Calcium Phosphate Augmentation of Screw Fixation in Femoral Neck Fracture

To improve the fixation stability of medial femoral neck fractures in osteoporotic bone, the use of injectable materials such as polymethylmethacrylate and calcium phosphate cement have been proposed. Significant improvement of the strength of fracture fixation augmented with calcium phosphate cement inserted into the drilled hole and in the region of inferior comminution, before screw insertion, has been reported (1). This study evaluates the strength of fixation using the new concept cannulated hip screws in a medial femoral neck fracture in osteoporotic bone augmented with calcium phosphate cement (Biopex, Mitsubishi Material). The hypothesis examined is that calcium phosphate cement introduced through the screw after implantation provide increased construct stiffness, compared with fixation without augmentation.

Materials and Methods:
Commercially-available six mm diameter cannulated titanium hip screws with a large central hole were used (DePuy, Warsaw IN). In the threaded portion of the screw, 9 side holes, 2mm in diameter, were evenly distributed in three directions. These side holes were created within 20mm of the tip of the screw (Fig. 1).

DISCUSSION:
Augmentation of cannulated screws used for femoral neck fracture fixation showed increased stiffness compared with un-augmented fixation. This may be because the cement which was drawn into the trabecular bone around the screws resulted in protection from cut out. The results from this experimental model suggest that augmentation with calcium phosphate cement using fenestrated cannulated screws may increase fracture site stability (via increased construct stiffness), especially in porotic bone. In addition, the advantage of this method of augmentation is that the cement is not leaking into the joint capsule through the fracture site, compared with the method in which the cement was injected into the holes drilled before inserting the screws (1). The physiological effects of the calcium phosphate cement in soft tissue, on fracture healing, in the femoral head and on stability of the fracture over time, and the effect of the holes in the threaded portion the screws are important issues that require further investigation.

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