



Proximal Humeral Fracture Plate



Physician Profile

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ORIF of a 3-part proximal humerus fracture with medial comminution

Patient Profile/History

35-year-old right-hand dominant female, who was riding as a passenger in a motor scooter and was struck by a passing vehicle at 35-45 miles per hour. She sustained multiple injuries including a right closed proximal humerus fracture with varus angulation and marked comminution of the greater tuberosity and calcar. Due to the perceived complexity of the fracture by the initial consulting orthopaedic surgeon, a shoulder and elbow specialist was consulted.

The patient's medical history is complicated with hypertension and sickle cell trait.

Upon examination, the patient was alert and oriented, with no apparent distress. Her right shoulder was in a shoulder immobilizer. Examination of the right upper extremity showed the skin to be intact with moderate soft tissue swelling. The axillary nerve was intact to light touch along with full motor and sensory of her median, radial and ulnar nerves. She had +2 radial pulses with less than two second capillary refill.

Surgical Treatment

An open reduction was performed with internal fixation of her proximal humerus utilizing the Integra® Proximal Humeral Fracture Plating System. Standard ORIF techniques were utilized.

As the manufacturer of this device, Integra does not practice medicine and does not recommend this or any other surgical technique for use on a specific patient. The surgeon who performs any procedure is responsible for determining and using the appropriate techniques in each patient.

Pre-Op and Post-Op Radiograph/MRI/CT Images and Surgical Pictures

Pre-operative imaging of a three-part proximal humerus fracture with greater than 1cm of displacement of the surgical neck with marked comminution of the surgical neck and calcar.



Intra-operative AP illustrating initial fixation with the 3 locking screws in the head and one cortical screw in the shaft.



Intra-operative AP showing reduction of the fracture as well as stable alignment of the proximal humerus and associated comminuted pieces. Note the 2 calcar screws stabilizing the medial column.



Intra-operative Lateral radiograph demonstrating near anatomic alignment of the tuberosities as well as proximal screw placement.

Physician Conclusion

Displaced proximal humerus fractures are technically demanding and can be associated with a high rate of screw cut out. Locking plates can provide greater angular and axial stability as well as preserve the periosteal blood supply. Proximal humerus fractures with loss of medial support present a surgical challenge with rates of varus collapse ranging from 15-40%.¹ Several studies have shown anatomic reduction of the medial calcar region and well placed calcar screws can reduce secondary loss of reduction.² Insertion of screws tangentially to the medial curvature of the surgical neck are denoted calcar screws. Fractures of the greater tuberosity allow for secondary shear forces at the humeral head-greater tuberosity interface further leading to varus collapse. Zhang et al. noted an increase in varus collapse in three - and four-part proximal humerus fractures without medial column support.⁴ Ponce et. al. performed a biomechanical study showing that medial comminution decreased the mean load-to-failure by 48% and that calcar screw fixation increased the mean-to-lead failure by 31% and the mean energy-to-failure by 44%. They also demonstrated improved stability in non-communited fractures and recommended use of calcar screws for the treatment of all proximal humerus fractures in osteoporotic bone regardless of the quality of the reduction.³ Studies have shown calcar screws to be safe for the circumflex vessels as well as the axillary nerve especially when using a deltopectoral approach.² Current research is in favor of placement of calcar screws in the treatment of these two - or three-part proximal humerus fractures with or without, medial comminution.

The Integra low-profile plate offers four screw hole options for medial calcar support that provide stable fixation to prevent varus collapse.

Referenced Citations:

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2. Georg Osterhoff, Christian Ossendorf, Guido A Wanner, Hans-Peter Simmen and Clément M Werner. The calcar screw in angular stable plate fixation of proximal humeral fractures - a case study. *Journal of Orthopaedic Surgery and Research* 2011, 6:50
3. Ponce B, Thompson KJ, Raghava P, Eberhardt EW, Tate JP, Volgas DA, Stannard JP. The Role of Medial Comminution and Calcar Restoration in Varus Collapse of Proximal Humeral Fractures Treated with Locking Plates. *J Bone Joint Surg Am.* 2013;95:e113(1-7)
4. Zhang LZ, Zheng J, Wang W, Lin G, Huang Y, Zheng J, Edem Prince GA, Yang G. The clinical benefit of medial support screws in locking plating of proximal humerus fractures: a prospective randomized study. *Int Orthop.* 2011 Nov;35(11):1655-61. Epub 2011 Mar 10.

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