

Reviewer #1:

Scientific Quality: Grade C (Good)

Language Quality: Grade A (Priority publishing)

Conclusion: Minor revision

Specific Comments to Authors: This study evaluated the strength to failure of locking plate in a fibula pro-tibia construct versus standard locking plate fixation in an ankle fracture saw bone model. It has been found that the fibula pro-tibia locking plate construct demonstrates biomechanical superiority to standard locking plates. Generally, this is an interesting study. It found a new and relatively more stable fixation construct for the syndesmotic ankle fractures. However, there are a few concerns that need to be clarified: 1. There may not be similar between the saw bone and osteoporotic bone. 2. The Locking Plate in fibula pro-tibia Configuration may prevent micro moving for the syndesmosis. It probably needs to be removed before full weight bearing. 3. There are no talus and ankle joint for the biomechanical testing. They may influence the testing results.

Many thanks for reviewing our paper.

1) We agree that there may be a difference between the saw bone and osteoporotic bone. However, we have tried to minimise this by using osteoporotic saw bone models. (Bariteau et al, 2014). We did explore the methodology of using matched embalmed elderly cadaveric legs. However, this is complicated by the United Kingdom's strict Human Tissue Act regulations and the cost of obtained cadaveric legs with DEXA scan to prove it was definitely osteoporotic. We believe using osteoporotic saw bone models was the best cost effective way to answer our question.

2) We have used this in clinical practice for 5 years now and we are following up this cohort of patients. Indications include osteoporotic elderly patients, poorly controlled diabetic patients, neuropaths. This study was to provide a biomechanical basis of this clinical practice. Prior to locking plates, tetracortical fixation was used to augment osteoporotic fixation and was known as Fibula Pro-tibial fixation (Koval et al 1997). Our Fibula Pro-Tibial locking fixation utilises the combined pull-out strength of locking screws to ensure a more biomechanical stronger construct. By using a tricortical fixation, this ensures that the fixation is not as rigid as non-locking tetracortical fixation and ensure some syndesmosis micro movement. We have to bear in mind that these are low demand patients. We are not advocating this fixation method for a functionally active elderly patient. We do not routinely remove the locking screws in our clinical practice and have not encountered any issues with broken screws. We believe this is due to the tricortical fixation.

This has been included in the final paragraph of the discussion section.

3) We bought full osteoporotic saw bone models of leg including the talus and foot. However after consultation with the laboratory's technicians and Prof of Engineering at the University, the talus and foot is not required as we are measuring torque.

References

Bariteau JT et al. A biomechanical evaluation of locked plating for distal fibula fractures in an osteoporotic sawbone model. *Foot Ankle Surg* . 2014;20(1):44-7.PMID: 24480499

Koval KJ et al. A new technique for complex fibula fracture fixation in the elderly: a clinical and biomechanical evaluation. *Journal of Orthopaedic Trauma*, 1997; 11(1): 28-33.

Many thanks
Mr Tosan Okoro; on behalf of all co-authors

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