

#2278 - Experimental Study / Free Papers

Stiffness Of Monoplanar And Biplanar Lateral Open Wedge Supracondylar Femur Osteotomies. A Comparative, Biomechanical Study

Orthopaedics / Knee & Lower Leg / Joint Preserving Surgery & Soft-tissue Repair

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Background

Lateral supracondylar femoral open wedge osteotomy is a less described option to correct valgus deformities of the distal femur. A monoplanar as well as a biplanar technique is possible. There is a lack in the literature in comparison of the biomechanical properties of both procedures.

Objectives

Our hypothesis was, that the biplanar open wedge osteotomy is superior to the monoplanar technique concerning axial and torsional stiffness.

Study Design & Methods

Eight composite femurs of the fourth-generation (Sawbones Europe AB, Malmö, Sweden) were used for testing. In all femurs the same lateral angle-locked plate was used (NCB© Distal Femur Plate, Zimmer-Biomet, Warsaw, USA). In all femurs a lateral distal supracondylar opening-wedge osteotomy was created. In four femurs a standardized monoplanar and in four femurs a standardized biplanar osteotomy was performed. All femurs were tested for axial and torsional load with a servo-hydraulic testing machine (Instron 8874, Instron Structural Testing GmbH, High Wycombe, UK). Each femur was tested with intact medial corticalis and with an on purpose attached fracture of the medial corticalis simulating an intraoperative fracture. Statistical analysis was performed using unpaired t-test (SPSS v. 23.0, Illinois, Chicago, USA). A value of $p < 0.05$ was considered significant.

Results

No damage to the bone, implant or construct was seen during the loading tests.

Axial stiffness was reduced in both groups by cutting the contralateral corticalis but no significantly ($p > 0.05$). No difference was seen between both groups with intact or with fractured contralateral corticalis ($p > 0.05$).

Torsional stiffness was reduced in both groups by cutting the contralateral corticalis for internal rotation ($p < 0.001$). No difference was seen between both groups with intact or with fractured contralateral corticalis ($p > 0.05$).

For external rotation, the torsional stiffness was only significantly reduced in the monoplanar group ($p < 0.001$), but not in the biplanar group ($p = 0.058$) after cutting the contralateral corticalis. The monoplanar group showed less torsional stiffness compared to the biplanar with intact ($p = 0.006$) or with fractured contralateral corticalis ($p < 0.001$).

Conclusions

No differences could be shown between a monoplanar and a biplanar lateral supracondylar femoral open wedge osteotomy for axial stiffness and for torsional stiffness concerned to internal rotation. The biplanar osteotomy showed better torsional stiffness for external rotation.