Author’s response to reviews

Title: The application of intraoperative ankle dislocation approach in the treatment of the unstable trimalleolar fractures involving posterior ankle comminuted fracture: a retrospective cohort study

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Reviewer reports:

Mariano Fernández-Fairén, MD, PhD (Reviewer 1): The technique that the authors present in this paper is a kind of summation of the classical posterolateral approach with the use we all make of the existing articular laxity postfracture to have a greater view and achieve a better reduction of the fragments.

Response: Thanks for your kindly review and concern. I will respond the question through three aspects:

First of all, the exposure and subsequent reduction and fixation of this technique is achieved via a medial incision not posterolateral approach.
In addition, as mentioned in the discussion section of the manuscript, based on the pathological classification of posterior malleolar fractures proposed by Haraguchi et al [18], the posterolateral approach is more suitable for type I fractures (fracture fragment is located laterally), and the conventional medial approach or posteromedial approach is more advantageous for type II fractures. Regarding the type III fractures (comminuted fractures, i.e., complicated posterior malleolar fractures), none of the above approaches can expose the articular surface sufficiently. Currently, little effort has been made to investigate the optimal treatment approaches for trimalleolar fractures involving posterior comminuted fractures and no definite criteria are available. In the present study, we introduced a novel intraoperative lateral ankle dislocation approach during surgical treatment for patients with unstable trimalleolar fractures involving posterior ankle comminuted fractures and compared its effects and safety with those with conventional approach. During follow-up, we found that the intraoperative ankle dislocation approach reduced the incidence of traumatic arthritis and improved ankle function but not compromised the rate of primary union, rate of talus necrosis, and union time. Moreover, it had the advantages of being a reproducible and simple operation.

As per the advantages, our approach indeed had a greater view which allows better reduction of fracture fragments. In addition, our technique will not damage the ankle-stabilizing structures and affect the anatomical structures surrounding the ankle, and thus can minimize the surgical damage. The findings of our approach show better functional outcomes and lower incidence of traumatic arthritis while not compromised the primary healing and healing time.

The approach they recommend is poorly described (Page 6, line 56).

Response: Thanks for your concern, the sentence has been corrected in the revised manuscript and as follows: After routine disinfection, an 8-cm skin incision was made along the middle line of the medial side of the tibia towards the tip of the medial malleolus (Figure 2). Please check it.

Figures 3 and 4 are the same.
Response: Thanks for your concern. However, these two figures showed different conditions actually. Fig.3. The distal articular surface of the tibia was exposed after dislocation. Fig.4. The posterior malleolar fracture after separation was anatomically reduced to the distal ends of the tibia under direct vision and then internally fixed with Kirschner wire. I have rephrased the descriptions of the figure legends of these two figures in the revised manuscript, please check them.

The peeling and free manipulation of the fragments has a serious risk of devascularization, which does not seem to us at all harmless.

Response: Thanks for your professional review and concern. The peeling and free manipulation of the fragments indeed has a risk of devascularization. However, it will be hard to achieve complete reduction if the displaced fragments were not removed, which may result in a greater influence on the smooth of the articular surface. This will affect the surgical curative effects. Thus we select the harmless manipulation. The findings of this study show that our technique produces no adverse effects due to no occurrence of delayed union and union. Thus, this type of free dissection is useful to improve prognosis in patients with trimalleolar ankle fractures. In the other surgical approaches, reduction of the articular surface could not be performed under direct vision. The main advantages of our technique is that the intraoperative ankle dislocation approach will not damage the ankle-stabilizing structures and affect the anatomical structures surrounding the ankle, and thus can minimize the surgical damage. In addition, our technique allows reduction of the articular surface of the posterior malleolus under direct vision. The intraoperative dislocation of the ankle can sufficiently expose the articular surface of the posterior malleolus. Then, reduction and fixation of the comminuted fracture fragments of the posterior malleolus can be performed under direct vision.

Overall, regarding this question, I have stated detailedly and marked them in the revised manuscript, please check them.
The other serious problem is soft tissue injury. Do they get in 7 days to eliminate the swelling of these tissues?

Response: Thanks for your concern. Postoperative swelling is not uncommon. In this study, affected limb elevated exercise was routinely conducted to decrease the swelling after surgery. In addition, mannitol infusions (250 ml) were administered twice daily for 3 days and discontinued unless there was no obvious wound swelling. I have added above descriptions in the revised manuscript, please check it.

What do you mean, page 10 line 34, "All fractures were newly closed"?

Response: Thanks for your concerns. “All fractures were fresh closed fractures” may be much better.

Except the incidence of traumatic arthritis between both groups, the difference between the other parameters is not significant.

Response: Thanks for your kindly review and concerns. Our technique provide better functional outcomes and lower incidence of traumatic arthritis compared to the conventional approach. In addition, the other advantages of our technique have been stated in the discussion section and other part of the manuscript. Intraoperative ankle dislocation approach will not damage the ankle-stabilizing structures and affect the anatomical structures surrounding the ankle, and thus can minimize the surgical damage. In addition, our technique allows reduction of the articular surface of the posterior malleolus under direct vision. The intraoperative dislocation of the ankle can sufficiently expose the articular surface of the posterior malleolus. Then, reduction and fixation of the comminuted fracture fragments of the posterior malleolus can be performed under direct vision. In addition, our technique not compromised the other parameters such as primary healing and healing time that you referred, our technique provide an alternative option for this kindly of fracture and thus may deserves further research.
However, based on your concern and other reviewers, I have rephrased the conclusion section in order to make a more objective description in the revised manuscript, please check them.

Was the postraumatic arthritis estimated according to a bimodal way yes / no? The comparison should be made according to the different levels of arthritis expressed in some existing classifications.

Response: Thanks for your kindly review and concern. Posttraumatic arthritis was estimated according to a bimodal way yes/no. Due to no occurrence of posttraumatic arthritis in the control group, thus we not specifically compared different levels of arthritis because it is not the emphasis on discussing. I wish you can allow it.

Niccolo Petrucciani (Reviewer 2): The article is a retrospective study on intraoperative ankle dislocation approach in the treatment of the unstable trimalleolar fractures, including 69 patients treated with the conventional or the novel approach. The topic is interesting, methods are well described and promising results are reported. The techniques are well described and the article is well written. I really appreciated this work, I have only one comment.

In the conclusions, the authors state that this approach is better than the conventional surgical approach and can be recommended. I think that the conclusions should be mitigated, considering that the study is retrospective and include only a small cohort of patients, as specified also in the limits.

Response: Thanks for your kindly review and suggestions, I have rephrased it in order to make it more exact and objective in the revised manuscript and as follows: This approach appears to be better than the conventional surgical approach for the treatment of unstable trimalleolar fractures involving comminuted posterior malleolar fractures. Large-scale prospective randomized controlled trials and multi-institutional studies are required to confirm and modify our findings in the future. Please check it.