

Evaluation of Two Different Methods of Fixation for Proximal Humerus Fractures

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Purpose: This study tests the hypothesis that a clover leaf plate with a tension band wire provides stiffer and stronger fixation in torsion than a cloverleaf plate without a tension band wire.

Introduction: Several methods are available for providing fixation of proximal humerus fractures which are commonly sustained in motor vehicle accidents and falls. Two such methods are a cloverleaf plate with or without a tension band wire. To insure proper bone healing the fractured ends of the bone must be rigidly fixed together. Torsional stiffness and torsional strength tests of a fractured humerus held together with a fixation device can be used to evaluate its ability to rigidly hold the fractured ends of bone together.

Methods: To test this hypothesis 10 embalmed humeri were procured from unidentified donors. To simulate a two-part fracture the head of the humerus was cut off at the surgical neck with a transverse cut. The head was then fixed to the shaft with a cloverleaf plate with or without a tension band wire. The shaft of the humerus was fixed to the base of the biaxial Instron and the head of the humerus was fixed to the actuator of the Instron (Figure 1 & 2). Torsional stiffness was determined by testing each fixed humerus in external rotation from 0.1 to 1.25 N*m at 1 Hz, 50 cycles, triangle wave form. The stiffness, N*m/degree was calculated from the average of 10 torque/rotation curves. Each humerus was then tested to failure in external rotation at 20°/second. Failure was defined as the peak torque or the torque reached at 45° rotation, whichever came first. Student's t-tests were used to determine if there was a significant difference ($p \leq 0.05$) in torsional stiffness and strength between the two groups.

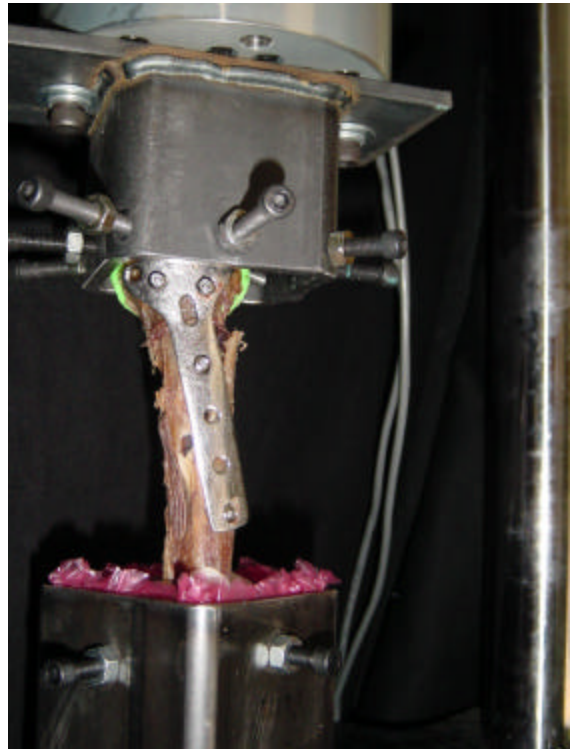


Figure 1 Cloverleaf Plate

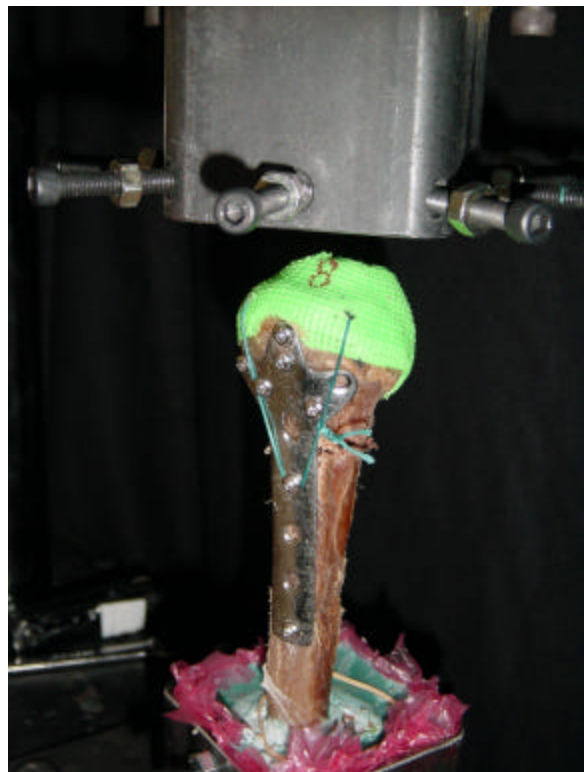


Figure 2 Cloverleaf Plate with Tension Band