The Peroneus Brevis and Plantar Fascia Are Related To Proximal 5th Metatarsal Fractures

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Disclosures

NO CONFLICT TO DISCLOSURE

Our disclosures are in the Final AOFAS Mobile App

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Introduction

- Proximal fifth metatarsal fractures (PFMF) are among the most common fractures in the foot.

- The plantar fascia (PF) and peroneus brevis (PB) insert at the base of the fifth metatarsal.1-4

- The relation of the PB and PF to the pathophysiology of PFMF remains controversial.

1Jones R. I. Annals of surgery, 1902
3Theodorou DJ, et. al., Radiology, 2003
Aim

Better understanding of the anatomy is required for better investigation of the fracture mechanism. The aim of this study was:

1. To define the footprint of the PB and PF insertions on the 5th metatarsal

2. To define the relation of PB and PF to the different zones of PFMF.
Methods

• IRB approved study

• 21 cadaveric fifth metatarsals

1. Placing 3 reference screws in the bone, 2 distally and 1 proximally
2. CT scan
3. 3D reconstruction in Rhinoceros, v5.0
4. Digitization of PB, PF and reference screws on 3D bone model
5. Simulation of the PFMF zones on the bone

6. Determination of shape, location and surface areas of both insertions and their relation to the different fractures zones
Methods

2. Reference screws were placed within the bone.
Methods

3 and 4.
Reference screws, PB and PF were mapped on the 3D model.

\(^1\text{Lawrence SJ, et. al., Foot & ankle, 1993}\)
6. Footprint of the PB and PF in relation to the different fracture zones
Results

PB insertion
- Oval shaped
- Dorsal side base of the bone
- Surface area of $88.1 \pm 46.4 \text{mm}^2$
- 100% of zone 1 PFMF (21/21), 29% (6/21) of zone 2 PFMF

PF insertion
- Oval shaped
- Around tip of the tuberosity
- Surface area of $150.7 \pm 53.6 \text{mm}^2$
- 100% (21/21) of zone 1 PFMF, 43% (9/21) of zone 2 PFMF
Conclusions

- PB and PF insertions are involved in all zone 1 PFMF and a significant percentage of zone 2 PFMF.

- The location of tendon insertions affects forces exerted on the bone.

- There may be a relation of the PB and PF insertions with the fracture mechanism of many zone 1 and 2 PFMF.

- In the treatment of these fractures, care should be taken to maintain or restore the anatomy of these insertions to maximize functional outcomes.
Clinical significance

- PB and PF may affect the pathophysiology of all Zone 1 fractures and a significant percentage of Zone 2 fractures:

To optimize healing of PFMF, forces of the PB and PF insertions that exert on the bone must be considered when treatment options are being determined.