



# Clinical Faceoff

## Clinical Faceoff: Are Distal-third Diaphyseal Humerus Fractures Best Treated Nonoperatively?

David Ring MD, PhD, Andrew Jawa MD, Lisa Cannada MD

**D**istal-third diaphyseal fractures of the humerus are so variably treated that they seem to be a paradigm for bias and misconceptions in surgery. Conceptually, a functional brace seems “too low,” but the fractures almost always heal, although some fractures heal with

varus deformity. The surgery is not easy because there is often a butterfly fragment—meaning that the plate must extend proximal, placing the radial nerve at risk. In order to get good fixation, one needs to extend the plate down the posterior, nonarticular part of the lateral column, which makes it difficult to use a straight plate. Consequently, the most distal screws might be unicortical, and subject to pull out in osteoporotic bone.

I invited two experts in the field of orthopaedic surgery to discuss the many treatment options associated with distal-third diaphyseal fractures of the humerus. Andrew Jawa MD is an orthopaedic surgeon at New

England Baptist Hospital in Boston, MA, USA, whose primary clinical interests include shoulder reconstruction for instability, arthritis, and trauma. Lisa K. Cannada MD is an orthopaedic traumatologist from Saint Louis University Hospital and St. John’s Mercy Medical Center in Saint Louis, MO, USA. Her major interests include long bone malunion, pilon fractures, and general trauma orthopaedics.

**David Ring MD, PhD:** *Advocates of operative treatment of a distal-third diaphyseal humerus fracture cite inability of a fracture brace to control the fracture, deformity, elbow stiffness, and delayed recovery as consequences of nonoperative treatment. Are these valid concerns?*

**Andrew Jawa MD:** These are reasonable concerns but based on current best evidence they are overstated. These fractures seem to heal reliably, in some cases with some varus and posterior angulation. Few patients have deformity greater than 30° in any direction. Most importantly, there appears to be no measurable functional deficit and little cosmetic deformity from the angulation. Elbow motion is

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minimally affected, with many patients able to comfortably move their elbow in about 6 fewer weeks. Some patients find the bracing cumbersome, but the majority are pleased with the excellent ROM and reasonably rapid recovery without the risks and discomforts of surgery.

**Lisa K. Cannada MD:** A fracture brace ends at the level of the fracture. While this is sufficient for healing, it cannot prevent varus malalignment. With a fracture brace and sling, the pain and instability of the fracture make the arm relatively useless for at least 4 weeks, usually 6 weeks, and up to 8 weeks as the fracture starts to heal. Even basic daily tasks are difficult on one's own. Eventually, shoulder and elbow motion return, but it can take weeks to months of uncomfortable stretching exercises. Some people have skin problems in the brace—particularly in hot, humid weather. In contrast, after plate and screw fixation, the arm is stable, can be used for light functional tasks immediately, and the pain of surgery improves in days rather than weeks.

**Dr. Ring:** *As Dr. Jawa points out, distal-third diaphyseal fractures seem to heal predictably and the slight varus deformity does not have much impact on function. What is the role of surgery?*

**Dr. Cannada:** The role of surgery is to restore function. Certain patients have circumstances that make fracture bracing for several weeks impractical: Single parents; caregivers for elderly parents/disabled family members; students at college without assistance for daily activities; and individuals who cannot afford time off of work. Patients have a choice between wearing a brace for more than 2 months with pain until consolidation or surgery with no restriction on motion and the ability to shower and participate in daily activities without a cumbersome brace immediately after surgery. With surgery, exercises to regain motion can begin much earlier, allowing the patients to feel they are making more rapid progress. In a systematic review including all type of humeral shaft fractures [4], 15% to 20% of patients treated with a fracture brace (and without surgery) had limitation of shoulder or elbow motion.

**Dr. Jawa:** Treatment decisions must always take into account the entire circumstance of a patient, and if an alternative treatment is proved better for a subgroup of patients, it should be used. However, at this point, it is only a hypothesis that ORIF allows patients to be more functional, with a faster recovery, and with less pain compared to functional bracing. There have been no published randomized trials

comparing operative and nonoperative treatment of diaphyseal humerus fractures, but there are in fact number of retrospective studies that do not show superiority of operative fixation [2]. Functional bracing for humeral shaft fractures is documented to provide reliable healing with excellent functional outcomes with low complication rates. The idea that motion returns earlier or more completely, and that patients feel better faster should be considered speculative until or unless it can be backed by prospective, comparative data. The few studies limited to distal-third diaphyseal fractures indicate plating and bracing have similar functional outcomes, but the complication rate for plating is higher.

**Dr. Ring:** *But plate fixation is straightforward, familiar to most orthopaedic surgeons, restores alignment, and allows more rapid use of the arm by stabilizing the fracture while it is healing. Why not offer patients surgery for a distal-third diaphyseal humerus fracture?*

**Dr. Jawa:** The risks of surgery are greater for distal-third humeral shaft fractures compared to middle and proximal-shaft fractures. Regardless of the surgical approach, the radial nerve must be exposed, placing it at risk for injury. Adequate fixation of the distal shaft is also more difficult due to the need to avoid the coronoid, radial, and

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olecranon fossae; the weaker metaphyseal bone distally; and the need to use short unicortical screws distally and avoid introducing varus malalignment when using a standard straight plate.

**Dr. Cannada:** A stabilized fracture makes a cumbersome brace and motion limitations unnecessary. After surgery the arm can be used in self-care and light activities without restriction. The keys to effective fixation of a distal third diaphyseal humerus fracture are: (1) Finding and protecting the radial nerve so that the nerve is not harmed and the sufficient fixation of the proximal fragment is obtained; and (2) using the nonarticular posterior part of the lateral column of the distal humerus to gain three more screws in the distal fragment than one would have if the plate ended above the olecranon fossa (plates designed to curve laterally at their distal end are helpful for this).

**Dr. Ring:** *Distal-third diaphyseal humerus fractures are often comminuted (with at least a butterfly fragment), making them even more difficult to secure. Does this support a nonoperative approach?*

**Dr. Cannada:** Preoperative planning is paramount. For plate fixation of a distal third diaphyseal humerus fracture, there are several centimeters of

bone from the distal part of the posterior column (nonarticular) to the fracture site. While a straight plate applied to this bone would introduce an angle in the fracture, there are now plates available that bend laterally to utilize this area of the bone and facilitate the placing of at least five screws in distal fragment. Long distal screws can often be directed into the trochlea of the distal humerus. The proper plate can be chosen and the surgery planned based on the radiographs. The radial nerve is located approximately at the midpoint of the humeral length from the lateral epicondyle when approached from direct lateral [1]. Meticulous dissection with exposure of the radial nerve if the plate extends to that location proximally will minimize risk of iatrogenic injury. In my opinion, fixation of a distal-third diaphyseal humerus fracture presents less of a challenge than fixation of a comminuted, intraarticular fracture through an olecranon osteotomy.

**Dr. Jawa:** I agree with Dr. Cannada on all of her points, which collectively indicate that fixing these fractures can be difficult, requiring dissection of the radial nerve and special plates to get adequate fixation. I also agree that distal-third fractures may be less of a challenge than an intra-articular distal humerus fracture, which are notoriously challenging. However, when

compared to middle or even a proximal-third shaft fracture, distal-third fractures are a substantial challenge that can lead to permanent radial nerve injury and fixation failure. Indeed, in the one study comparing bracing to ORIF of distal-third fractures [3], both of these complications occurred.

**Dr. Ring:** *A patient with an acute distal-third diaphyseal humerus fracture feels “broken” and in need of repair. The pain, swelling, bruising, and separation/angulation of the bone on radiographs reinforce the sense that the arm may not be dependable without surgery. How do you help a patient balance this sense that surgery is necessary with the evidence that the arm works well with nonoperative treatment?*

**Dr. Jawa:** Most patients do not want unnecessary surgery given the perceived inherent risk that accompanies all procedures. These patients easily respond to the information that plating does not make a fracture unite faster, angulated fractures have little or no functional deficit, and there is a small, but real risk of a major life-changing complication, such as nerve palsy, with surgery. In my experience, the patients who dwell on the pain, bruising, and alignment simply need more time for discussion or reflection. Many patients ask what we would do for ourselves, and my

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honest response is that I would treat my own fracture nonoperatively with bracing. In my opinion, the recovery time and functional results are similar for both of these treatments and the risk of nonoperative treatment is minimal.

**Dr. Cannada:** It is understandable that patients often feel like something needs to be done. The radiograph looks bad and the arm hurts, is unstable, and does not work. I think it is important that patients understand they can recover very well from a distal third diaphyseal humerus fracture without surgery. I try to get them to weigh the risks of surgery with the benefit of being able to use their arm functionally about 6 weeks sooner than they would if the fracture was treated in a brace. Many surgeons would choose surgery if they had this fracture in order to return to work sooner. Patients whose job or family situation does not allow for extended leave may similarly choose surgery. There are risks with any surgery—and nerve palsy is one of the most disconcerting and should be mentioned. On the other hand, most iatrogenic radial nerve injuries recover.

**Dr. Ring:** *If surgeons do not agree on the best treatment of a distal third diaphyseal fracture of the humerus,*

*what is the best way to be sure that the patient's preferences are considered?*

**Dr. Cannada:** I have the patient focus on three L's: location of the fracture, life circumstances, and a list of risks and benefits. For a distal third humeral shaft fracture, I advise patients of the risk of malunion. Next, I discuss personal preferences and circumstances: Age, hand dominance, body habitus, comorbidities, and expectations of treatment. Are they willing to come-back weekly initially if nonoperative treatment is chosen? Are there family obligations, job or school demands? How much support does the patient have at home? Finally, I list the risks and benefits of operative and nonoperative treatment.

**Dr. Jawa:** When treating any major medical issue that has multiple treatment options, there are three facts that I always try to keep in mind: (1) It can be difficult for someone not in the medical field to understand medical issues. It takes time to explain the basics, let alone the subtleties of treatment. (2) As guides, we must recognize our biases and the likelihood that we might guide patients where we want them to go rather than toward their own preferences. (3) Both the surgeon and patient need to feel comfortable with the ultimate

treatment decision, which may require compromise on the surgeon's part or further time for explanation to the patient.

In the case of a distal-third humeral shaft fracture, I recognize that I am biased toward initial nonoperative treatment in a functional brace, as I personally cannot justify the risks of surgery against the unproven benefits. It is the treatment I would choose for myself. For patients who favor surgery based on reasonable consideration and a demonstrated understanding of the risks and benefits, I would either consider surgery if I felt the reasoning was sound or more likely refer the patient for a second opinion to a colleague like Dr. Cannada whose approach may be more in line with the thinking of that patient. Ultimately, the best way of making sure the patient's preferences are met is making the effort to determine what they understand, to understand their preferences, and to explain our rationale and recommendations for treatment.

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