Biomechanical Comparison of Four Different Lateral Plate Constructs for Distal Fibula Fractures

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My disclosure is in the Final AOFAS Program Book.
I have no potential conflicts with this presentation.
Introduction

- Displaced lateral malleolar fractures are often treated with lateral plate fixation

- We subjected a range of contemporary lateral fibula plates to a series of controlled mechanical tests designed to reveal performance differences
Methods

- Forty fresh frozen lower extremities were divided into four groups

- A Weber B distal fibula fracture was simulated with an osteotomy and stabilized using one of four plate systems:
  - Synthes one-third tubular plate with interfragmentary lag screw
  - Synthes LCP locking plate with lag screw
  - Orthohelix MaxLock Extreme low-profile locking plate with lag screw
  - TriMed Sidewinder non-locking plate

Sagittal plane bending test setup. Controlled bending load is applied 150 mm from center of fracture. Clinometer measures fibula shaft angulation relative to immobile distal fragment.
Methods

- Controlled monotonic bending and cyclic torsional loading were applied to quantify:
  - Bending stiffness
  - Torsional stiffness
  - Fracture site motion

Torsion testing apparatus. Rotation was applied to distal fibula fragment. Both distal fragment and fibula shaft rotation were monitored to accurately calculate motion at level of fracture.
Mean (n=10 per group) bending stiffness calculated between 1 Nm and 1.5 Nm of bending moment. Bending direction refers to distal fragment motion relative to the fibula shaft.
Results

Mean initial torsional stiffness calculated between 1.5 Nm and 2.0 Nm of torque. Rotation direction refers to distal fragment motion relative to the fibula shaft.
Results

Mean (n=10 per experimental group) fracture site angulation under 1.5 Nm bending moment. Bending direction refers to distal fragment motion relative to the fibula shaft.

Mean initial fracture site rotation under 2.0 Nm torsional moment. Rotational direction refers to distal fragment motion relative to the fibula shaft.
Conclusions

- Significant differences in plate performance were not demonstrated.

- The effects of bone quality variability and differences in interfragmentary screw trajectory resulted in data dispersion that confounded absolute ranking of plate performance.
References


