

Dear Fang-Fang Ji,

thank you very much for the review of our manuscript. Please find enclosed our revised manuscript "Management of syndesmotic injuries – what is the evidence?" (27218) with responses to the comments of the Editors and Reviewer. We thank the Editors and the Reviewers for their valuable comments.

We hope that the revised version of our manuscript is now appropriate for publication in the World Journal of Orthopedics.

Please find our comments to the reviewer concerns by point-by-point responses. In the revised manuscript track changes indicate the revisions.

**Reviewed by 00739181**

Management of syndesmotic injuries is always the hot topic in the orthopaedic conference. There are many different views of diagnosis and treatment of the injury, and no consensus has reached in many issues about this injury. So, it is valuable to discuss this topic. The object of the article is to provide a current concepts review of the clinical presentation, diagnosis and treatment of syndesmotic injuries, and to supply some evidence in treating the injury. But in my opinion, there are some deficiencies in the article.

1. There are different views in diagnosis and treatment of the injury, and no consensus has reached in many areas, such as diagnosis before and in operation, fixation types, evaluation of the reduction in operation and hardware removal, et al. The author should lay out some important contemporary views. For example, as to intraoperative assessment of reduction of syndesmosis, open reduction of syndesmosis or comparing the X-ray views to another normal ankle are also important, which are accepted by many surgeons. But the author only focuses on 3-D CT which is somewhat not so popular nowadays.

Answer: Thank you for this important comment. We agree with the reviewer, that intraoperative assessment of reduction and 2D radiographs are accepted by many surgeons. However, as described in our manuscript (Line 276-282) it is difficult to assess the accuracy

of reduction by open reduction or 2D fluoroscopy. Therefore, we decided to put some focus of this review on the intraoperative assessment of reduction of the syndesmosis. We believe that the intraoperative visualization by open reduction and 2D-fluoroscopy alone may not be helpful to detect malalignment of the syndesmosis in every patient. This is confirmed many previous reports that have been cited in the review. As shown by our study group, intraoperative 3D imaging might be a possible solution to overcome these problems. We have analyzed the results of 251 patients with syndesmotic injuries with intraoperative assessment with 3D imaging. In 82 patients (32.7%), malreduction of the syndesmosis or the stabilized fractures was found on the three-dimensional scan despite the fact that the fracture appeared to be adequately reduced on 2D fluoroscopy. Even if 3D imaging is not popular nowadays, we think it is important to keep this message in the manuscript as it provides some new information that has not been described in a review about syndesmotic injuries before. Alternatively, a postoperative CT can be performed to check the reduction of the syndesmosis as described in the review.

2. For the Radiographs, AP, lateral and mortise views may be not enough to evaluate the injury. The gravity stress view before and in the operation is also important. Can the author address this more detailedly?

Answer: Thank you for this comment. We have added the method of the manual stress test and the gravity stress view in the revised manuscript.

Line 142

In addition to plain radiographs, manual or the gravity external rotation stress radiographs can be applied to the injured ankle to evaluate the integrity of the deltoid ligament [23]. The amount of medial clear space widening of  $> 5$  mm is highly suspicious for a rupture of the deep deltoid ligament. As a limitation of the manual stress test it should be mentioned that the amount of applied force necessary when performing an external rotation stress radiograph is not well defined and mainly determined by the patient's pain level [23].

3. Hardware removal is also the matter. The authors did not mention about the hardware removal or not, when to remove, complications after removal and complications when not removal, but all these are the matters that orthopaedic surgeons care about.

Answer: We completely agree with the reviewer that hardware removal is also an important issue. Therefore, we have added the aspects of “hardware removal or not, when to remove, complications after removal and complications when not removal” in the revised manuscript.

Line 225

A possible disadvantage of the syndesmotic screw is the need for implant removal. In general, the syndesmosis takes 8 to 12 weeks to heal, and afterwards removal of the hardware is recommended by most authors [38]. However, the hardware removal is accompanied by high complication rates such as wound infection, re-occurrence of screw breakage and diastasis during removal [39]. Alternatively, the syndesmotic screw can be left in situ. Schepers published a review with 472 patients included with retained syndesmotic screws. Eighty patients had loose diastasis or broken screws [40]. Despite this, there were no significant differences in clinical outcome between retained or removed screws.

4. Rigid fixation and elastic fixation of syndesmosis are the types that used in the injury, and there are controversial points. The authors only related to the Tightrope fixation. Can the authors analyze and compare the two fixations in detail.

Answer: We agree with the reviewer, that the method of fixation is an important aspect in the treatment of syndesmotic injuries. Therefore, we have added a detailed description of rigid vs. elastic fixation in the revised manuscript.

Line 242

Currently, debate exists over rigid screw fixation versus suture button techniques as the ideal fixation method. The theoretical advantages of a suture-button device over metallic syndesmotic screws are that it allows physiologic motion at the syndesmosis while maintaining the reduction, less risk of hardware pain and subsequent implant removal, and it may permit earlier return to motion as there is no risk of screw breakage and subsequent recurrent syndesmotic diastasis [41]. In a cadaveric study, Teramoto et al. sequentially assessed native syndesmosis ligament stability, suture button, and screw fixation for diastasis in six anatomic specimens [42]. With anatomically directed fixation, there was no significant difference in diastasis for any fixation technique compared with the intact native ligaments.

However, screw fixation provided the most rigid fixation and greatest stability against external rotation force.

In the last two decades, many authors have sought to compare suture button techniques versus rigid fixation with cortical screws [26]. To date, for isolated unstable syndesmosis injuries, no study has shown suture button techniques to be inferior to rigid fixation with regard to joint stability and patient satisfaction.

**Reviewed by 02689728**

well written.

Answer: Thank you!

**Reviewed by 02699758**

The authors demonstrated the overview for diagnosis and treatment of ankle syndesmotric injuries. This paper is concise and well written. I recommend this manuscript is accepted with following minor revisions.

1. I agree with the use of 3.5 or 4.5 mm cortical screws for syndesmotric injury. Do the authors have any comment on the time of screw removal?

Answer: According to literature screw removal is recommended after 8 to 12 weeks. We have added this aspect in the revised manuscript.

Line 226

In general, the syndesmosis takes 8 to 12 weeks to heal, and afterwards removal of the hardware is recommended by most authors [38].

2. Bioabsorbable screws are also used for fixation of distal tibiofibular joint. Those are no need for removal, and there might be no problem if those are broken during weight bearing. Do the authors have any comment on the use of bioabsorbable screws?

Answer: Thank you for this comment. We have added one paragraph about bioabsorbable screws as an alternative fixation device in syndesmotic injuries.

Line 234

Another alternative fixation device are bioabsorbable screws. Bioabsorbable screws can be used instead of syndesmotic screws for stabilization of the syndesmosis but have the advantage that screw removal is unnecessary. A recently published review compared the results of bioabsorbable and metallic syndesmotic screws [38]. Bioabsorbable syndesmotic screws and metallic syndesmotic screws were comparable with respect to the incidence of complications and range of motion. However, the absolute number of complications was greater with bioabsorbable screws (23.4% vs. 5.7%). Most frequent complications of bioabsorbable screws were wound-related complications in 19.7% of the patients.

**Reviewed by 01220036**

accepted

Answer: Thank you!