

Total Elbow Arthroplasty in Young Patients - An 8-Year Follow-up Case Series

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Learning Point of the Article:

Total elbow arthroplasty is still relevant today, even in younger population giving good functional outcomes.

Abstract

Introduction: Certain elbow pathologies can give rise to considerable loss of joint function, which would severely affect the daily living activities of the patients. Total elbow arthroplasty (TEA) can be a safe and reasonable motion-preserving and pain-relieving option in such debilitating elbow conditions. The aim of this case series is to evaluate the functional outcome of TEA in young patients with four different indications after an 8-year follow-up.

Case Report: We report a case series of four TEA cases done for different indications, namely rheumatoid arthritis, chronic elbow dislocation, post-traumatic elbow ankylosis, and failed primary total elbow replacement, all in relatively young patients. All patients were given a semi-constrained Coonrad-Morrey prosthesis using a posterior Bryan-Morrey approach. The cases were done during the years 2013-2014. Eight-year follow-up of each case showed excellent functional outcome and persistent pain relief with a high Mayo Elbow Performance Score. All the patients have given written consent for publishing this article.

Conclusion: Despite being uncommon, total elbow replacement can be the choice of surgery for certain elbow affections, giving satisfactory functional recovery and good pain relief, even in a younger population.

Keywords: Total elbow arthroplasty, replacement, elbow, rheumatoid arthritis, mayo elbow performance score.

Introduction

The elbow being one of the most mobile joints, its smooth and complete range of movement (ROM) is necessary for the good functioning of the upper extremity. The elbow has a normal movement range of full extension to 145° of flexion and about 160° of pronation-supination [1]. Within this range, an individual requires at least 30-130° of flexion and rotation between 50° of supination and 50° of pronation for average daily activities [2].

Dee described total elbow arthroplasty (TEA) for the 1st time in 1972 to treat patients with RA. However, there have been

constant modifications in the techniques and implant designs of TEA [3], which has led to the realization that its indications could include complex comminuted elbow fractures, post-traumatic arthrosis and ankylosis, chronic instability, failure of fracture fixation, and even elbow osteoarthritis [4-10].

Elbow prosthesis has undergone rapid evolution and refinement since it was first described. At present, the available prostheses are of the following types:

Unconstrained

Ewald's capitello-condylar design is an example. Since

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Author's Photo Gallery



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Case 1: 39-year-old female with right elbow rheumatoid arthritis (RA).

components here are unlinked, it requires functional collateral ligaments and a good soft tissue envelope. It would also ideally require good bone quality. The most common complication reported is instability. (5–10% dislocation) [11]. Thus, the component alignment needs to be perfect.

Semiconstrained

It has a sloppy hinge that gives some rotational and varus-valgus freedom, thus reducing stress on the bone-cement interface and the incidence of component loosening. It has the best results of all the designs. The radial head need not be replaced. The anterior flange of the humeral component resists posteriorly directed and rotational forces. The Coonrad-Morrey design is an example [11].

Constrained

Constrained is considered to be the most stable type. It has a rigidly hinged design. Highest loosening rate amongst the three. Dee's design is an example of a constrained elbow prosthesis



Case 2: 48-year-old female with ankylosed elbow due to chronic untreated dislocation since childhood.

[11].

Case Report

Case 1

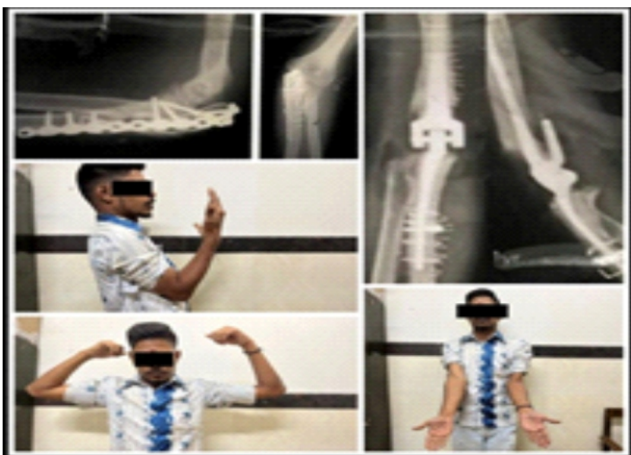
39-year-old female with right elbow stiffness and non-relieving pain due to rheumatoid arthritis (RA). The movement arc was only 20° (80–100° of flexion). Eight years post-operatively she had excellent ROM and good pain relief, with a Mayo Elbow Performance Score (MEPS) of 85.

Case 2

A 48-year-old female with chronic untreated right elbow dislocation since childhood resulting in an ankylosed joint with only jog of movements possible. Eight years post-op, painless and near-complete ROM with MEPS of 100.

Case 3

A 26-year-old male with a completely ankylosed elbow at 90° due to a year-old history of a compound comminuted fracture of



Case 3: 26-year-old male with post-traumatic elbow ankylosis.



Case 4: 35-year-old female with failed right TEA.

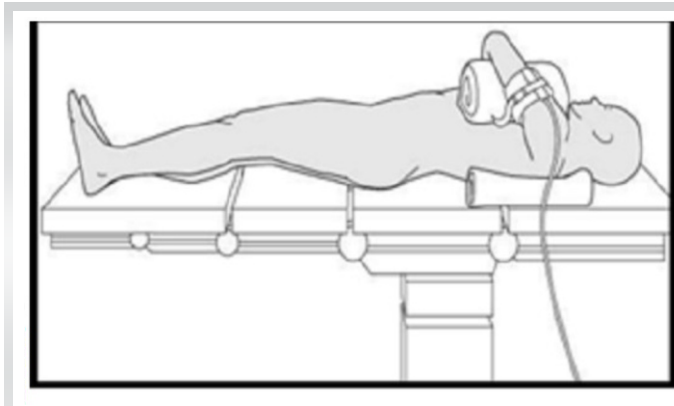


Figure 1: Patient position.

the right proximal ulna, which was fixed followed by implant removal. Excellent functional results 8 years post-operatively with MEPS of 100.

Case 4

A 35-year-old female with right TEA done 2 years ago presented with a broken prosthesis hinge, resulting in multiaxial elbow instability. Revision surgery was done. Intra-op, the broken screw of the hinge could not be retrieved due to excessive fibrosis. Ulna was fractured during the removal of the cement mantle, which was fixed with wires. We managed to get a good functional ROM post-operatively and MEPS of 85 at 8-year follow-up.

Operative technique

All surgeries were performed by the same surgeon. A semi-constrained Coonrad-Morrey prosthesis by ZIMMER was used in all four cases. Surgeries were performed with the patient in a supine position with the forearm supported on the torso (Fig. 1). The posterior Bryan-Morrey approach was used (Fig. 2). The average operative time was 118 minutes. Care was taken to isolate and protect the ulnar nerve (Fig. 3). The olecranon process was preserved to provide a good lever arm for the triceps to work on. To improve flexion and extension, anterior capsulotomy and triceps release were done, respectively. The flexor muscles were released if found contracted. After

preparing the ulna and humerus canals, reduction was done with trial components (Fig. 4 and 5), followed by definitive cemented component implantation (Fig. 6). Cementing was done with the help of an endotracheal tube (Fig. 7). The ROM was always confirmed under anesthesia. Triceps were secured to the olecranon through drill holes. The patient was given an arm pouch post-op. X-rays were done the same day. Physiotherapy was started the very next day in the form of passive- and active-assisted elbow ROM exercises. Three doses of antibiotics were given, and the patient was discharged on the third post-op day.

Follow-up

Suture removal was done after 2 weeks. At 3-month follow-up, all patients had a ROM arc of around 120° (10–130°) of flexion-extension and around 130° of pronation-supination. Follow-up X-rays showed good alignment. There were no wound- or neurovascular-related problems. All patients were able to carry out their activities of daily living (ADL) with varying degrees of comfort level. All patients were followed up after 8 years to see for functional outcomes.

Results

At 8 years of follow-up, the results were persistent, with no new complaints from any of the patients. There was no evidence of loosening, heterotrophic ossification, or osteolysis in any of the cases. All of them had excellent functional outcomes with MEPS in the range of good to excellent (85–100).

Discussion

A few decades ago, it was believed that the survival rate for total elbow replacement was low. Moreover, complications like damage to the radial and ulnar nerves, periprosthetic fractures, infection, and wound dehiscence were also established [7,12, 13]. These were a few of the main reasons against its use. Surgeons thus resorted to salvage substitutes like elbow joint fusion and soft tissue interposition arthroplasty, but they too were accused of low functional scores and a high number of drawbacks [14-18]. Using newly developed designs and techniques, TEA has now been reported to have a 5-year



Figure 2: Incision.



Figure 3: Ulnar nerve isolated.

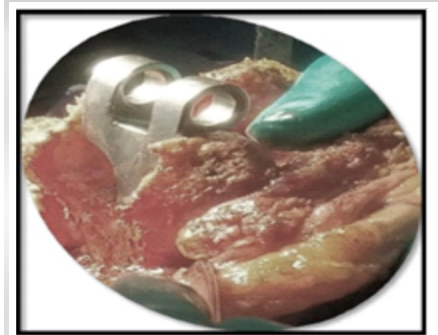


Figure 4: Humeral component trial.

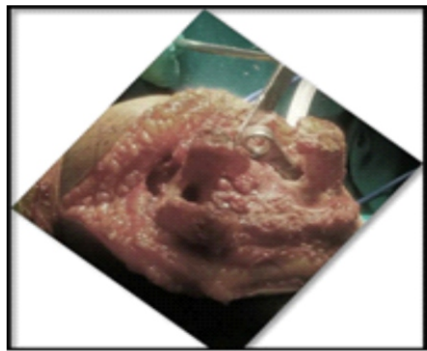


Figure 5: Ulnar component trial.



Figure 6: Cementing

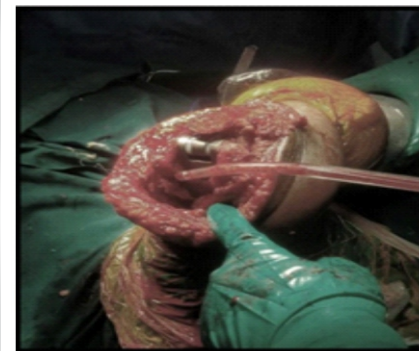


Figure 7: Final Prosthesis.

survival rate of 97.7% and a 10-year survival rate of 91.0% [7]. It has emerged as a viable option for end-stage elbow pathologies, even in younger patients, with favorable results.

Park et al. conducted a retrospective study of 23 semi-constrained elbow arthroplasties in a younger population of <40 years, which showed a 95% rate of survival at 8-years and 89% at 15. These were surprisingly close to the survival rates of TEA in older populations [19].

In another review of the literature by Welsink et al., they studied 9379 elbow arthroplasties done for various pathologies. The mean rate of survival at 7.8 years was 85.5%, and at 12.3 years, it was 74% [20].

Celli and Morrey, in their study of 55 TEAs done in a population below 45 years of age, showed that 93%, i.e., 51 patients, had a Mayo performance score of 85 and above [21].

This has encouraged surgeons to consider TEA for various indications, even in a younger population.

There are still some complications that are being reported in TEA, clinical loosening being the most frequent one [20,22,23]. Reviewing the literature points out that the lowest outcomes were seen in patients with previous elbow trauma, with higher failure and complication rates [24, 25]. The reason for this could be that post-traumatic osteoarthritis of the elbow is seen more frequently in active young patients and is associated with soft tissue contractions, fixed deformities, loose

bone stock, and previously done surgeries, which would increase the complication rates [8].

In this case series, we did not encounter any of these complications except for the intra-op olecranon fracture in one case. The 8-year functional outcomes of all four cases are excellent and worth reporting.

Conclusion

Despite having some complications, elbow arthroplasties have stood the test of time and are in fact proving to be a good treatment choice for several elbow pathologies, including complex trauma and primary osteoarthritis. It can give good functional results, even in young patients, as we have shown in this case series, with a rapid return to performing ADL.

Clinical Message

- TEA is a pain-relieving and motion-preserving procedure that still has its indications.
- TEA continues to provide good functional outcomes for end-stage elbow pathologies, even in a younger population.
- TEA has its own set of complications, the most common being the loosening of the prosthesis. However, they can be tackled with newer designs and better techniques.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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Consent: The authors confirm that informed consent was obtained from the patient for publication of this case report

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