Simulated arthroscopic hallux MT arthrodesis utilizing full thread compression screws shows similar stiffness and load to failure compared to locking plate, with less plantar gapping.

Alastair Younger, Ken Hunt, Judas Kelly, Richie Fuld, Nick Anderson, Todd Baldini

Study performed at the Biomechanics lab, University of Colorado
Disclosure

I, Alastair Younger declare that in the past 3 years:

I have received support from the following companies:
Zimmer, Bioventus, Cartiva, Acumed, Wright medical, Synthes, Ferring.

I have done consulting work for the following companies:
Zimmer, Ferring, Acumed, Wright medical

I have done speaking engagements for the following companies:
Zimmer, Acumed, Wright Medical

I hold individual shares in the following:
Cambie Surgery Centre, Specialist Referral Clinic, Footbridge Centre for Integrated Foot Care
MTP fusion

- Can be performed open or arthroscopic
- Arthroscopic procedure requires the use of screws
- With preservation of the subchondral bone plate full thread screws may have better fixation than full thread screws

Purpose:
- To compare the stiffness and strength of first MTP fusion in an arthroscopic model compared to standard dorsal plate fixation
Methods

• 16 feet (8 matched pairs) used
• 8 randomized to plate and cross screw
• 8 randomized to full thread cross screws
• Repeated cyclical load to determine stiffness
• Load to failure
• Comparison between plate and screw
• Correlation with bone density
Results

- Plantar gapping higher in the plate group
Failure mode

Failure in MTP fusion via plate bending

Failure of screw fixation by cut out
Effect of bone density on failure

Screw Failure Load vs. BMD
Pearson Correlation Coefficient $r = 0.938$

Locked Plate Failure Load vs. BMD
Pearson Correlation Coefficient $r = 0.619$
Effect of bone mineral density on fusion stiffness

Screw Stiffness vs. BMD
Pearson Correlation Coefficient $r = 0.790$

Locked Plate Stiffness vs. BMD
Pearson Correlation Coefficient $r = 0.359$
Summary

• Full thread cross screws give appropriate strength for arthroscopic ankle fusion

• Arthroscopic fusion and screw fixation may not be appropriate in elderly osteoporotic patients