

Humeral Shaft Fractures Treated with Lag Screw Fixation Heal with Callus

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Purpose: Existing dogma states that fractures treated with anatomic reduction of fracture fragments and lag screw fixation will heal with primary bone healing and no fracture callus. Our observations lead us to question this dogma in the domain of humeral shaft fracture healing. Our hypothesis was that fractures treated with anatomic reduction and lag screw fixation with neutralization plating of the humeral diaphysis will heal without fracture callus.

Methods: We performed a retrospective chart and radiographic review of all humeral shaft fractures (OTA 1.12A-C) treated with open reduction and internal fixation at a Level I trauma center over 11 years (2003-2014). We included diaphyseal fractures treated with standard 4.5-mm or 3.5-mm plates (n = 153) as well as more proximal and distal periarticular diaphyseal fractures treated with precontoured specialty plates (n = 65). Our study group (n = 218) included only healed patients treated with lag screws and neutralization plating and did not include any patients with hardware failure. All images of healed fractures were reviewed on PACS (picture archiving and communication system) clinical software. Our primary outcome measure was the presence of healing through primary (no callus) or secondary (obvious callus) bone healing. Descriptive statistics were calculated and comparative tests used a two-sided Fisher exact test.

Results: Our data indicated that 99.1 (216/218, 95% confidence interval [CI] 97.8%-100%) healed fractures demonstrated callus at final healing. The rate of callus formation was similar in patients treated with 3.5-mm plates (98.9%) as well as 4.5-mm plates (100%, P = 1.00), despite the use of lag screws and attempt to achieve primary bone healing.

Conclusion: In contrast to existing dogma, primary bone healing was rarely observed despite the use of lag screw fixation. This is an important fact as existing teaching indicates that callus formation after attempts at primary bone healing is a sign that fixation or fracture healing may be failing. Clinicians should be aware that callus formation after plate and screw fixation with a goal of primary bone healing in the humerus is not typically a sign of impending failure and should in fact be routinely expected.