Anatomy Preservation in the Active Elderly After Upper Extremity Fragility Fracture

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Optimizing outcomes after fragility fracture of the upper extremity in the aged patient can have a profound positive impact on their quality of life. Proximal and distal humeral fractures are examples of common osteoporotic fractures in the elderly patient that deserve a thoughtful approach to promote wellness and continued functionality. Anatomy-preserving techniques, when feasible, are typically preferable to arthroplasty strategies, yet special considerations need to be exercised for uneventful open reduction internal fixation (ORIF).

Uneventful recovery and return to function is essential for the older patient with humeral fracture at the proximal or distal end. Maintaining independence is critical for the older patient, and outcome post-fracture can influence the ability of these patients to adequately perform their activities of daily living. Performance of routine activities, such as cooking, cleaning, and hygiene, as well as mobility (rising from a chair) are predicated on effective upper extremity recovery after fracture.

Beyond routine activities of daily living, the quality of life in the active elderly may be dependent on a higher level of functionality after fracture of the proximal or distal humerus. A subset of these patients desire to maintain gainful employment. Further, continued happiness in many of these patients is in concert with their ability to engage in their recreational pursuits.

In an effort to accomplish the treatment goals of the elderly patient with peri-articular humeral fracture, judgment is exercised to determine the paradigm based on the host and specific injury pattern. Clearly, the medically infirm with stable fracture
pattern are candidates for closed management. However, the active, healthier elderly patient will typically benefit from a more pro-active approach.

Peri-articular fractures of the humerus, including the distal and proximal end, have commonality as it relates to the blueprint for surgical care in the elderly host when indicated. Most of these fractures are the result of low energy trauma in the setting of compromised osteoporotic bone. Compounding the issue of metabolically weakened bone is the diminutive nature of the articular segment of the proximal or distal humerus. Further, although simple fracture patterns commonly occur (such as two-part surgical neck proximal humeral fracture and transverse distal humeral fracture), not infrequently, more complex patterns present with variable degrees of metadiaphyseal comminution and intra-articular extension.

Although arthroplasty does play a prominent role as a management option for proximal and distal humeral fracture in the elderly, including shoulder hemiarthroplasty, reverse total shoulder, and total elbow arthroplasty, it is a recommendation that restoration of normal shoulder or elbow anatomy through ORIF should be a first-line strategy, if feasible based on host/injury biology and fracture variant. Although not orthopaedic surgeons, Marvin Gaye and Tammi Terrell emphasized this in their hit single from 1968, “Ain’t Nothing Like the Real Thing.”

Arthroplasty for distal humeral fracture is typically with a constrained or semiconstrained hinge with significant force transmission absorption at the prosthesis/cement interface that infamously has led to early loosening, requiring revision surgery. Hemiarthroplasty, the traditional replacement strategy for proximal humeral fracture, has been heralded as a pain control operation, yet functional results are variable at best. Reverse total shoulder arthroplasty is an innovative technique. At this year’s American Academy of Orthopaedic Surgeons annual meeting, we are reporting encouraging early results for severe shoulder fracture/dislocations, yet long term outcomes are lacking and revision options are limited.

ORIF is indicated as the gold standard when exacting reduction and durable internal fixation can be achieved to support early motion and reliable osseous union. Fortunately in 2015, surgical technique and technology have evolved to extend the indications for ORIF. As a general principle, achieving and maintaining anatomic reduction is paramount. Rigid fixation of the short osteopenic articular segment is critical for success. Multiple points of fixation in the diminutive proximal (shoulder) or distal (elbow) segment in different planes are necessary. Usage of fixed-angle technology when feasible is advantageous.

Two research papers were published by our trauma division recently, outlining our strategies for successful ORIF in selected fragility fractures of the proximal and distal humerus. Operative paradigm emphasized anatomic reduction, rigid internal fixation, and early rehabilitation. Goals of care included avoidance of post-traumatic pain and return to meaningful functionality.

The first paper was entitled “Open Reconstruction of Complex Proximal Metadiaphyseal Fragility Fractures of the Humerus.” Over a four-year period, we managed 18 osteoporotic patients...
with ORIF for proximal humeral fracture with comminution extending into the metadiaphysis. Open operative exposure was performed with the direct reduction method, including interfragmentary compression when feasible. (Figure 1) Definitive fixation included a long peri-articular locking plate. Multiple fixed-angle points/planes of fixation were achieved into the diminutive proximal segment. Tuberosity repair was facilitated by suture placement into the adjacent rotator cuff and anchored to the indwelling plate. Given the construct rigidity, despite a complex fracture pattern, early rehabilitation was emphasized. This pro-active approach yielded uneventful union in all cases. More importantly, optimal functionality was reported with DASH scores clinically indistinguishable from the general population.

The second paper was entitled “Bicolumnar 90-90 Plating of Low-Energy Distal Humeral Fractures in the Elderly Patient.” The principle of anatomic reduction and rigid internal fixation was promoted by our 90-90 bicolumnar plate osteosynthesis method. A triceps-sparing exposure, when appropriate, was used to avoid iatrogenic muscular damage/scarring and to promote joint motion. Multiple points/planes of fixation into the diminutive short distal segment was achieved to promote reliable union and successful early rehabilitation. (Figure 2) The distal humerus were instrumented with plates/screws direct medial and lateral, as well as posteromedial and posterolateral. Both small fragment and minifragment plates were used with locking technology when feasible. Results demonstrated union in all cases with restoration of functionality. A majority of patients achieved a functional arc of motion (average 105 degree arc).

Treatment of the elderly patient with a peri-articular proximal or distal humeral fracture presents a unique set of challenges, and treatment must be tailored to the individual patient and fracture pattern. Although arthroplasty is a viable treatment option for cases in which ORIF is unreliable, restoration of native anatomy is most desirable when technically feasible. Special consideration/technique is warranted when ORIF is deemed the treatment of choice. Successful ORIF after peri-articular humeral fracture promotes wellness and continued functionality in the active older patient.

References
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