BIOMECHANICAL ANALYSIS OF SCREW FIXATION AND DORSAL PLATING IN MYERSON B1 LISFRANC INJURY IN CADAVERS

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INTRODUCTION:

Current management of ligamentous Lisfranc injury is by open reduction and internal fixation. Screw fixation is considered the gold standard in managing such injury while other modes are gaining more popularity.

METHODS:

This is a cadaveric study, followed by finite element analysis to assess the stability of fixation between dorsal plating and screw fixation in ligamentous Lisfranc Myerson B1 injury. 8 cadaveric specimens free of any pathology to the foot is assessed and given the similar injury and divided randomly into 2 arms, dorsal plating (plate) and screw fixation (screw). All fixation is done by the same surgeon and is examined under xray to ensure reduction. All specimens are tested under axial load at 30° plantar flexion with a servohydraulic machine to measure diastasis under axial load of 350N and subsequently increased until failure. a CT scan of a young healthy subject at 36 years old is processed and modelled into 3 dimentional (3D) object, meshed and is fixed with similar fixation. The mesh is analysed in finite element analysis under axial loading to assess diastasis and stress distribution along implant.

RESULTS:

Statistical analysis of diastasis and load to failure between both group is analysed. As a result, both fixation is comparable in axial load, with p value of 0.7331 for axial loading and 0.956 for load to failure.

Table 1 showing biomechanical analysis of screw vs plate and Finite element analysis

Specimen (screw)	Load to failure (N)	Specimen (plate)	Load to failure (N)
Cad 1	382	Cad 2	398
Cad 3	675	Cad 4	353
Cad 5	434	Cad 6	751
cad 7	421	Cad 8	384
Mean	478	mean	471.5
Median	427.5	Median	391
P value	0.956		

Table 2 showing finite element result of screw vs plate group

Axial load 350N	Screw fixation	Plate fixation
Total deformation	12.4 mm	55mm
Diathesis of C1-M2	0.2mm	0.3mm

CONCLUSION:

Conclusion, screw fixation and dorsal plating for managing Lisfranc injury revealed similar strength and stability in biomechanical and finite element analysis.

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