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Distal Humerus Fractures

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Fractures of the distal humerus in adults have traditionally presented a treatment challenge for the orthopedic surgeon. The combination of anatomic complexity, multifragmentary comminution, and a short distal segment, often in the setting of osteoporotic bone, renders these fractures difficult to treat successfully and often make a full restoration of function uncertain. Multiple methods of treatment for these fractures have been described, including bracing, internal fixation, hemiarthroplasty, and total elbow arthroplasty (TEA).

This article reviews the epidemiology and classification of these injuries and the numerous described fixation and arthroplasty techniques. The current treatment algorithm and authors' preferred method of internal fixation are also illustrated. Additionally, the treatment of these injuries in the elderly population and the complications of surgical treatment are reviewed.

Epidemiology

Population-based studies have established our baseline understanding of distal humerus fractures. Robinson and colleagues [1] reported a 5.7/100,000 prevalence of these injuries, with a bimodal distribution regarding gender and age. The first peak occurred in boys/men aged 12 to 19, followed by a second peak in women older than 80. The prevalence in men decreased in the third through sixth decades before increasing again after age 70. The prevalence in women increased every decade after age 20. Older patients were typically injured in falls, whereas younger individuals sustained their fractures more commonly during athletic activities or motor vehicle accidents (Fig. 1).

A similar study conducted at the authors' institution from 1965 to 1974 described the incidence of all humerus fractures seen over a 10-year period. Of 586 humerus fractures, 191 (33%) involved the distal third. These fractures were most commonly seen in a younger population. However, incidence also increased with age. Between ages 50 and 69, 11 fractures per 100,000 person-years were reported, which increased to 21 fractures per 100,000 person-years in the group aged 70 and older. The mechanism of injury was typically a fall from height or significant trauma [2].

With regard to the elderly population, the prevalence of these injuries continues to rise. A study of osteoporotic distal humerus fractures in elderly women over a 25-year period documented an increasing prevalence, from 11/100,000 in 1970 to 30/100,000 in 1995. The age-adjusted prevalence increased similarly over the same time period. A regression analysis based on these data predicted a prevalence of 52/100,000 women by the year 2030, which would reflect an exponential growth of these injuries [3]. The investigators called for preventive measures to stem this growing trend.

Clinical evaluation

As with all injuries, the evaluation begins with a thorough history and physical examination. Careful attention must be paid to the mechanism of injury, which denotes the amount of energy absorbed by the affected limb. The physical

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Fig. 1. Distal humerus fractures often are the result of significant trauma in young adult patients. In the elderly, however, they are more commonly seen after a lower energy mechanism, such as a fall.

examination should include assessment of the skin and soft tissues to reveal the presence of an open injury or significant soft tissue damage. Although neurovascular disruption is thought to be uncommon with these fractures, a complete evaluation of these structures should be performed to rule out any such injuries.

Classification

The most commonly referenced classification system for adult distal humerus fractures was advanced by Muller (Fig. 2) [4]. Known as the Orthopedic Trauma Association classification, this scheme categorizes these fractures anatomically. Type A injuries include extra-articular, transcondylar, and apophyseal fractures. Type B fractures have partial articular involvement, whereas type C injuries have complete or complex involvement of the elbow joint.

Other classification systems have also been described. The system of Mehne and Matta was advanced in 1992. In this scheme, type I fractures are intra-articular and are subdivided into single- and double-column fractures. Capitellar and trochlear fractures are also treated separately under this category. Type II fractures are extra-articular but intracapsular. These fractures include high (proximal to the olecranon fossa) and low (involving the olecranon fossa) transcondylar fractures. Type III fractures are extracapsular and essentially are those that involve the medial or lateral epicondyles [5].

In another submitted classification scheme, Davies and Stanley achieved substantial intraobserver and interobserver agreement with their radiographically based system that defines fractures as extra-articular, predominantly intra-articular, or predominantly articular [6].

Adding CT has also been found to be helpful in fracture classification. A recent study by Doornberg and colleagues [7] found that reformatting images with three-dimensional CT substantially improved intraobserver reliability but did not significantly affect interobserver agreement. The investigators also concluded that this addition was a helpful adjunct for preoperative planning.

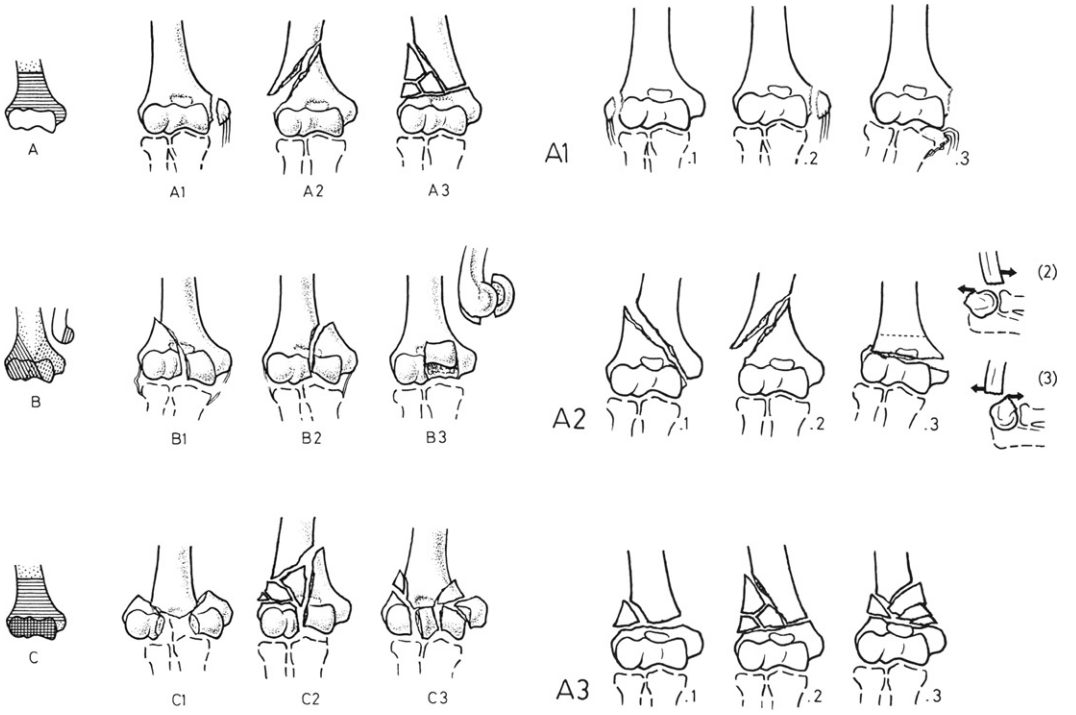

Fig. 2. AO classification of distal humerus fractures (*Adapted from* Muller ME, Koch P, Schaftzker J. Comprehensive classification of fractures of long bones. Berlin: Springer-Verlag; 1990; with permission.)

Conservative treatment

Although much of the current literature has focused on the operative treatment of these fractures, some investigators have advocated conservative treatment for extra-articular injuries. Sarmiento and colleagues [8] published a series of 85 such fractures treated with bracing. Although 15% of the fractures were open and 18% had peripheral nerve injuries at presentation, functional bracing resulted in 96% union, no infections, and good functional results. All nerve injuries also had resolved or were improving at the time of latest follow-up.

Another recent study showed similarly good outcomes after functional bracing of distal third humeral shaft fractures (ie, extra-articular) in young adults. In this series, all 21 fractures united, with minimal angular deformity and no restriction in elbow motion [9].

Operative versus nonoperative treatment

Early studies comparing operative and nonoperative treatment for adult distal humerus fractures often concluded that conservative treatment was superior. Horne [10] reported in a series of 50 patients that better results were obtained with nonoperative than with operative treatment. The poor results of surgical treatment were attributed to an inability to maintain rigid fixation, which resulted in a lengthy period of immobilization. Conservative treatment was recommended for all but the simplest distal humerus fractures.

Other studies of the same period, although acknowledging the technical challenge of obtaining secure distal fixation, tended to favor operative fixation when possible. In one report of 24 comminuted distal humerus fractures, better functional results were obtained with surgical intervention than with nonoperative treatment. Conservative therapy was recommended in cases where adequate fixation could not be attained or in contaminated wounds [11]. Further, Zagorski and others [12] compared operative and nonoperative treatment in 42 comminuted intra-articular distal humerus fractures. Patients treated with open reduction internal fixation achieved 76% good and excellent results, whereas only 8% of patients obtained the same outcome with conservative treatment. These investigators concluded

that rigid anatomic fixation combined with early motion were associated with favorable results. These fundamental principles continue to govern our currently accepted treatment paradigm for these injuries. As such, internal fixation is generally accepted as the standard of care for the treatment of intra-articular distal humerus fractures.

Operative fixation

Initial failures of internal fixation for adult distal humerus fractures were typically related to an inability to achieve rigid fixation, particularly in the distal segment, which is often comminuted or osteoporotic. However, Gabel and colleagues [13] in 1987 published a report of 13 patients who had distal humerus fractures treated with dual plating. Of the 10 patients available at 2 years of follow-up, 9 of them attained good or excellent results. Based on these data, the investigators advocated operative treatment with their technique to allow rigid fixation and early motion.

In the early 1990s, Helfet and Schmeling [14] advanced a protocol consisting of orthogonal medial column and posterior lateral column plating for intra-articular distal humerus fractures. With this technique, they attained 75% good and excellent results for Muller type C fractures, and a low complication rate. On the basis of these results, fixation of adult distal humerus fractures for the past 15 years has focused on this concept of "90-90" plating.

More recently, multiple fixation techniques have been described. These include fixation using custom T-plates [15], double tension-band plating [16], lateral J-plates [17], minifragment osteosynthesis [18], Kirschner wires [19], large fragment tibial plates [20], and reconstruction plates [21]. All these fixation methods have achieved some manner of success using objective or subjective outcome measures. Additionally, augmentation using tricortical iliac crest bone graft has been advocated for particularly comminuted fractures [22].

Biomechanics of fixation

With the realization that rigid fixation is difficult to attain in the distal humerus, several investigators have analyzed the biomechanical features of different plate configurations. Self and colleagues [23] reported their results with medial and lateral plating using supplementation with bolts. They found this configuration to have increased strength and stability compared with other constructs.

Subsequently, Jacobsen and colleagues [24] reported their biomechanical data in testing different plate configurations. They found no difference in torsional stiffness among the different constructs tested. All constructs were susceptible to bending stress in the sagittal plane, compared with intact specimens. The configuration of a medial pelvic reconstruction plate combined with a posterolateral dynamic compression plate achieved the strongest sagittal plane stiffness. Adding a third plate laterally did not add any significant resistance to bending.

With the advent of locking plate technology, attention turned toward testing the biomechanical properties of these devices in distal humerus fractures. One study concluded that locking compression plates confer "substantial advantage" in these fractures when the bone quality is poor or if significant metaphyseal comminution is present [25]. The same investigator later reported the results of a cadaveric study testing locking compression plates versus reconstruction plates in orthogonal and parallel posterior configurations. In this model, an increase in stiffness to torsional and anteroposterior bending forces was reported with a construct using locking plates at a 90° orientation to each other. However, plate types showed little difference in stiffness, and the investigators concluded that plate configuration was a more important variable than plate type. Nevertheless, they also suggested that locking plates may be helpful in the setting of osteoporosis or comminution [26].

Operative approaches

One area of controversy in these fractures is the use of the olecranon osteotomy to attain full exposure of the distal humerus and elbow joint. Advocates point to the relative ease of fixation without the triceps obstructing the surgeon's view, whereas detractors are often concerned with the small, but not insignificant, rate of osteotomy nonunion. Coles and colleagues [27] described their 6-year experience with distal humerus fractures using olecranon osteotomy, particularly for more complex fractures. They encountered no nonunions in their series of 67 patients, despite the fact that more than one half of these fractures were open. Five patients (8%) required isolated hardware removal for symptomatic discomfort. The investigators recommended the use of

olecranon osteotomy for complex intra-articular distal humerus fractures. Another study advocates preservation of the anconeus by lifting it as a flap before olecranon osteotomy (Fig. 3) [28]. Standard olecranon osteotomy approaches result in denervation of the anconeus muscle, which should be avoided.

As an alternative, the entire triceps and anconeus can be reflected as a unit off the olecranon [29,30]. Although this approach provides adequate exposure for all types of distal humerus fractures, concern exists about the ultimate healing of the triceps back to the olecranon bony surface.

Other investigators have used a triceps-splitting exposure in these fractures, which can be a difficult exposure for type C fractures for most orthopedic surgeons, but has been shown to be useful in at least one report [31]. In a series of 33 distal humerus fractures (29 of which were type C) with a mean of 26 months follow-up, Ziran and colleagues [31] concluded that a triceps-splitting approach allowed adequate exposure, with an acceptable rate of complications.

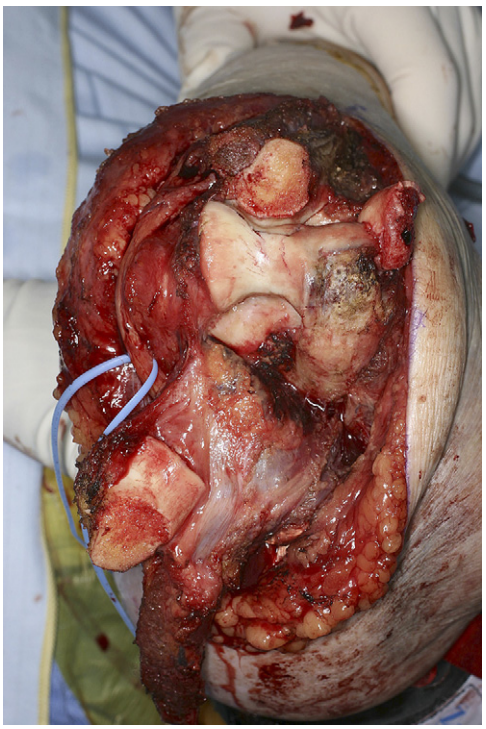

Fig. 3. The authors advocate an anconeus-sparing approach to the distal humerus with olecranon osteotomy for exposure of intra-articular distal humerus fractures.

Ulnar nerve management

Ulnar neuropathy is a well-recognized postoperative complication of adult distal humerus fractures, and routine transposition of the nerve is routinely advocated [32,33]. Wang and colleagues [33] reported the results of 20 patients who had distal humerus fractures treated with open reduction internal fixation and anterior subcutaneous ulnar nerve transposition. In a follow-up period ranging from 15 to 35 months, no patients had ulnar nerve symptoms. The investigators recommended routine transposition to avoid postoperative ulnar neuritis.

Other investigators have not routinely transposed the ulnar nerve and have reported their results. Gupta [34] reported on a series of 55 distal humerus fractures treated with posterior fixation. Only one patient underwent coincident ulnar nerve transposition. Three patients developed ulnar neuritis, which resolved by the third postoperative week. Although this report indicates that ulnar nerve transposition is not mandatory with dual posterior plating constructs, the authors would argue that constructs involving the use of a medial plate are biomechanically superior to all-posterior fixation. And when using a medial plate, the ulnar nerve would be in close contact with it, if not transposed. Therefore, the authors continue to recommend routine ulnar nerve transposition in these fractures.

Outcomes

Results of operative fixation in adult distal humerus fractures have been extensively reported in the literature. Earlier studies recorded 50% to 81% good and excellent clinical results at various institutions [35–40]. Most of these reports stressed rigid anatomic fixation and early motion as the essential aspects of care. More recent studies have documented 84% to 88% good and excellent outcomes with an assortment of outcome measures [41–43].

Others have commented specifically on the functional outcome of patients following these fractures. Gofton and colleagues [44] reported 93% patient satisfaction following open reduction internal fixation of 23 type C distal humerus fractures despite a complication rate of 48%. Elbow motion arc averaged 122°. Aslam and Willett had similar results in their study of 26 patients. In this series, the average motion arc was 112°, with mean pronation of 75° and mean supination of 76°. Although none of the patients were able to

regain normal grip strength, 75% of them were able to return to their previous occupation and activities. Also, 85% of these patients reported satisfaction with their outcomes [45]. McKee and colleagues [46] also studied function following internal fixation of distal humerus fractures, using several limb-specific outcome measures. They found most patients to have mild persistent physical impairment, usually caused by range-of-motion and strength deficits in the affected upper extremity. However, general health status, as evaluated by 36-Item Short Form Health Survey (SF-36), was not adversely affected after operative treatment. Finally, Ozdemir and colleagues [47] reported long-term follow-up at an average of 81.5 months following open reduction internal fixation of intra-articular distal humerus fractures. Mean elbow range of motion was from 26° to115°. Predictors of favorable outcomes included closed fractures, boys/men, younger patients, operations using a posterior approach and olecranon osteotomy, and fixation constructs using dual plates.

Authors' preferred method of fixation and technique

At the authors' institution, they have instituted a protocol for complex intra-articular adult distal humerus fractures using parallel plates applied in the sagittal plane. The purpose of using this plate configuration is to maximize distal fragment fixation and stability at the supracondylar level [32].

In approaching a distal humerus fracture, surgical positioning is important for adequate exposure of the surgical site. Surgery may be performed in the prone position, with the arm over a small bump or over the side of the table. This position can sometimes be difficult from an anesthetic standpoint because distal humerus fractures often occur in the elderly. Specifically, these cases can be prolonged, with potential subsequent complications in the prone position.

A somewhat easier approach from an anesthetic and surgical standpoint is to position in the patient supine on the operating table, with a small bump under the scapula on the affected side, which will tend to rotate the upper extremity forward. With hip bolsters on the operative table, the patient can be inclined 20° toward the unaffected side, and the patient can then be draped sterilely, with the arm placed across the chest over a soft bolster. A sterile tourniquet can then be placed high up on the arm to assist with the early surgical exposure of the procedure.

A posterior incision is then made and full thickness skin flaps are created. The ulnar nerve is identified and released in situ for later transposition. In cases involving only the lateral aspect of the distal humerus, the ulnar nerve may not need to be transposed, particularly if an olecranon osteotomy is not going to be performed. In the standard approach to a distal humerus fracture, an osteotomy is performed of the olecranon. The authors prefer an anconeus flap transolecranon approach, which preserves the anconeus innervation and blood supply [28]. Routine osteotomy of the olecranon otherwise tends to denervate the anconeus. Once the anconeus is lifted up as a flap, the osteotomy of the olecranon can be performed (Fig. 4). This procedure can be done as a Chevron-type osteotomy or as a straight osteotomy of the olecranon. The authors prefer a straight osteotomy of the olecranon performed first by use of a sagittal saw to go through the initial posterior cortex of the olecranon.

Next, a wide, flat, sharp osteotome is used to bring the cut approximately half way through the olecranon. This step should be done while visualizing from both the medial and lateral sides to ensure that the osteotomy is being aimed at the center portion of the greater sigmoid notch, which contains minimal cartilage. Once the osteotome has been brought to the half-way mark through the olecranon, the osteotome is levered and the remainder of the olecranon is fractured off from the ulna. This 50% fracture of the olecranon contains interdigitations, which are key to an accurate reduction at the end of the procedure. The olecranon fragment and the anconeus are then retracted proximally, revealing the distal humerus fracture (see Fig. 4).

At this point, the distal humerus fracture is meticulously assembled for fixation. Typically, the distal articular surface, particularly the anterior trochlea and capitellum, are assembled using 2-mm Steinmann pins placed just under the articular surface of the fracture fragment. As these pins are placed, it should be kept in mind that the pins should be kept out of the potential footprint of either a medial or lateral plate for final reduction. Once the distal articular fragments, typically two to three, are reassembled using two to three 2-mm Steinmann pins, they are repositioned onto the end of the humeral shaft, and, using additional pins, they are placed from distal to proximal into the shaft, securing temporary fixation of the distal fragments to the shaft.

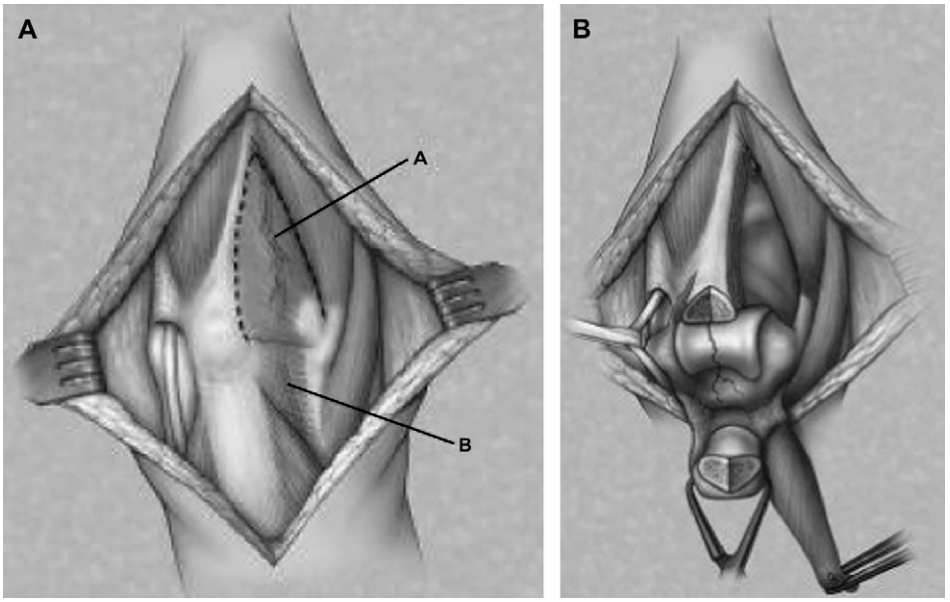

Fig. 4. Anconeus flap transolecranon approach to the distal humerus. (*A*) The anconeus (A) is elevated as a flap to preserve its innervation. (*B*) After the anconeus is elevated, the olecranon (see B in Fig. 4A) osteotomy can be performed in standard fashion. (*From* Athwal GS, Rispoli D, Steinmann SP. The anconeus flap transolecranon approach to the distal humerus; J Orthop Trauma 2006;20(4):282–5; with permission.)

At this point, preliminary fixation of the fracture has been achieved (Fig. 5).

Next, plates are positioned for final fixation. The authors prefer to use precontoured plates for easier application. Additionally, it has been reported that use of such plates is a factor that maximizes fixation [48]. The medial or lateral plate can be applied first, depending on the surgeon's preference. Typically, the plate is reduced to the fracture, held in position with digital pressure, and, using the slotted hole in the plate, preliminary plate fixation is then achieved. The fracture is then inspected and slight readjustments are made, if necessary, through the screw in the oval-slotted hole. When plate fixation seems adequate, a screw is placed on the distal aspect of the plate into the distal fracture construct. At this point, a large bone clamp is used to compress the distal fragment onto the shaft while a compression screw is placed proximally in the plate to achieve good compression of the distal segment to the shaft of the humerus.

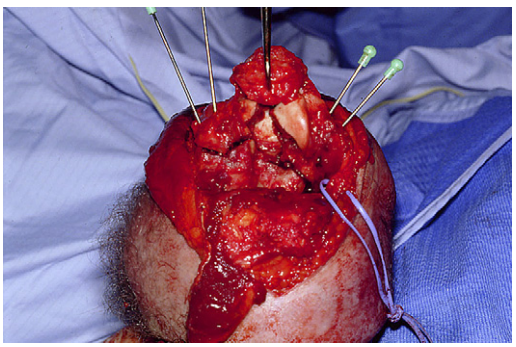

Fig. 5. With significantly comminuted intra-articular fractures, Steinmann pins may be used for provisional fixation.

Likewise, the second plate is placed first with a screw in the slotted hole to allow for adjustment and alignment of the plate. Then a screw is placed into the distal fragment, and, with use of a reduction clamp to compress the distal construct on to the shaft, a compression screw is placed in the proximal aspect of the plate. At this point, further screws are placed into the plates to allow for a strong final construct (Fig. 6). Several companies allow for a locking option in the screws in the proximal and distal aspects of the plates. Particularly in the distal fragment, locking screws allow for a somewhat stronger construct in the softer cancellous bone.

All the screws used in the reduction of the fracture should be placed ideally through the plate

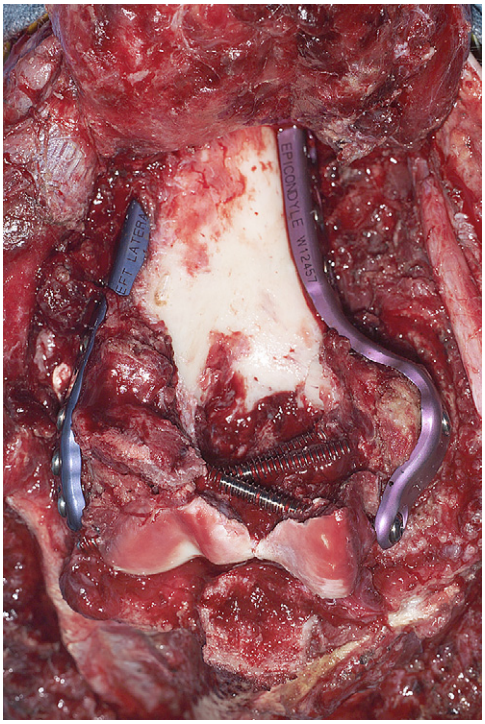

Fig. 6. After the articular surface is reconstructed, precontoured parallel plates are applied in the sagittal plane.

to allow greater security and strength of the reduction. Also, the screws should be as long as possible to fix as many fragments as possible in the distal articular construct. Additionally, use of larger 3.5-mm screws, as opposed to smaller 2.7-mm screws, should be used where possible, to strengthen the construct also. Occasionally, screws from a medial and lateral plate will engage each other, which is desirable because it will actually strengthen the construct from the medial to the lateral side (Fig. 7). Once the final screws have been placed into the plates, the elbow joint should be reduced and moved through a full range of motion to identify any evidence of crepitus or catching of the fracture fragments. If noticed, this problem can often be addressed with a bone tamp or a bur to smooth out edges to allow for full motion.

After the articular reduction is checked and found to be adequate, the olecranon osteotomy is reduced to the ulna, and can often be held in place temporarily with a large pin. Plate, screw, or tension-band fixation of the olecranon fragment can then be performed. The authors tend to prefer plate fixation of this fragment because it seems to give greater security to the reduction.

At closure, the ulnar nerve is checked again and transposed into an anterior pouch. A drain is often placed, and staples are typically used in the posterior incision. Postoperatively, the extremity is kept elevated in a sterile dressing, with a posterior plaster splint in the Statue of Liberty position overnight. If strong fixation was felt to be achieved at surgery, immediate active motion can be allowed for the patient. If fixation is inadequate because of significant comminution or osteoporotic bone, motion can be delayed until adequate healing has occurred. The authors prefer this conservative approach in these more tenuous settings because it is easier to address a stiff, healed distal humerus fracture than one which has lost fixation. Additionally, splints and continuous passive motion devices can be used in the postoperative period to help encourage range of motion.

Distal humerus fractures in the elderly

As the proportion and absolute number of distal humerus fractures rise with age, many investigators have begun reporting the results of treatment specifically regarding elderly patients. Although the definition of elderly is certainly open to interpretation, these studies include patients 60 years and older, although many of them focus on older cohorts [49–55]. For example, Srinivasan and colleagues [55] compared nonoperative treatment to open reduction internal fixation in 28 patients with an average age of 85. Operative fixation was found to yield superior results, with a complication rate comparable to that of studies involving younger patients. Several other case series have reported a high rate of good and excellent results comparable to those reported for the population at large (see Refs. [24,49–51,53,54]).

Other studies reported somewhat less optimistic results, however. Korner and colleagues [52] noted a high complication rate (29%) and only 58% good and excellent results using the Mayo Elbow Performance Score. Although acknowledging the difficulties inherent in treating these often osteoporotic fractures, the investigators nevertheless recommended operative fixation for these injuries in the elderly. Additionally, immobilization times longer than 14 days were discouraged. In contrast, Hausman and Panozzo [49]

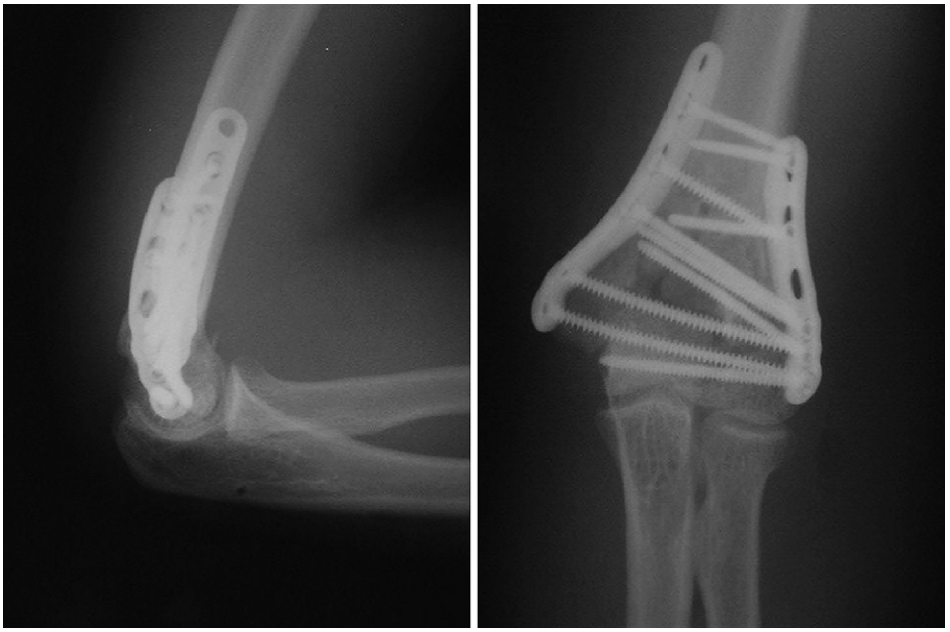

Fig. 7. Use of parallel plating often allows screws to engage each other, resulting in improved fixation. An olecranon osteotomy was not used in this case because the articular surface could be reconstructed without violating the proximal ulna.

recommended postoperative immobilization if fixation is not felt to be sufficiently rigid at the end of surgery. They specifically reference a high rate of success with subsequent contracture release if necessary, but maintain that recovery from lost fixation is less predictable.

Arthroplasty for distal humerus fractures

As TEA emerged as a viable treatment for degenerative disorders of the elbow, many investigators began using this technique in selected, usually elderly, patients and subsequently reporting their results. The first such report, by Cobb and Morrey [56], studied a group of 20 patients (21 elbows) with an average age of 72 treated with primary TEA. They found 100% good and excellent results at an average follow-up of 3.3 years. On the strength of these results, the investigators recommended TEA as a potential alternative in elderly patients. Several other studies have shown satisfactory results with this technique, but long term follow-up is lacking to date [57–63].

Three studies have compared open reduction internal fixation to TEA for treatment of distal humerus fractures in the elderly. Obremskey and colleagues [64] found no strong evidence in support of either treatment modality in an evidence-based review of the literature. Alternatively, Frankle and colleagues [65] reported 100% good and excellent results in women older than 65 with rheumatoid arthritis and other comorbidities treated with TEA. These results compared favorably with the 75% good and excellent results in a more active group treated with internal fixation. TEA was recommended as a viable treatment in these patients, particularly in those with significant comorbidities. Additionally, a recent randomized controlled trial of operative fixation versus TEA in elderly patients who had intra-articular distal humerus fractures found significantly superior Mayo Elbow Performance Scores in the TEA group at 2 years of follow-up [66]. As a result, the authors suggest that TEA is a reasonable treatment alternative for these injuries in select, low-demand, elderly patients, although longer term studies are necessary to define its role fully.

One emerging additional treatment option is hemiarthroplasty for distal humerus fractures (Fig. 8). In this procedure, the medial and lateral columns are reconstructed but the joint surface is left unrepaired. An anatomic distal humerus

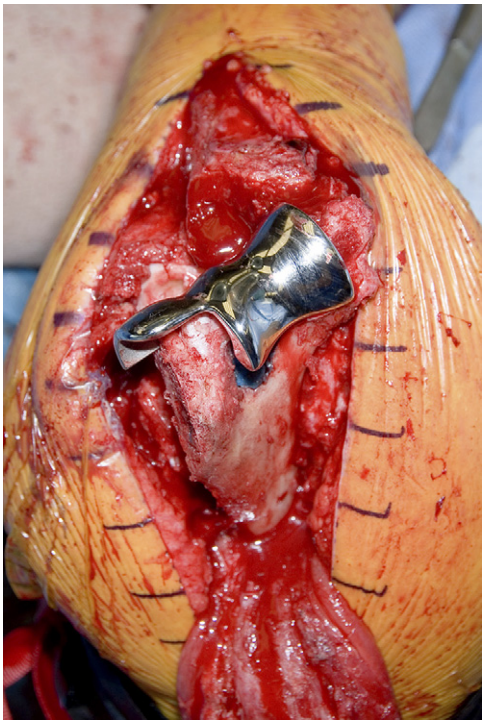

Fig. 8. Distal humeral hemiarthroplasty has been reported with some success in selected patients when the articular surface is not reconstructable.

component from a TEA set is then placed as a substitute to the articular surface. One recent preliminary report of patients treated with Sorbie distal humerus replacement and found all to have good or excellent Mayo Elbow Performance scores (S.P. Steinmann, personal communication).

Complications

Although several clinical studies have reported complication rates with their series, a handful of studies have focused on reporting adverse events following treatment of adult distal humerus fractures. Sodergard and colleagues [67] studied 18 patients who sustained mechanical failure of their fixation constructs. In most of these patients, the cause of failure was unstable fixation, whereas osteoporosis and unknown causes were seen less commonly. The same investigators subsequently reported an average 6-year follow-up study in which 27 of 96 patients suffered postoperative complications. Failure of fixation was the most commonly reported complication (16 patients), but nerve injuries and infections were also seen. Three patients had permanent ulnar nerve dysfunction at final follow-up [68].

Other reports included the aforementioned complications but also noted other problems following operative fixation [69,70]. Kinik and colleagues [69] studied 46 patients treated with open reduction internal fixation. They found nonunion and fixation failure to be relatively uncommon (2%), but reported an approximately 11% rate of nerve complications and significant range of motion loss. Also, 28% of patients were seen to have heterotopic ossification.

Complications of TEA for adult distal humerus fractures are not significantly different from those of TEA for other disorders. Cobb and Morrey [56] noted one fractured ulnar component, three ulnar neuropraxias, and one case of reflex sympathetic dystrophy in their original series. Kamineni and Morrey [60] reported a slightly higher complication rate of 29% in a subsequent series. Although 5 out of 49 elbows required revision surgery, most complications did not require further operative intervention. Other studies reported an overall low rate of complications, with a high rate of clinical success [58,59,61–63].

Summary

Adult distal humerus fractures remain a challenge for the orthopedic surgeon. Additionally, these injuries may be seen with increasing frequency in the future as the proportion of elderly patients in our society continues to rise. Successful treatment and restoration of function are rooted in a firm grasp of the relevant treatment principles. In most patients, internal fixation with modern plates and surgical technique can achieve a satisfactory result. TEA is an alternative treatment in elderly patients who have osteoporotic bone or significant articular comminution not amenable to internal fixation. The role of hemiarthroplasty requires further exploration to delineate its role in these fractures.

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