

Plate Positioning in Periprosthetic or Interprosthetic Femur Fractures With Stable Implants-A Biomechanical Study

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BACKGROUND

Angular stable plate fixation is a widely accepted treatment option for interprosthetic or periprosthetic femoral fractures with stable implants. This biomechanical study tries to establish a safe distance of the plate from the tip of a femoral prosthesis.

METHODS

A total of 38 composite femurs were reamed to an inner diameter of 23 mm to create an osteoporotic bone model. A Weber hip stem was cemented into each and a distal femoral NCB plate applied with the distance to the stem varying from 8 cm apart to 6 cm overlap in 2-cm steps. Each specimen was tested in cyclic axial loading (400 N-1500 N) and then cyclic torsion (0.6 Nm-50 Nm). Peak strain on the femur around the tip of the plate was measured with a 3D image correlation system and averaged over 26 cycles (excluding the first 3 and the last cycles). Finally, each femur was axially loaded to failure.

RESULTS

Strain increased with decreasing overlap or gap. Seven specimens failed early between 2-cm overlap and 2-cm gap. Results were divided into a far group with a distance of >4 cm and a close group of <4 cm. Strain was significantly higher in the close group for axial ($P < .001$) and torsional ($P < .001$) loading. Failure load was significantly lower in the close group ($P = .002$).

CONCLUSION

A minimal gap and/or overlap of at least 6 cm is recommended in osteoporotic bone to avoid stress risers.

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