



## Total Elbow Arthroplasty for Complete Bony Ankylosis of the Elbow in Patients with Rheumatoid Arthritis: A Report of Three Cases

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### Abstract

We report three cases of Total Elbow Arthroplasty (TEA) for complete bony ankylosis in patients with Rheumatoid Arthritis (RA). Two cases had trauma around the elbow joint before ankylosis. At the most recent examinations, the average arc of motion was 85 degrees among patients. Two patients satisfied with surgical outcomes, however, one patient complained of residual pain and numbness. There were some reports about TEA of ankylosed elbow, however, there were few reports limited to ankylosed elbow with RA. TEA for ankylosed elbows in patients with RA is a good surgical option to restore adequate function. To gain a good outcome, it should be evaluated other joints in the extremity in order to properly evaluate the mobility and function of the elbow and to prepare a comprehensive plan of pre- and post-operative management that takes into consideration the full motion of the upper extremity.

**Keywords:** Ankylosed elbow; Rheumatoid arthritis, Total elbow arthroplasty

### Introduction

Rheumatoid Arthritis (RA) is a common disease characterized by chronic synovitis and resulting in joint destruction. Recent advancements in the diagnostic process and treatment of RA have decreased joint surgery, including synovectomy or joint replacement, over the last decade [1]. Nevertheless, some patients with severe joint destruction occasionally develop severe contractures or ankylosis which impair the Activities of Daily Living (ADL).

The incidence of elbow joint involvement in Rheumatoid Arthritis (RA) is approximately 50% [2]. Destruction of the elbow joint seriously impairs upper limb function. Moreover, complete ankylosis of the elbow results in severe disability and functional limitations, especially when other joints in the ipsilateral upper extremity also have limited motion [3]. In a previous study not limited to RA patients, the analysis of compensatory movement after arthrodesis of the elbow showed compromised ability, despite a significantly increased dependence on wrist movement [4]. Since the wrist or shoulder joint is occasionally damaged and impaired in patients with RA, ankylosis of the elbow affects ADL more than it would in a patient without RA [2]. Accordingly, an ankylosed elbow, especially in RA patients, generally should be treated.

Elbow contractures are usually treated with arthroscopic surgery or open surgical release and numerous reports have indicated the achievement of good results [5-6]. However, fewer reports present the results of Total Elbow Arthroplasty (TEA) in ankylosed elbows [3,7-10]. Figgie et al. [3] concluded that stiff elbows are difficult to treat and have a high complication rate. The latter study was reported in 1989 and good anatomical implants were not available at that time. Since implant design and surgical techniques have advanced in recent years, TEA could now be a reliable option to restore function to completely ankylosed elbows damaged by RA. There were some reports of TEA on ankylosed elbow; however, there were few reports about TEA ankylosed elbow limited to RA patient. This report is a retrospective review of TEAs performed in our hospital between 2008 and 2015 for ankylosed elbows in patients with RA. We examine complete ankylosis in three elbows of three patients with RA who underwent TEA. All of the patients were women and their average age at surgery was 55 years (range, 29 to 72 years). Herein we report these cases.

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**Figure 1:** Plain radiographs of the right elbow of a 29-year-old female patient (Case 1). (A) Preoperative anteroposterior and lateral views. (B) Anteroposterior and lateral views after total elbow arthroplasty (TEA).

## Case Presentation

### Case 1

A 29-year-old woman had complained of polyarthralgia when she was 16 years old, at which time she visited our clinic and was diagnosed with RA. When she was 27 years old she struck her right elbow when she fell to the ground. After the accident, she was referred to the nearby hospital, where she was diagnosed with a right humeral supracondylar fracture and treated conservatively with a cast. Bone union was achieved 3 months after the injury. However, this patient was referred to our department 1 year after the injury because she noticed a reduction in motion and gradual impairment of her right elbow. Radiographs revealed that her right elbow was completely ankylosed and fused at 20 degrees flexed position (Figure 1A). There were no symptoms due to ulnar nerve. In the hope that she would be able to regain the mobility needed to be able to wash her face and hair by her, at 29 years of age she underwent a linked TEA (K-NOW<sup>®</sup> snap in; Nakashima Medical, Okayama, Japan). The posterior Campbell approach was used, and the triceps was incised in an inverted V-shape. First, the ulnar nerve was isolated and protected. Second, the extensor carpi ulnaris and anconeus muscles were released from the ulna. Although osseous ankylosis had occurred, it was easy to identify the landmarks of the original humeroulnar joint. After the radial head was resected, the humeroulnar joint line was carefully opened using a bone saw and mini-osteotomies. The rest of the procedure was almost the same as any standard TEA method. Care was taken to release the anterior part of the capsule to improve extension and the triceps muscle was released from the humerus in order to improve flexion. Under general anesthesia, the range of motion of the elbow ranged from 0 to 125 degrees after the implants had settled. The triceps flap was elongated using the V-Y method. The ulnar nerve was replaced anteriorly from its origin. A radiographic examination after the surgery showed the alignment of components was acceptable (Figure 1B). The patient's elbow was immobilized with a splint for 1 week. Under the observation of an occupational therapist, the splint was removed and range of motion exercises were begun with a 30 degrees restriction on extension. Three weeks after the operation, the patient was allowed to move her elbow freely. Any elbow brace was not applied. At the most recent examination, or 65 months after surgery, passive motion of the patient's elbow ranged from 30 to 110 degrees and she did not experience any pain or numbness. She was able to wash her face and hair by herself again and she was very satisfied with the surgical outcome.

### Case 2

A 64 year old woman was diagnosed with RA at the age of 30. By age 60 she began to feel pain in her left elbow and motion at the



**Figure 2:** 64-year-old female patient (Case 2). (A) Preoperative anteroposterior and lateral views. (B) Anteroposterior and lateral views after TEA.

joint gradually declined. When she was referred to our clinic at age 64, her left elbow was fused at 45 degrees. Radiographs revealed that her elbow was completely ankylosed (Figure 2A). She complained of disability in her left elbow during Activities of Daily Living (ADL) and she hoped to regain motion in her left elbow. This patient underwent a linked TEA using The Discovery<sup>®</sup> Elbow System (Biomet, IN, USA). The surgical approach and technique were the same as described for Case 1 and included a triceps flap elongation and ulnar nerve transposition. Under general anesthesia, the range of motion of the elbow ranged from 0 to 140 degrees after the implant settled. The radiographic examination after surgery showed that there was a good alignment of components (Figure 2B). Postoperative treatment was also the same as it was for Case 1. At the most recent examination, or 6 months after surgery, passive motion of this patient's elbow ranged from 20 to 130 degrees and she did not experience any pain or numbness. In addition, her ADL could be performed satisfactorily once again.

### Case 3

A 72-year-old woman was diagnosed with RA in a hospital at age 45 and she was treated with disease modifying antirheumatic drugs. She injured her left elbow at age 69 and was diagnosed with a supracondylar fracture of the humerus. Her left elbow was treated conservatively and progressively lost motion. This patient hoped to undergo elbow surgery and was referred to our hospital at age 71. Her left elbow was fused at 90 degrees and radiographs revealed that it was completely ankylosed (Figure 3A). At age 72, she underwent linked TEA using The Discovery Elbow System. The surgical approach and technique were the same as those described for Case 1 and included a triceps flap elongation and ulnar nerve transposition. Because a crack occurred on the lateral condyle of the humerus during bone reaming, Kirchner wires were inserted and the fragment was fixed. Under general anesthesia, the range of motion of the elbow ranged



**Figure 3:** 72-year-old female patient (Case 3). (A) Preoperative anteroposterior and lateral views. (B) Anteroposterior and lateral views after TEA.

from 40 to 140 degrees after the implant settled. A radiographic examination after the surgery showed that the alignment of the implants was acceptable (Figure 3B). The postoperative treatment was the same as described for Case 1. The patient complained of continued numbness in her ring and little finger immediately after the surgery. Therefore, she underwent neurolysis of the ulnar nerve 7 months after her primary surgery. The symptoms on the ulnar side of her hand gradually improved after the neurolysis; however, hand numbness persisted at her most recent examination. Passive motion at her elbow ranged from 60 to 125 degrees. The increased range of motion at the patient's elbow improved her ADL, so she was satisfied with her surgical outcome to some extent, despite the hand numbness that persisted.

## Discussion

There have been several reported case series of TEA for ankylosed elbows [3,7-9]. Figgie et al. [3] reported a 19-case series of TEA using linked implants for ankylosed elbows in patients with a variety of conditions that have included RA. Of the 19 cases, 4 cases were evaluated as excellent, 11 as good, 3 as fair, and 1 as a failure. The failed case occurred after an infection developed around the surgical site and the implants were removed. The authors stated that the functional limitations of patients should be evaluated at the outset and this should include a concurrent evaluation of other upper extremity joints. Mansat et al. [8] reported 14 cases, 4 of which were rated as excellent, 4 were good, 1 was fair, and 5 were poor. Peden et al. [9] reported 13 cases: 5 were rated as excellent, 3 were good, 4 were fair, and 1 was poor. According to these reports, functional ability restored in most patients postoperatively and was sufficient enough that they could perform ADL normally. In our cases, two of the three patients were very satisfied with the surgical outcome and reported that their ADLs were better than they had been preoperatively.

In the previous reports, the range of motion achieved at the elbows was mostly good. Figgie et al. [3] reported that the mean arc of motion improved from 0 degrees preoperatively to 80 degrees (range, 35 to 115 degrees of flexion) at an average 5.75 years after the operation. Mansat et al. [8] reported that the mean increase in the arc of flexion was 60 degrees (range, 5 to 115 degrees), with a mean increase of 33 degrees in flexion and 27 degrees in extension. Peden et al. [9] reported that the improvement in range of motion at the elbow measured 1 year after the operation was maintained for all patients after a 12-year follow-up. In our study, the average arc of motion was 85 degrees (range, 65 to 110 degrees) at the most recent examination. This result is similar to that of the Peden et al. [9] study. Improvement in the range of motion of the elbow improves the ADL for patients with RA. Common complications following TEA are aseptic loosening, infections, ulnar nerve problems, elbow instability, dislocation, subluxation, intraoperative fracture, fracture of the prosthesis, and ectopic bone formation [10]. When performing TEA for an ankylosed elbow, special care should be taken to prevent infection, ulnar nerve problems, instability, and an intraoperative fracture [3,8-10]. Infection is not typically frequent, but severe complications can arise if it does occur. In the previous study reported by Figgie et al. [3] the only case to fail was due to a deep infection and the patient was not a suitable candidate for implant arthroplasty because of noncompliance. Mansat et al. [8] reported that a deep infection developed in one elbow of two patients with posttraumatic stiffness. One patient had two previous operations prior to the arthroplasty, and the other patient had been operated on four times

before. Both of these patients required revision surgery. In another previous report, three patients had deep perioperative infections that required an average of four additional operations [9]. Neurogenic symptoms, especially those pertaining to ulnar nerve disorders, were a relatively common complication after TEA. It was reported that some patients with moderate neurogenic symptoms preoperatively had complete relief after ulnar nerve decompression and transposition, while other previously asymptomatic patients developed ulnar nerve symptoms; however, no pain was attributed to the ulnar nerve [8]. Among our cases, one of the three patients had significant ulnar nerve symptoms after undergoing TEA and required revision surgery (neurolysis). Because kinking or compression of the ulnar nerve can occur after TEA for ankylosed elbows [3], perioperative procedures to manage the ulnar nerve should be employed. In previous reports, linked implants have been recommended in order to maintain the stability of elbows over the full course of the period during which they are observed [8,9]. Our cases had received linked implants and we did not encounter complaints regarding symptoms caused by elbow instability. Intraoperative fracture is one of the most severe complications to try and avoid during this type of operation. Peden et al. [9] reported that two cases had a fracture of the lateral humeral epicondyle which resolved uneventfully and the ulnar component was malpositioned causing a perforation of the posterior cortex in another case. Mansat et al. [8] reported that two patients sustained a fracture associated with a loose component. One of our cases had an intraoperative fracture and it was fixed with a Kirchner wire. We noted that the original border between the humerus and ulna was sometimes difficult to identify intraoperatively and this can inadvertently contribute to a fracture when opening up an ankylosed joint.

In conclusion, TEA for ankylosed elbows in patients with RA is a good surgical option to restore adequate function as well as any other spontaneous ankylosis. For the sake of a good outcome, it is necessary to evaluate other joints in the extremity in order to properly evaluate the mobility and function of the elbow and to prepare a comprehensive plan of pre- and post-operative management that takes into consideration the full motion of the upper extremity.

## References

1. Momohara S, Inoue E, Ikari K, Ochi K, Ishida O, Yano K, et al. Recent trends in orthopedic surgery aiming to improve quality of life for those with rheumatoid arthritis: data from a large observational cohort. *J Rheumatol*. 2014; 41: 862-866.
2. Souther WA. Surgery for rheumatoid arthritis: upper limb surgery of the elbow. *Ann Rheum Dis*. 1990; 49: 871-872.
3. Figgie MP, Inglis AE, Mow CS, Figgie HE. Total elbow arthroplasty for complete ankylosis of the elbow. *J Bone Joint Surg Am*. 1989; 71: 513-520.
4. O'Neill OR, Morrey BF, Tanaka S, An KN. Compensatory motion in the upper extremity after elbow arthrodesis. *Clin Orthop Relat Res*. 1992; 281: 89-96.
5. Glynn JJ, Niebauer JJ. Flexion and extension contracture of the elbow: surgical management. *Clin Orthop Relat Res*. 1976; 117: 289-291.
6. Weizenbluth M, Eichenblat M, Lipskeir E, Kessler I. Arthrolysis of the elbow. 13 cases of posttraumatic stiffness. *Acta Orthop Scandinavica*. 1990; 60: 642-645.
7. Kraay MJ, Figgie MP, Inglis AE, Wolfe SW, Ranawat CS. Primary semiconstrained total elbow arthroplasty. Survival analysis of 113 consecutive cases. *J Bone Joint Surg Br*. 1994; 76: 636-640.

8. Mansat P, Morrey BF. Semiconstrained total elbow arthroplasty for ankylosed and stiff elbows. *J Bone Joint Surg Am.* 2000; 82: 1260-1268.
9. Peden JP, Morrey BF. Total elbow replacement for the management of the ankylosed or fused elbow. *J Bone Joint Surg Br.* 2008; 90: 1198-1204.
10. Voloshin I, Schippert DW, Kakar S, Kaye EK, Morrey BF. Complications of total elbow replacement: a systematic review. *J Shoulder Elbow Surg.* 2011; 20: 158-168.