

STRAIN IN THE PROXIMAL FEMUR: THE EFFECT OF EXETER STEM IMPLANTATION AND POSITION

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This investigation has been designed to determine the strain patterns in the proximal femur prior to THA stem implantation (three specimens) and to compare this to the strain of the proximal femur implanted with an Exeter stem in both neutral (five specimens) and varus (four specimens) stem positions.

Sawbones femurs were implanted with Exeter stems. Implant position with respect to the femur was controlled using specially designed positioning devices. Implanted specimens were instrumented with strain rosettes positioned along the lateral and anterior aspects of the femur with a third rosette positioned at the medial calcar. A static anatomical loading vector of 650N was applied to the head of the implant for 7½ minutes. Data was gathered during the application of the load and for a further 7½ minutes following the removal of the load.

There was a significant variation in longitudinal strain at the medial calcar with a strain of $-1800\mu\epsilon$ observed on the native femur specimens and $-430\mu\epsilon$ and $-360\mu\epsilon$ measured on the neutral ($P=0.04$) and varus ($P=0.02$) stem position specimens respectively. No significant difference in proximal femoral strain in the longitudinal direction at the calcar was detected between neutral and varus stem positions. The magnitude of circumferential strain was reduced for both the neutral and varus stem positions when compared to the native femur. The similarity of the strain at the medial calcar for the neutral and varus specimens may explain why varus malposition of the Exeter stem has not been associated with adverse clinical outcomes.