



ORIGINAL ARTICLE

# Total elbow arthroplasty for primary osteoarthritis



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**Background:** Primary osteoarthritis of the elbow is a less common indication for total elbow arthroplasty (TEA). Higher complication rates in younger, active patients may offset short-term improvements in pain and function. The purpose of this study was to determine pain relief, functional outcomes, complications, and survival of TEA in this population.

**Methods:** Between 1984 and 2011, 20 consecutive TEAs were performed for primary elbow osteoarthritis. Two patients died before the 2-year follow-up. Mean age at surgery was 68 years (range, 51–85 years). Outcome measures included pain, motion, Mayo Elbow Performance Score, satisfaction, complications, and reoperations. Mean follow-up was 8.9 years (range, 2–20 years).

**Results:** Three elbows sustained mechanical failures. Complications included intraoperative fracture (n = 2), wound irrigation and débridement (n = 1), bony ankylosis (n = 1), humeral loosening (n = 1), humeral component fracture (n = 1), and mechanical failure of a radial head component (n = 1). Fifteen elbows without mechanical failure were examined clinically. Pain improved from 3.6 to 1.5 ( $P < .001$ ). Range of motion remained clinically unchanged ( $P > .05$ ), with preoperative flexion contractures not improving. Mayo Elbow Performance Scores were available for 13 elbows without mechanical failure, averaging 81.5 points (range, 60–100 points); these were graded as excellent (n = 5), good (n = 2), and fair (n = 6). Subjectively, all patients without mechanical failure were satisfied.

**Conclusion:** TEA represents a reliable surgical option for pain relief in patients with primary osteoarthritis. However, restoration of extension is not always obtained, indicating that more aggressive soft tissue releases or bony resection should be considered. Complications occurred in a large number of elbows, but mechanical failure was low considering the nature of this population and the length of follow-up.

**Level of evidence:** Level IV; Case Series; Treatment Study

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Total elbow arthroplasty (TEA) has been reported to provide pain relief and improved function in patients with end-stage arthritis of various causes. In the early years of elbow arthroplasty, most patients undergoing this procedure were

affected by inflammatory arthritis. With the widespread use of disease-modifying antirheumatic drugs and the adoption of expanded indications for elbow arthroplasty, most arthroplasties are currently performed for other indications, mainly post-traumatic osteoarthritis, distal humeral fractures, and nonunions.<sup>4,7</sup>

Primary osteoarthritis of the elbow is a relatively common condition likely associated with overuse of the joint over an extended time. It is much more prevalent in men, and most patients are involved in manual labor and lift weights

The Mayo Clinic Institutional Review Board approved this study (IRB 07-007944).

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repetitively.<sup>16</sup> The primary complaints of patients initially presenting with primary osteoarthritis is often loss of motion and impingement pain at the extremes of motion. Frequently there is little or no pain in the midarc of flexion.

In these early stages, primary osteoarthritis of the elbow can be treated successfully with osteophyte removal and capsulectomy.<sup>1</sup> However, a subset of patients continues to degenerate and eventually develop pain through the midarc of motion that may not respond well to even multiple attempts at osteocapsular arthroplasty. In these circumstances, elbow arthroplasty is an alternative option, especially in the older patient. TEA in this population represents less than 1% of preoperative diagnoses in large studies of patients with mixed diagnoses.<sup>5,6,10</sup>

Patients must be willing to accept the activity limitations of a TEA, which is not uniformly the case in this population. Thus, the performance of TEA in these patients remains concerning. TEA has the potential to provide pain relief and improved function but could also be associated with a high rate of mechanical failure in the typical patient who develops primary osteoarthritis and has a higher baseline activity level than the historic inflammatory patient.

Owing to the rarity of the diagnosis and reluctance to implant a TEA in this active population, reports on outcomes after TEA for primary osteoarthritis are limited to 3 studies in the English literature, including a previous case series of 5 elbows from our institution.<sup>3,9,14</sup> Two other small case series each report 11 elbows with primary osteoarthritis with a mean follow-up of 68 and 57 months, respectively.<sup>3,14</sup> Larger studies are needed to examine this population and determine the roll of TEA in the treatment of primary elbow osteoarthritis. We aim to expand on our previous case series and review our experience over a 27-year period with TEA for primary osteoarthritis with a minimum 2-year follow-up to assess pain relief, functional outcomes, complications, and the revision rate in this population.

## Methods

### Patients

Between January 1, 1984, and December 31, 2011, 1305 TEAs were performed at our institution. Of these, 20 (<1%) were performed in patients for primary elbow osteoarthritis. Two patients died before the 2-year follow-up, leaving 18 elbows (90% of the overall cohort; 7 men, 11 women) with a mean age at the time of surgery of 68 years (range, 51-85 years) that had been monitored for a minimum of 2 years or until reoperation. The mean follow-up for these 18 elbows was 8.9 years (range, 2-20 years).

Patients were indicated for TEA when their pain included the midarc of motion, pain with resisted flexion and extension, and pain at rest and at night. Imaging showed characteristic findings of primary elbow osteoarthritis with hypertrophic marginal osteophytosis affecting the ulnohumeral joint and an absence of inflammatory changes. Conservative measures before TEA had failed in all patients, with 5 undergoing a previous débridement procedure (4 open, 1 arthroscopic) before arthroplasty. One additional patient underwent an isolated ulnar nerve transposition before TEA without débridement.

Efforts were made to preserve the native elbow in young active patients until symptoms could no longer be tolerated. Patients had to be willing to accept the activity limitations of a TEA before the operation was scheduled, which was more common in women despite the disease being more common in men.

### Surgical procedures

Seven subspecialty practicing surgeons performed the index procedure, with more than half of the procedures performed by one of the senior author's surgeons (B.F.M.). All surgeons performed TEA as a part of their routine practice. Surgery was performed using a Bryan-Morrey triceps-reflecting approach in 17 elbows and a triceps split in 1 elbow. The ulnar nerve was transposed in an anterior subcutaneous pocket in 13 elbows; 2 additional elbows had undergone prior ulnar nerve transposition. Implants used included the Coonrad-Morrey system (Zimmer, Warsaw, IN, USA) in 14 elbows, the Latitude system (Tornier, Minneapolis, MN, USA) in 3 elbows, and the Pritchard system (DePuy, Warsaw, IN, USA) in 1 elbow, depending on surgeon preference.

Implants were fixed with antibiotic-loaded cement (18 of 18) and linked (17 of 18). An extensive capsulectomy was performed in 7 elbows in an effort to gain full intraoperative range of motion without having to excessively shorten the distal humerus. Intraoperative range of motion obtained at the end of the procedure included mean extension of 6° (range, 0°-30°) and mean flexion of 137° (range, 130°-145°). Postoperative heterotopic ossification prophylaxis was not routinely used.

The operative arm was splinted in full extension for 2 to 7 days postoperatively, depending on the state of the extensor mechanism and soft tissue envelope. Patients were instructed postoperatively to refrain from lifting more than 2 pounds repetitively and 10 pounds rarely with a single lift. The radial head was maintained in 17 elbows because there was no significant malalignment or impingement. One elbow treated with a Latitude prosthesis underwent concurrent radial head replacement because of existing arthritic changes.

### Evaluation

All patients were assessed prospectively at regular intervals through our institutional joint database. Pain, active range of motion, and other elements of the Mayo Elbow Performance Score (MEPS) are obtained at the clinical follow-up or by a validated letter questionnaire or telephone interview at 1, 2, and 5 years, and every 5 years thereafter.<sup>2</sup> This information was collected retrospectively along with a record review to identify previous surgical procedures, complications, and reoperations. Sufficient information was available to calculate the MEPS at most recent follow-up for 13 of the 15 elbows without mechanical failure.

Preoperative radiographs were available for all elbows and were evaluated for cartilage loss, bony erosion, carrying angle deformities, and subluxation. Cartilage loss was assessed as partial (thinned joint space) or complete (bone-on-bone articulation). Bony erosion was classified as being present if the native architecture of the elbow had been disrupted beyond complete loss of the cartilage space. Postoperative radiographs were available for 94% of the elbows at a mean follow-up of 6.9 years (range, 0.9-20 years). Radiographs were performed in 1 elbow with mechanical failure before revision at 0.9 years, with the remainder of elbows all having follow-up of greater than 2 years.

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