular located at 1cm above the ankle joint in an AP and mortise views. If the TCS was exceeding 5 mm, then syndesmotic disruption was diagnosed.

**Inclusion criteria**

Adult patients (≥18 years) of both genders.

lateral malleolus Weber C fracture on radiography, AP view with tibiofibular clear space exceeding five millimeters and associated medial malleolar/deltoid ligament disruption (medial clear space more than 4mm).

**Exclusion criteria**

- (1) Patients with multiple injuries or open fractures.
- (2) Patients with delayed presentation more than 6 weeks after the injury.

- (3) Patients with syndesmotic injury and proximal fibula fractures (Maisonneuve type).
- (4) Patients with associated intra-articular pathological fractures.

**Study procedure**

Data were collected in three phases: preoperative, operative, and postoperative phases. Patients' radiological and functional outcomes were assessed. A designated form was used to document patients' demographic and clinical data all through the study period.

**The pre-operative phase**

- (1) This phase focused mainly on patients' selection from the study population and pre-operative evaluation of the selected patients.
- (2) All patients presenting to the ER with a twisting ankle were assessed and were initially managed with cast immobilization, analgesia, and elevation. Patients meeting our selection criteria were given a thorough explanation of the procedure, its value, and the surgical techniques used. Those who gave a consent to join in this study were enrolled.
- (3) Full medical history to document their demographic characteristics and the mechanism of injury were determined. Then, radiologically evaluated to measure the width of the syndesmotic joint by measuring the medial clear space (MCS) and the tibiofibular clear space (TCS) in radiography AP and mortise (anteroposterior 15-degree internal rotation) views. Radiological evaluation was done by the same surgeon in order to minimize any bias as much as possible.
- (4) Certain drugs should be stopped such as aspirin, NSAIDs as they increase the risk of bleeding. Also, steroids may slow down bone and/or soft tissue healing
- (5) Nicotine should be stopped as they slows down the blood flow and so increases the risk of DVT
- (6) Surgery done after edema and bullae subsided (10–14 days) and skin wrinkles appear to avoid wound complication.
- (7) Prophylactic antibiotic (ceftazidime 2g as third generation cephalosporins) should be administered within 30 to 60 min before skin incision. The dose is increased to 3g if weight is more than 120 kg.

**The operative phase**

*Intra-operative evaluation of the syndesmosis*

The syndesmotic distal tibiofibular joint disruption was established intra-operatively under fluoroscopic control by external rotation stress test, in which the examiner (the principal investigator) stabilized the proximal tibia

and gripped the ankle in neutral flexion at a 90° between the tibia and the hind-foot. After that constant force application of external rotation to the ankle mortise. The disruption of syndesmosis was confirmed if TCS greater than 5 mm, or distal tibiofibular overlapping TFO less than 5 mm measured at 1 cm proximal to tibial plafond as seen on the fluoroscopy.

To minimize the bias, only the same surgeon performed all operations. At first, the lateral ankle structures were internally fixed, and then the medial malleolus was fixed in all patients either by two partially serrated screws or a tension band. The recommended treatment was followed only with patients in whom the anatomical restoration of the distal syndesmotom joint and maintenance of fibular length can be achieved. Other cases were excluded from this study. Then the fixation was done as follows:

- (1) Syndesmosis-only fixation: Through a small lateral skin incision, a syndesmosis screw was inserted. Restoring the length of the fibula and rotation was assessed under fluoroscopic control and Shenton's line of ankle joint is restored. Then, a single tricortical cortical screw (3.5 mm) with washer was introduced through the syndesmosis about 2 cm proximal to the tibiotalar joint line (According to AO principles of fracture management).
- (2) Syndesmosis and fibular fixation: First, a 3.5 mm cortical lag screw was introduced through the fracture site to fix the fracture, after that a 7-hole 1/3 tubular plate with six 3.5 mm cortical screws were used to fix the fracture with 6 cortices of fixation, then this syndesmotom fixation was followed.

#### *Post-operative phase*

Following the operation, a below-knee plaster splint were used in all patients. And they were requested to follow-up in out-patient clinic in 2 weeks for surgical wound care and skin sutures removal. Afterwards, removable plaster cast was applied for 4 weeks to allow gradual affable movements of ankle joint out of cast. During this period, non-weight-bearing mobilization were followed using crutches. Then, radiography of ankle AP, lateral and mortise views were done to assess accurate reduction and ankle joint stability and fracture healing. In case of improving clinically and radiologically, syndesmotom screws were removed under local anesthesia 6–8 weeks after surgery, and ankle joint range of motion and partial weight-bearing were permitted. All patients followed a specific rehabilitation Exercise Program.

#### *Outcome measures*

- (1) Radiological evaluation: at follow-up, patients' tibiofibular syndesmosis was re-assessed by measuring TCS and MCS. These measures were taken immediately postoperative, 6 weeks, 3 months, and 6 months and in comparison, to the pre-operative variables.
- (2) Postoperative complications: including soft tissue infection, delayed union, DVT, complex regional pain syndrome (CRPS) were recorded.
- (3) Assessment of patients' functionality: assessment of all Patients by using Olerud-Molander Ankle Score (OMAS) during last follow-up appointment. This was a self-administered objective scoring system that evaluate patients' functionality through nine different items. These items include stiffness, oedema, pain, abilities to climb the stairs, running, jumping, squatting, supports, and activities of daily living. The total score ranges from 0 (totally impaired) to 100 (completely unimpaired). Patients' scores were interpreted as: excellent (91–100), good (61–90), fair (31–60), and poor (0–30). The original questionnaire was translated into Arabic by a certified translation office without any alteration or loss of its concepts. The researcher discussed all items with the translator to ensure that questionnaire's accuracy can be ascertained. The translated version of the questionnaire was tested for accuracy and piloted to ensure its clarity.

All assessments were done by another physician who was not informed of the surgical technique performed for each patient, to minimize any bias.

#### *Data analysis*

- (1) Data of Patients were passed in a Microsoft Excel sheet and then analyzed by the Statistical Package for Social Sciences (SPSS) software program version 25.0.
- (2) Data was presented as tables and graphs.
- (3) For descriptive analysis, continuous data were expressed as mean±standard deviation, whereas categorical variables will be expressed as frequencies and percentages.
- (4) Student t-test and ANOVA were used to compare TCS-AP, TCS-M, MCS, and OMAS scores between different groups, whereas Chi-square test will be used to compare categorical outcomes such as post-operative complications.
- (5) Pearson correlation coefficient was used to study the correlations between TCS-AP, TCS-M, MCS, OMAS scores and the other variables.

**Table 1 Demographic characteristics of patients among both groups**

Variables	Syndesmosis-only group (n=27)	Syndesmosis and fixation group (n=27)	P-value
Age (y), mean±SD	54.56±12.95	60.81±12.66	0.73 <sup>a</sup>
Sex, n (%)			
Male	14 (52)	12 (44.4)	0.59 <sup>b</sup>
Female	13 (48)	15 (55.6)	
Chronic illness	12 (44.4)	17 (62.9)	
Hypertension	7 (25.9)	9 (33.3)	0.55 <sup>b</sup>
Diabetes mellitus	5 (18.5)	8 (29.6)	0.34 <sup>b</sup>

<sup>a</sup>P-value are based on Man-Whitney U test. Statistical significance less than 0.05.

<sup>b</sup>P-value are based on Chi-Square test. Statistical significance less than 0.05.

<sup>c</sup>P-value are based on fisher Exact test. Statistical significance less than 0.05.

**Table 2 Comparison of tibiofibular clear space (AP view) between patients with syndesmosis-only and syndesmosis and plate fixation groups post-operatively**

Variables	Syndesmosis-only group (n=27)	Syndesmosis and fixation group (n=27)	P-value
Tibiofibular clear space (AP view)			
Preoperative	8.44±1.19	8.78±1.25	0.324 <sup>a</sup>
Immediately postoperative	3.22±0.8	2.85±0.82	0.123 <sup>a</sup>
After 6 months	4.30±0.91	3.74±0.98	<b>0.03<sup>a</sup></b>

<sup>a</sup>P-value are based on Man-Whitney U test. Statistical significance less than 0.05.

**Table 3 Comparison of tibiofibular clear space (mortise view) between patients with syndesmosis-only and syndesmosis and fixation groups postoperatively**

Variables	Syndesmosis-only group (n=27)	Syndesmosis and fixation group (n=27)	P-value
Tibiofibular clear space (mortise view)			
Preoperative	8.44±1.19	8.59±1.12	0.589 <sup>a</sup>
Immediately postoperative	2.78±0.64	2.44±0.7	0.063 <sup>a</sup>
After 6 months	3.74±0.81	3.22±0.8	<b>0.017<sup>a</sup></b>

<sup>a</sup>P-value are based on Man-Whitney U test. Statistical significance less than 0.05.

**Table 4 Comparison of medial clear space (MCS) between patients with syndesmosis-only and syndesmosis and fixation groups post-operatively**

Variables	Syndesmosis-only group (n=27)	Syndesmosis and fixation group (n=27)	P-value
Medial clear space (MCS)			
Preoperative	3.56±0.7	3.41±0.64	0.41 <sup>a</sup>
Immediately postoperative	1.98±0.4	1.96±0.36	0.79 <sup>a</sup>
After 6 months	2.21±0.51	2.15±0.36	0.684 <sup>a</sup>

<sup>a</sup>P-value are based on Man-Whitney U test. Statistical significance less than 0.05.

(6) Results were statistically significant at a P-value less than 0.05 and highly significant at p-value less than 0.001.

## Results

Table 1 display demographic component of patients among both groups. Patients mean age in both groups, was comparable (54.56±12.95 vs 60.81±12.66) years. About 44.4% of the patients in syndesmosis-only group had chronic illness, while about 63% of the patients in the syndesmosis and fixation group had diabetes and hypertension.

There was no statistically significant difference between the two groups in any of the demographic characteristics.

Table 2 found that there was no statistically significant difference between patients with syndesmosis-only and syndesmosis and fixation groups in regard to tibiofibular clear space (AP view) preoperatively (P=0.324), immediately after operation (P=0.123), 6 weeks postoperative (P=0.117) and 3 months postoperative (P=0.061). On the other hand, patients who had performed syndesmosis-only were found to have significantly higher tibiofibular clear space (AP view) at 6 months compared with those who had syndesmosis and fixation (P=0.03).

Table 3 found that there was no statistically significant difference between patients with syndesmosis-only and syndesmosis and fixation groups regarding tibiofibular clear space (mortise view) preoperatively (P=0.589), immediately after operation (P=0.063), 6 weeks



**Table 5 Comparison of postoperative complications between patients with syndesmosis-only and syndesmosis and fixation groups post-operatively**

Variables	Syndesmosis-only group (n=27)	Syndesmosis and fixation group (n=27)	P-value
Soft tissue infection			
Absent	26 (96.3)	24 (88.9)	0.61 <sup>a</sup>
Present	1 (3.7)	3 (11.1)	
Delayed union			
Absent	23 (85.4)	23 (85.2)	0.91 <sup>a</sup>
Present	4 (14.8)	4 (14.8)	
Complex regional pain syndrome			
Absent	27 (100)	24 (92.6)	0.49 <sup>a</sup>
Present	0 (0)	2 (7.4)	

Data are presented as number (%)

<sup>a</sup>P-value are based on Chi-square test. Statistical significance less than 0.05.

**Table 6 Comparison of patients' functionality between patients with syndesmosis-only and syndesmosis and fixation groups postoperatively**

Variables	Syndesmosis-only group (n=27)	Syndesmosis and fixation group (n=27)	P-value
Olerud and Molander ankle scale (OMAS)			
Pain	20±4.8	19.63±4.58	0.65 <sup>a</sup>
Stiffness	9.26±2.67	10±1.5	0.15 <sup>a</sup>
Swelling	9.07±2.42	9.44±1.6	0.65 <sup>a</sup>
Stair climbing	9.63±1.33	8.70±2.23	0.07 <sup>a</sup>
Running	4.26±1.81	3.89±2.12	0.49 <sup>a</sup>
Jumping	4.07±1.98	4.26±1.81	0.9 <sup>a</sup>
Squatting	4.26±1.81	4.26±1.81	0.9 <sup>a</sup>
Supports	9.26±1.81	9.26±1.81	0.72 <sup>a</sup>
Activities of daily living	16.67±3.67	17.04±3.47	0.63 <sup>a</sup>

<sup>a</sup>P-value are based on Mann-Whitney U test. Statistical significance less than 0.05.

**Table 7 Comparison total Olerud and Molander ankle scale between patients with syndesmosis-only and syndesmosis and fixation groups**

Variables	Syndesmosis-only group (n=27)	Syndesmosis and fixation group (n=27)	P-value
Sex, n (%)			
Excellent	12 (44.4)	11 (40.7)	0.86 <sup>a</sup>
Good	11 (40.7)	13 (48.1)	
Fair	4 (14.8)	3 (11.1)	

<sup>a</sup>P-value are based on Fisher Exact test. Statistical significance less than 0.05.

postoperative ( $P=0.062$ ) and 3 months postoperative ( $P=0.093$ ). On the other hand, patients who had performed syndesmosis-only were found to have significantly higher tibiofibular clear space (mortise view) at 6 months ( $3.74\pm 0.81$ ) compared with those who had syndesmosis and fixation ( $3.22\pm 0.8$ ) ( $P=0.017$ ).

Table 4 compares the medial clear space (MCS) between patients with syndesmosis-only and syndesmosis and fixation groups.

It was found that there was no statistically significant difference between patients with syndesmosis-only and syndesmosis and fixation groups preoperatively ( $P=0.41$ ), immediately after operation ( $P=0.79$ ), 6 weeks postoperative ( $P=0.90$ ), 3 months postoperative ( $P=0.473$ ) and 6 months postoperative ( $P=0.684$ ).

Table 5 shows that patients in the syndesmosis and fixation group had total incidence of complications

(9 patients, 33.3%) more than that occurred in the Syndesmosis-only group (5 patients, 18.5%). However, there was no statistically significant difference between syndesmosis-only and syndesmosis and fixation groups regarding the incidence of soft tissue infection (0.61), delayed union (0.91) or Complex regional pain syndrome ( $P=0.49$ ).

The 4 cases of infection were treated by daily dressing and based on culture and sensitivity the antibiotic was given and complete healing occurred. While the two cases of regional pain syndrome were treated by physiotherapy and gabapentin and anti-elevation measures.

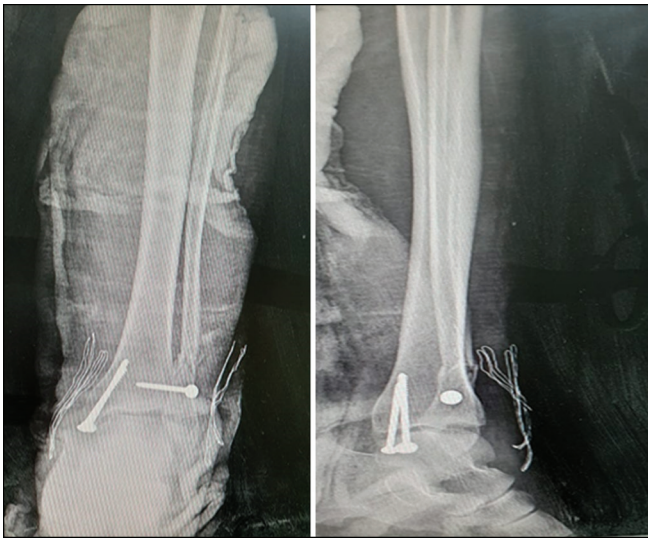
Table 6 compares the patients' functionality between syndesmosis-only and syndesmosis and fixation groups. It was found that there was no statistically significant difference between patients with syndesmosis-only and syndesmosis and fixation groups in regard to all items of OMAS scale.

Figure 1



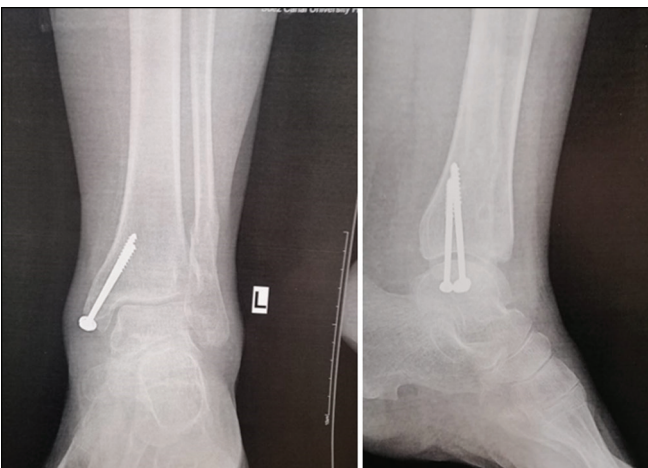
Weber c fracture.

Figure 2



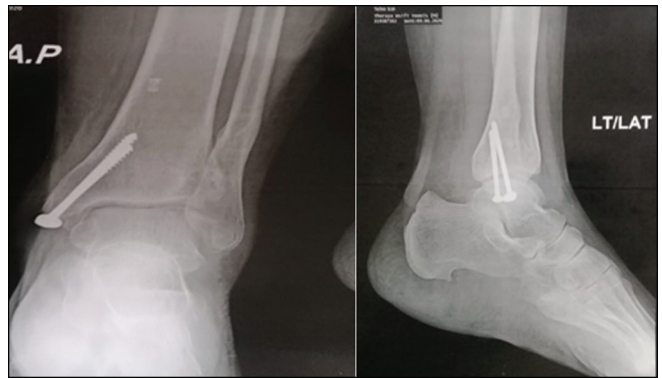
Immediate post operative ap and lat. views.

Figure 3



6 weeks post operative removal of syndesmotomic screw.

Figure 4



6 months postoperative.

Figure 5



Weber C fracture.

Figure 6



Immediate postoperative ap and lat. Views plate and syndesmotic screw.

Table 7 About 45% of the patients in the syndesmosis-only group were classified in the excellent category according to Olerud-Molander Ankle Score scale Figs 1–4

While about 50% of the patients in the syndesmosis and fixation group Figs 5 and 6

Were classified in the good category according to OMAS scale. Overall, there was no statistically significant difference between patients with syndesmosis-only and syndesmosis and fixation groups regarding OMAS grade ( $P=0.86$ ).

## Discussion

This study was designed as a randomized controlled clinical trial the randomization by coin that included patients with lateral malleolus Weber C fracture who attended the emergency room after an ankle twisting injury. Patients in this study were randomly classified into two groups: group A included patients who underwent syndesmosis-only fixation and group B included patients who underwent syndesmosis and fibular fixation. This study aims to compare the clinical and radiological outcomes of syndesmosis-only fixation versus syndesmosis and fibular fixation in patients who had Weber C lateral malleolus fractures.

Patients mean age, in both groups, was comparable ( $54.56 \pm 12.95$  vs  $60.81 \pm 12.66$ ) years. More than half of the patients in both groups came from rural areas. About 44.4% of the patients in the syndesmosis-only group had a chronic illness, while about 63% of the

patients in the syndesmosis and fixation group had diabetes and hypertension.

## Joint stability

### Comparison of tibiofibular clear space (AP view)

Increased Tibiofibular clear space usually denotes an unstable joint [6]. In the present study, it was found that Tibiofibular clear space (AP View) was  $8.44 \pm 1.19$  postoperatively in the syndesmosis only group. It was also found that there was no statistically significant difference between patients with syndesmosis-only and syndesmosis and fixation groups regarding tibiofibular clear space (AP view) preoperatively ( $P=0.324$ ), immediately after operation ( $P=0.123$ ), 6 weeks postoperative ( $P=0.117$ ) and 3 months postoperative ( $P=0.0061$ ). On the other hand, patients who had performed syndesmosis-only were found to have significantly higher tibiofibular clear space (AP view) at 6 months compared with those who had syndesmosis and fixation ( $P=0.03$ ).

### Tibiofibular clear space (mortise view)

It was found that there was no statistically significant difference between patients with syndesmosis-only and syndesmosis and fixation groups regarding tibiofibular clear space (mortise view) preoperatively ( $P=0.589$ ), immediately after operation ( $P=0.0063$ ), 6 weeks postoperative ( $P=0.062$ ) and 3 months postoperative ( $P=0.0093$ ). On the other hand, patients who had performed syndesmosis-only were found to have significantly higher tibiofibular clear space (mortise view) at 6 months ( $3.74 \pm 0.81$ ) compared with those who had syndesmosis and fixation ( $3.22 \pm 0.8$ ) ( $P=0.017$ ).

### Medial clear space (MCS)

It was found that there was no statistically significant difference between patients with syndesmosis-only and syndesmosis and fixation groups preoperatively ( $P=0.41$ ), immediately after operation ( $P=0.79$ ), 6 weeks postoperative ( $P=0.90$ ), 3 months postoperative ( $P=0.473$ ) and 6 months postoperative ( $P=0.684$ ).

Other studies, Sipahioğlu *et al.*, [1] studied the outcomes of the syndesmosis only fixation in cases of Weber C suprasyndesmotoc fractures with distal tibiofibular injury. Results showed declines in anteroposterior tibiofibular space and lateral fibular space which were statistically significant relationship. Medial mortise distance preoperatively was  $3 \pm 1.9$  mm (range 2–11 mm) and postoperatively  $2.1 \pm 0.5$  mm (range 1–3 mm) [1].

In addition, Mohammed R, [6] studied the fixation of syndesmotic only for suprasyndesmotoc Weber-C fractures of ankle joint with the injury of syndesmotic ligament. The study included 12 patients and results



showed that the reduction of mortise of the ankle joint occurred in all patients except one patient. In this patient, syndesmotom screw removed by the of the eighth weeks, leading to late diastasis. Nonunion of the fibula occurred and revision surgery was done with bone grafting and internal fixation [6].

#### Postoperative complications

In this study, it was found that patients in syndesmosis and fixation group had total incidence of complications (9 patients, 33.3%) more than that occurred in Syndesmosis-only group (5 patients, 18.5%). However, there was no statistically significant difference between syndesmosis-only and syndesmosis and fixation groups in regard to incidence of soft tissue infection (0.61), delayed union (0.91) or Complex regional pain syndrome ( $P=0.49$ ).

There was some complications that treated such as superficial tissue infection (2 patients of plate and syndesmosis fixation), DVT (2 patients of syndesmosis only group) and syndesmotom screw breakage after walking (2 patients of plate and syndesmosis fixation group).

Mehta *et al.*, [8] who studied the most common complications after ankle fractures reported that patients of a young age are at risk of having osteoarthritic change post-trauma with a substantial effect on the duality of life because of pain and compromised function. Patients of old age, especially those who had uncontrolled diabetes and osteoporosis are at high risk of surgical wound complications, infection and failure of internal fixation [8].

On the other hand, according to Leyes *et al.*, [9] After surgical intervention of ankle fractures, Complications attributed to patient characteristics can be (e.g., age, obesity, diabetes, alcohol abuse, lowered immunity, and noncompliance), complications attributed to fracture factors can be (e.g., open fractures, comminution), and finally complications attributed to iatrogenic factors (e.g., inaccurate reduction, joint penetration by screws, early removal of syndesmotom screws) [6].

#### Patients' functionality

It was found that there was no statistically significant difference between patients with syndesmosis-only and syndesmosis and fixation groups regarding all items of the OMAS scale.

About 45% of the patients in the syndesmosis-only group were classified in the excellent category according to the OMAS scale while about 50% of the

patients in the syndesmosis and fixation group were classified in the good category according to the OMAS scale. Overall, there was no statistically significant difference between patients with syndesmosis-only and syndesmosis and fixation groups in regard to OMAS grade ( $P=0.86$ ).

Several studies demonstrate that anatomic reduction of the distal tibiofibular syndesmotom joint is the only most significant indicator of good functional result of ankle joint fractures with distal tibiofibular syndesmotom injury [2]. Maintaining the length of fibula and keeping the accurate rotation of the fibula relative to the tibia are necessary for achieving of tibiofibular relationship [5].

Similarly, in the retrospective observational study by Mohammed R. [6] twelve patients were included and they had ankle fracture Weber type-C. They were managed by syndesmosis only fixation. The results reported that at an average period of follow-up of 13 months (range 7–21 months), functional outcome using the OMAS was 75. Four (33%) patients had excellent outcome, 6 (50%) patients had good outcome, and 2 (17%) patients had fair outcome [6].

On the other hand, syndesmosis and fixation was assessed by Mohapatra and Raj [10] who studied the functional results of malleolar fractures of ankle joint managed by open reduction and internal fixation. In interfragmentary lag screw was used to fix fibulae fragments after which 3.5 mm Low contact dynamic compression plate/ distal fibula anatomical LCP was applied. Seventeen (32%) patients had excellent results, 27 (51%) patients had good results, seven (13.3%) patients had fair and two (3.7%) patients had poor results respectively [10].

As with any other study, the present study had some limitations first, the study size was relatively small. Second, the follow-up period was also relatively short. It is recommended to start further studies with a much longer follow-up period to evaluate long-term results. This study assesses only acute syndesmotom injury and doesn't include chronic syndesmotom injuries. Nevertheless, one of the advantages of the present study is that it is considered one of very few studies to assess the outcomes of syndesmosis only procedures in the management of Lateral Malleolus Weber C Fractures.

In conclusion, syndesmosis-only fixation is a good and effective method of treatment for Weber type-C lateral malleolar fractures with syndesmotom joint disruption.



It is minimally invasive and gives similar results to syndesmosis with fibular fixation.

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## Conclusion

The study was a randomized controlled clinical trial study, that reported that there was significant stability and nearby functional outcomes with a minimally invasive technique in patients managed by syndesmosis-only fixation and those managed by syndesmosis and fibular fixation. The results are optimistic regarding the benefits of syndesmosis-only fixation in patients with Weber type-C ankle fractures with syndesmotic joint disruption. However, many confirmatory studies need to be done.

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The authors have seen and approved the content and have contributed significantly to the work.

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Nil.

## Conflicts of interest

The authors declare no conflict of interest.

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## References

- 1 Sipahioglu S, Zehir S, Isikan E. Weber C ankle fractures with tibiofibular diastasis: syndesmosis-only fixation. *Acta Ortop Bras* 2017; 25:67–70.
- 2 Weening B, Bhandari M. Predictors of functional outcome following transsyndesmotic screw fixation of ankle fractures. *J Orthop Trauma* 2005; 19:102–8.
- 3 Monga P, Kumar A, Simons A, Panikker V. Management of distal tibiofibular syndesmotic injuries: a snapshot of current practice. *Acta Orthop Belg* 2008; 74:365.
- 4 Bell DP, Wong MK. Syndesmotic screw fixation in Weber C ankle injuries—should the screw be removed before weight bearing?. *Injury* 2006; 37:891–8.
- 5 Beumer A, Campo MM, Niesing R, Day J, Kleinrensink G-J, Swierstra BA. Screw fixation of the syndesmosis: a cadaver model comparing stainless steel and titanium screws and three and four cortical fixation. *Injury* 2005; 36:60–4.
- 6 Mohammed R, Syed S, Metikala S, Ali SA. Evaluation of the syndesmotic-only fixation for Weber-C ankle fractures with syndesmotic injury. *Indian J Orthop* 2011; 45:454.
- 7 Dawson B, Trapp RG. *Basic and clinical biostatistics*. Singapore 2004; 2001:141–2.
- 8 Mehta SS, Rees K, Cutler L, Mangwani J. Understanding risks and complications in the management of ankle fractures. *Indian J Orthop* 2014; 48:445–52.
- 9 Leyes M, Torres R, Guillén P. Complications of open reduction and internal fixation of ankle fractures. *Foot Ankle Clin* 2003; 8:131–47.
- 10 Mohapatra A, Raj K. Functional outcome after surgical treatment of ankle fracture using Baird Jackson score. *Int J Res Orthop* 2018; 4:638.