Results: Within the first post-operative year 16 patients had radiographs demonstrating loosening (broken or mobile screws or plates) with eight patients demonstrating signs of a recurrent pubic diastasis. Within this group five patients required revision surgery. The remaining 11 patients did not have a worse functional outcome compared to the rest of the study group. Of the five patients requiring revision surgery, four did not have additional posterior pelvic fixation.

Conclusions: Loosening of anterior metalwork, while common, is not in itself an indication for revision surgery. Additional posterior fixation may reduce anterior metalwork revision rates.

doi:10.1016/j.injury.2010.07.463

1A.52

The biomechanics of lag screw insertion: a comparison of the Synthes Dynamic Hip Screw, Dynamic Helical Hip Screw, Proximal Femoral Nail Antirotation and the Stryker Gamma 3 lag screws

M.J.H. McCarthy, J. McFarlane*, R. Long, R. Weston, S. Gheduzzi, J. Keenan, A. Miles

CT2 Trauma and Orthopaedics, Royal Devon and Exeter Hospital, United Kingdom

E-mail address: johnmcfarlan@gmail.com (J. McFarlane).

Objectives: To compare the biomechanical properties of lag screw insertion in a laboratory model. Two blades, the Synthes Dynamic Helical Hip Screw (DHHS) and Proximal Femoral Nail Antirotation (PFNA), and two screws, the Synthes Dynamic Hip Screw (DHS) and Stryker Gamma 3 lag screw, were compared.

Setting: Orthopaedic biomechanics laboratory.

Design: Insertion testing was carried out in high- and low-density polyurethane foam mounted and attached to a Zwick Roell Amsler Hydrowin.

Outcome measures: The axial load and torque during insertion of the implants was measured.

Results: The force required to insert the DHHS and PFNA blades was greater than the DHS and Gamma 3 screws into both low- and high-density foam. The force required to insert the DHHS and PFNA blades into high-density foam was greater than low-density foam. The torque required to insert the DHHS and PFNA blades into high-density foam was less than that to insert the DHS and Gamma 3 screws. The torque required to insert the DHS and Gamma 3 screws into low-density foam was less than the DHHS and PFNA blades. The torque during insertion of the DHHS and PFNA blades seemed to be independent of foam density.

Conclusions: The insertional properties of blades are significantly different to screws and this may have clinical importance.

doi:10.1016/j.injury.2010.07.464

A biomechanical analysis of lag screw position in the femoral head for cephalomedullary nails used to fix unstable peritrochanteric fractures

P.R.T. Kuzyk[a,*], G. Higgins[a], R. Zdero[b], S. Shah[b], M. Olsen[b], J.P. Waddell[a], E.H. Schemitsch[a]

[a] *Division of Orthopaedic Surgery, University of Toronto, Toronto, ON, Canada*
[b] *Martin Orthopaedic Biomechanics Laboratory, St. Michael's Hospital, Toronto, ON, Canada*

Purpose: Minimizing tip–apex distance (TAD) has been shown to reduce clinical failure of extramedullary sliding hip screws used to fix peritrochanteric fractures. The purpose of this study was to determine if such a relationship exists for the position of a cephalomedullary nail lag screw in the femoral head.

Methods: Long Gamma 3 nails (Stryker, Mahwah, NJ) were inserted into 30 intact synthetic femurs. An unstable four-part fracture was created, anatomically reduced, and repaired using one of 5 lag screw placements in the femoral head (Fig. 1): (1) superior, (2) inferior, (3) anterior, (4) posterior, and (5) central. All specimens were radiographed in the anterioposterior and lateral planes, and radiographic measurements including TAD and a calcar referenced tip–apex distance (CalTAD) were calculated (Fig. 2). All specimens were tested for axial, lateral, and torsional stiffness, and then loaded to failure in the axial position. ANOVA was used to compare means of the five treatment groups. Linear regression analysis was used to compare stiffness and load-to-failure (dependant variables) with radiographic measurements (independent variables).

Results: The inferior lag screw position had significantly greater mean axial stiffness than superior ($p < 0.01$), anterior ($p = 0.02$) and posterior ($p = 0.04$) positions. Analysis revealed significantly less mean torsional stiffness for the superior lag screw position com-

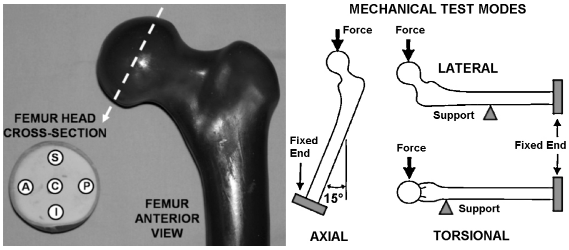
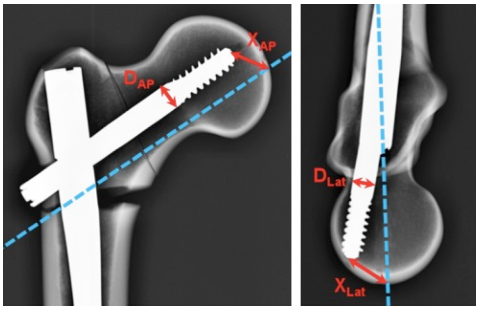


Fig. 1. (A) Photo of a cross-section of the synthetic femoral head illustrating the five different positions of the lag screw: S = superior, I = inferior, A = anterior, P = posterior, and C = central. (B) Axial, lateral and torsional testing positions.



$$\mathrm{CalTAD} = \left(X_{AP} \times \frac{D_{True}}{D_{AP}}\right) + \left(X_{Lat} \times \frac{D_{True}}{D_{Lat}}\right)$$

Fig. 2. Calculation of the calcar referenced tip–apex difference (CalTAD) based on (A) AP and (B) lateral radiographs. D_{True} = known diameter of the lag screw (10.5 mm).