

Biomechanical Augmentation Of Locked Plating System In Osteoporotic Proximal Humeral Fractures Using Novel Bioactive Cement

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INTRODUCTION:

The fixation of osteoporotic proximal humeral fractures by locking plate can be augmented by local filling of bioactive bone cement. The purpose of this study was to test if local filling of a novel strontium-containing hydroxyapatite (Sr-HA) bone cement can improve the outcomes of fixation of a locking plate system in a cadaveric proximal humeral fracture model.

MATERIALS AND METHODS:

Twelve pairs of formalin-treated cadaveric humeri were used. One side of six pairs was for the cemented group while the other side was for the control group. The bone mineral density of all samples was tested. A three-part-fracture model was created, reduced and fixed by the proximal humerus locking plate (PHILOS, DePuySynthes, USA). A 1cm gap was created between the proximal and distal part of the humeri. In the cemented group, the most proximal four screw holes were filled with 2ml Sr-HA bone cement, with 0.5ml in each hole. In the control group, the screw holes were not filled by cement. Locking screws were inserted in a standard manner before the cement hardened. X-Ray of the samples was taken before all the specimens being subjected to mechanical study, in which six pairs were used for varus bending test while other six pairs were used for axial rotational test.

RESULTS:

The median (minimal-maximal) of the BMD of all specimen was 0.528(0.343-0.770) g/cm. No significant difference was found in BMD between two groups. The X-Ray showed that the implant was in position

with cement filling surrounding the most proximal four screws in the cemented group. Better mechanical outcomes were found in the cemented group in terms of lower maximal per cycle motions between the head and shaft fragments in both axial loading test and the rotational test. Statistically significant difference between the cemented and the controlled group was found in the varus bending test study, but not in the axial rotation test.

DISCUSSIONS:

There were several limiting factors in the study, including relative small sample size, long term biomechanical effects of bioactive cement not demonstrated

CONCLUSIONS:

The local filling of Sr-HA bone cement enhances fixation of the PHILOS locking plate in cadaveric proximal humeral fracture model. The improvement is found statistically significant in the varus bending test but not in the axial rotation test.