A Review Paper

The Emerging Role for UNI-Elbow™ Arthroplasty

Matthew M. Tomaino, MD, MBA

Abstract

UNI-Elbow arthroplasty is an innovative alternative to radial head resection or implant removal in addressing painful radiocapitellar joint arthrosis. As an "arthroplasty" solution, it retains the biomechanical function of the elbow and obviates the potential complications of not having a radial head. Although its role is likely to evolve as clinical experience accumulates and reported outcomes increase in number, it may have a role in the setting of acute and chronic Essex-Lopresti lesions, and when previous radial head arthroplasty has resulted in capitellar arthrosis but when removal of the implant alone is felt to be contraindicated.

Total elbow arthroplasty has revolutionized treatment of ulnohumeral joint destruction from inflammatory arthritis secondary to rheumatoid disease.[1] Over the past 2 decades, investigators have documented the favorable impact of improved implant design on clinical outcomes. As a result, the indications for total elbow arthroplasty have been successfully extended to include cases of posttraumatic arthritis and acute fracture in the age-appropriate patient.

So too have the implant designs and indications for radial head arthroplasty evolved over time. The biomechanical role of the radial head as a secondary restraint to valgus load provided, at the outset, a compelling argument for radial head replacement as treatment for irreparable fractures both in the setting of valgus instability after elbow dislocation and in the setting of longitudinal radioulnar instability after Essex-Lopresti injury.[2,3] Clinical outcomes have demonstrated excellent functional restoration so long as ligament-sparing surgical approaches are used and the implant is not oversized.[4]

No doubt as a consequence of these innovative advances, isolated radiocapitellar disease—unicompartmental arthritis—has been the most recent target of innovation. Historically, aconeous muscle interposition or resection of the radial head has been used to provide pain relief for unicompartmental disease. However, there are clinical scenarios in which "uni-arthroplasty" may have appeal. The objective of such an alternative is preservation of normal elbow biomechanics—a particularly compelling proposition when either radial head excision, alone, or radial head arthroplasty, alone, might be expected to result in poor outcome. As with any new device, however, the question of advisability exists.

My purpose in writing this article, therefore, is not to advocate on behalf of the implant but to identify potential indications for its application—that is, cases in which its use might be feasible—which then will allow a more robust assessment of outcomes.

Dr. Tomaino is Founder, Tomaino Orthopaedic Care for Shoulder, Hand, and Elbow, LLC, Rochester, New York.

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Uni-Elbow Radio Capitellum System

The first commercially available implant for isolated radiocapitellar disease is the UNI-Elbow™ Radio Capitellum System (Small Bone Innovations, Morrisville, PA). This implant is designed to be used in conjunction with the SBI rHead™ prosthesis (Figure 1). These 2 components articulate against each other in a concave–convex spherical relationship and are anatomically designed for minimal resection in order to restore normal articulation. The implants are available in left- and right-hand configurations and in various sizes, and they are modular, meaning that any size capitellum will fit any size head.

"An important indication for uni-elbow arthroplasty is painful capitellar wear after radial head arthroplasty."

Indications

Admittedly, radiocapitellar or isolated capitellar arthritis might be effectively treated with radial head excision. However, because normal biomechanical function of the forearm and elbow necessitates load transfer from the radius to the ulna between the wrist and the elbow, and at both the radiocapitellar and ulnohumeral joints, uni-arthroplasty may have a role.[5-7]

An important indication for UNI-Elbow arthroplasty is painful capitellar wear after radial head arthroplasty. Such wear may result most commonly in 2 clinical situations: after radial head arthroplasty in which postoperative instability or overstuffing of the joint results in capitellar arthrosis, and after radial head arthroplasty in the setting of longitudinal radioulnar instability (Essex-Lopresti lesion). These 2 indications are the most compelling because in these types of clinical scenarios little exists for effectively providing pain-free function to the elbow. A new device, even without long-term

Figure 1. The UNI-Elbow Radio Capitellum System (Small Bone Innovations, Morrisville, PA).

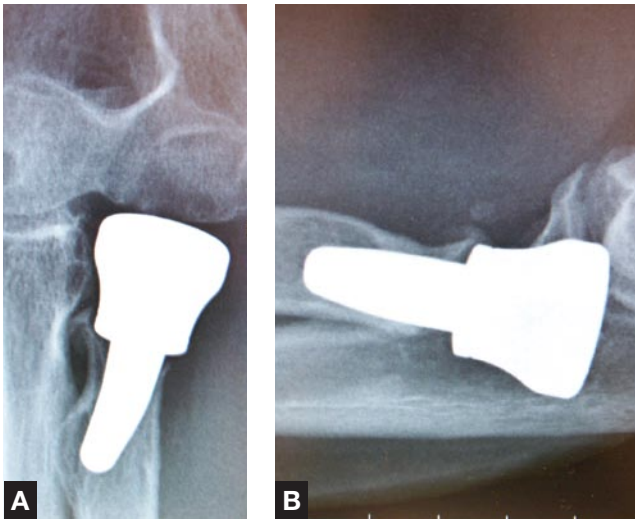

Figure 2. Preoperative anteroposterior (A) and lateral (B) radiographs of elbow.

data, may provide a useful salvage, when few options exist arguably.

We may find with time that UNI-Elbow arthroplasty may also have a role in the primary treatment of Essex-Lopresti injuries in combination with triangular fibrocartilage complex repair. Indeed, few satisfactory options exist for this acute injury, and innovative attempts to reconstruct the interosseous ligament (IOL), which might obviate the problem of late capitellar wear, are not proven either.[8]

In the first clinical situation mentioned, capitellar wear may arguably be addressed by implant removal alone, but this would be contraindicated in the presence of valgus instability or longitudinal instability. Capitellar resurfacing and exchange of the radial head with the biomodular radial head will both improve tracking and diminish pain. In the second clinical situation, prior forearm IOL injury will result in abnormal load transfer between the radius and ulna, thus overloading the capitellum. The UNI-Elbow arthroplasty provides a novel solution—anticipating that a resurfaced capitellum will be more resilient than cartilage and therefore less painful over time—even in the absence of IOL reconstruction. Indeed, this solution supports use of the device in the face of both an irreparable radial head and an IOL injury.

As experience with this alternative increases, so too might the indications expand to include cases for which simple radial head excision might be relied on, such as arthritis secondary to osteochondritis dissecans.

Contraindications

Use of this implant requires a competent lateral collateral ligament, a nonarthritic ulnohumeral articulation (otherwise total elbow arthroplasty might be indicated), and an adequate soft-tissue envelope. Additional contraindications include muscle deficiency to allow elbow flexion/extension, skeletal immaturity, sensitivity to the materials used in the device, and infection or history thereof.

Case Example

A patient in her 40s was treated initially for a Mason 3 radial head fracture with radial head arthroplasty. For almost 1 year, she experienced intermittent popping, and ultimately she presented with pain. Radiographs showed posterior subluxation of the radial head and capitellar arthrosis (Figure 2). Physical examination showed nearly full range of motion, plus a positive pivot-shift test consistent with posterolateral rotary instability. Assessment showed lateral collateral ligament insufficiency and capitellar arthrosis.

The preoperative plan included lateral collateral ligament reconstruction, capitellar resurfacing, and radial head implant exchange to a biomodular radial head to avoid

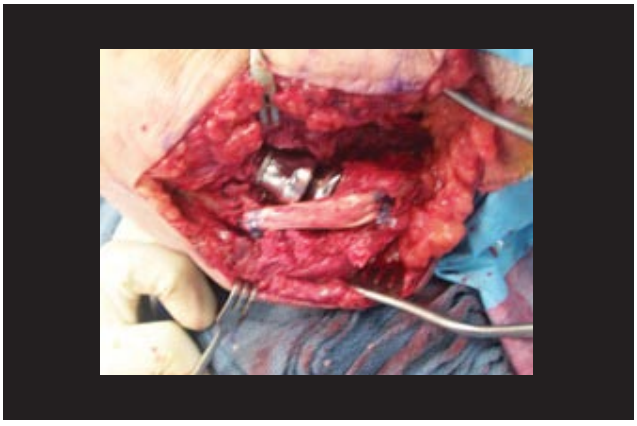

Figure 3. After lateral collateral ligament reconstruction.

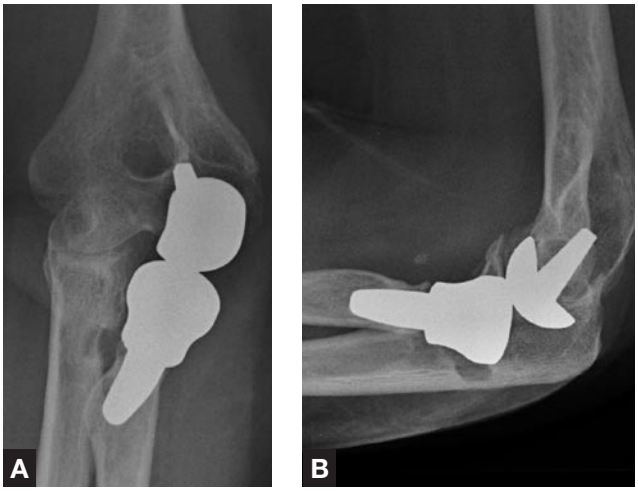

Figure 4. Postoperative anteroposterior (A) and lateral (B) radiographs of elbow.

the instability that might accompany radial head removal alone. Ligament reconstruction was performed with tibialis anterior allograft and biotenodesis screw fixation (Arthrex, Naples, Fla) (Figure 3). However, the radial head prosthesis that was in place could not be removed because of bony ingrowth; rather than risking significant destruction with such an effort, only the capitellar device was placed (Figure 4). The clinical outcome 8 months after surgery was pain-free range of motion without clinical evidence of instability, despite evidence on the lateral radiograph of persistent posterior subluxation. Despite the suboptimal situation of metal articulating with metal, and persistent subluxation (albeit less than before surgery), the patient was satisfied, having obtained near complete pain relief.

Summary

In conclusion, UNI-Elbow arthroplasty is an innovative alternative to radial head resection or implant removal in addressing painful radiocapitellar joint arthrosis. As an "arthroplasty" solution, it retains the biomechanical function of the elbow and obviates the potential complications of not having a radial head. Although its role is likely to evolve as clinical experience accumulates and reported outcomes increase in number, it may have a role in the setting of acute and chronic Essex-Lopresti lesions, and when previous radial head arthroplasty has resulted in capitellar arthrosis but when removal of the implant alone is felt to be contraindicated.

Author's Disclosure Statement

The author wishes to note that he is on the Scientific Advisory Boards for Small Bone Innovations and BioMedical Enterprises, Inc., and he is a paid consultant for DePuy, Inc.

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