Study Title:
Tension Side PlantarMax Lapidus Plate Fixation Does Not Weaken the Anterior Tibial Tendon

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Matthew Buchanan- I have a potential conflict with this presentation due to being a paid consultant for Merete Medical

David Goodwin- I have no potential conflicts with this presentation

Jihui Li- I have no potential conflicts with this presentation
Introduction

The Plantarmax™ Lapidus plate (Merete Medical, New Windsor, NY, USA) is a recently developed plantar plate indicated for use with the Lapidus procedure (Fig. 1). Plantar plate application utilizes the tension band principle by converting a tensile force to a compressive force on the convex (plantar) side of the foot. As a result, patients are permitted to bear weight immediately after surgery and may also have a lower incidence of symptomatic hardware because of the larger soft-tissue envelope on the plantar aspect of the foot.

The Plantarmax lapidus plate design was based on four distinct advantages: superior tension sided fixation, medial locking or non locking screw fixation, interfragmentary compression screw through the plate across the tarsometatarsal joint for additional fixation, and immediate weight bearing compared to traditional 4-6 week non weight bearing protocols, allowing the patient to resume normal daily activities immediately post-operatively.

Early clinical results of the Plantarmax lapidus plate for medium to high intermetatarsal angle hallux valgus corrections have been promising. During the plate’s design and early clinical use, one potential concern with the Plantarmax lapidus plate is that its application may partially disrupt the anterior tibial tendon’s insertion onto the medial cuneiform and base of the first metatarsal.

Methods

Eight matched pairs of human cadaveric legs were sectioned through the mid-tibia. All specimens underwent exposure of the insertion of the anterior tibial tendon through a standard medial approach. One specimen from each pair was randomly selected and then underwent PlantarMax plate application with screw fixation, while the other specimen was left in its native form. The specimen was fixed on a MTS material testing systems (MTS Inc., Eiden Prairie, MN) and the anterior tibial tendon was loaded until failure at 1mm/s with notation of the site of failure (Fig. 2). Paired student t-test was used to determine the significance of the difference between the two groups. Statistical significance was defined as α<0.05.

Results

The mean load to failure was 853.5N (standard deviation 253.0N) in the Plantarmax lapidus plate group and 854.8N (standard deviation 268.1N) in the native foot group. The difference between the two groups was not significant (p=0.97).

The most common modes of failure were anterior tibial tendon midsubstance tears (n=6) and tearing of the anterior tibial tendon from the 1st metatarsal without bone avulsion (n=6). There were no significant differences in failure patterns between the two groups.

Objectives

Present a biomechanical analysis of the anterior tibial tendon strength in specimens with and without Plantarmax lapidus plate applications.

Clinical Relevance

Further study is needed to determine biomechanical strength and clinical outcomes of the Plantarmax plate compared to other currently used fixation systems for the Lapidus procedure.

Conclusion

Application of the Plantarmax lapidus plate does not significantly weaken the anterior tibial tendon.

Figures

Figure 1: Plantarmax Lapidus Plate

Figure 2: Biomechanical Testing of the Plantarmax Lapidus Plate
References

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