

Short term evaluation of total elbow arthroplasty (tea) using baksi's sloppy hinge prosthesis to manage elbow dysfunction

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Abstract

This article aims to evaluate Total Elbow Arthroplasty using Baksi's sloppy hinge prosthesis an operative intervention for patients who have limitations in using the elbow joints due to trauma or chronic inflammatory conditions. With improvements in technique, introduction of newer semi-constrained and unconstrained prosthesis, it is being increasingly used for a wide variety of indications like rheumatoid arthritis, severe osteoarthritis, post traumatic arthritis, chronic instability, comminute fractures not suitable for fixation in the elderly, non unions of distal humerus, tuberculosis elbow with extensive joint destruction, tumours around the elbow, revision arthroplasty. A case series has been prepared for the duration of two years from April 2013 to April 2015. After appropriate preoperative workup and case evaluation, 5 patients were operated with total elbow arthroplasty at a tertiary government teaching hospital. The parameters evaluated were indications for the procedure, intraoperative and postoperative complications, recovery and return to normal joint function. Patients were followed up for at regular intervals upto 1year. Mayo Elbow performance score was used for quantifying anatomical and functional results. The candidate for total elbow arthroplasty should exhibit joint destruction which significantly compromises the activities of daily living. Even though elbow replacements are far more rare than hip or knee arthroplasties, it can come close to an ideal arthroplastic operative procedure resulting in a stable, mobile and painless joint with good patient satisfaction and being reproducible as a technique to perform.

Keywords:

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INTRODUCTION

Elbow is a non-weight bearing trochoginglymoid synovial joint as it affords two degrees of freedom. It is stabilized medially by medial collateral ligament complex and laterally by lateral collateral ligament complex. Elbow joint movements are essential to co-ordinate shoulder as well as forearm and wrist movements and is useful in performing activities of daily living like eating,

combing, writing, lifting weights, personal hygiene etc¹. Disabling conditions like severe rheumatoid arthritis, post traumatic arthritis, severely comminuted supracondylar humerus fractures, nonunion of distal humerus fractures and tuberculosis of elbow with joint destruction and tumours around elbow can cause considerable pain, deformity, loss of movements and hampering of day to day activities. For such cases, we found TEA to be a viable option especially where conservative management will not suffice. Baksi's sloppy hinge is a low cost semiconstrained prosthesis and hence can be used in low-resource setups. Here is an attempt to study the anatomical and functional end results using Baksi's prosthesis.

MATERIALS AND METHODS

A case series has been prepared for the duration of one year from April 2013 to April 2015. After appropriate preoperative workup and case evaluation, 5 patients were operated with total elbow arthroplasty at a tertiary

government teaching hospital. The parameters evaluated were indications for the procedure, intraoperative and postoperative complications, recovery and return to normal joint function. Patients were followed up for at regular intervals at 1st, 3rd, 6th, 14th and 28th week and 1 year. Mayo Elbow performance score was used for quantifying anatomical and functional results². Baksi's sloppy hinge elbow is a semi constrained implant with pin-stabilized but loose hinges to avoid the potential for dislocation or subluxation. There is 7° to 10° of laxity which allows some varus-valgus movement, but still limits axial rotation. Forces across the prosthesis are therefore dissipated primarily to the surrounding soft tissues, thus protecting the cement-to-bone interfaces³.

Procedure

After general or regional anaesthesia, the operation is performed in lateral position under tourniquet. Posteromedial incision over the elbow joint is taken. The ulnar nerve was identified and protected. The triceps is mobilized laterally. Head of radius is excised at the level of annular ligament. Ankylosed or diseased mass is then removed. A transverse cut over the distal end of humerus is just proximal to olecranon fossa and a L-shaped cut is taken at the upper end of ulna preserving the insertion of triceps and brachialis. The canal of humerus is prepared using serial harpoon reamers and triangular rasps. Similarly, an ulnar medullary canal is prepared using harpoon reamers and quadrangular rasps. The vertical height of the prosthetic hinge is compared with the gap between cut ends of humerus and ulna in both extension and flexion. This is followed by pulse lavage and manual cementing. Humeral and ulnar components are fixed with bone cement using impactor just before the cement set. The components are assembled using hinge screw and then secured using lock screw. The range of movements at the elbow are checked intraoperatively. The tourniquet is released after haemostasis is achieved, wound closed over a suction drain. An above-elbow plaster of Paris slab is given in 90 degrees flexion. For the management of the two patients with tuberculous arthritis, they were administered antituberculous medication for 14 days

before surgery and continued 12 months postoperatively. The patients were treated with the following antituberculous medications: isoniazid (300 mg/d), rifampicin (450 mg/d), ethambutol (750 mg/d), and streptomycin (750 mg/d×3 months). The inflamed soft tissues and the necrotic bone were completely curetted out at the time of operation.

Post operative rehabilitation

After 48 hours, drain is removed. The slab is removed daily and active and passive elbow range of motion exercises is performed. Sutures are removed on 12th postoperative day after which isometric exercises are started. Heavy weight lifting and strenuous activity are avoided permanently.

RESULTS

5 patients were treated with Baksi's sloppy hinge elbow prosthesis between April 2013 to April 2015. The average age was 54 years with maximum age of 70 years and minimum of 35 years. Two patients (40%) were male and three (60%) were females. The indications for surgery were –In two patients, tuberculous elbow with extensive joint destruction. One patient had Rheumatoid Arthritis affecting elbow joint. One had non union of fracture of distal humerus. All four patients had fixed flexion deformities affecting day to day activities. One patient had comminuted distal humerus fracture. All these patients were followed up at regular intervals upto 1 year and assessed using Mayo Elbow Performance Score. All five patients had painless elbows on follow up. Average range of movements was 104°. In all patients, joints were stable after replacement surgery. Average range of motion was from 14-118°. One patient had intraoperative complication of fracture of ulna, which was unicortical. It was treated conservatively with plaster of Paris slab immobilization and did not need revision surgery. None of the patients had other known complications like infection, nerve injury or prosthesis loosening. According to Mayo Elbow Performance Score, four patients (80%) had excellent results, one had good results (20%).





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DISCUSSION

Total elbow arthroplasty is a challenging surgery which needs surgeon to be well acquainted with elbow anatomy, surgical approaches and biomechanics. Previously TEA was having high complication rate. Earlier, elbow arthroplasty was a relatively infrequent procedure and available literature was limited. However, now there is increasing evidence that support the overall efficacy of TEA with wider indications^{4,5}. With improvements in technique, introduction of newer semi-constrained and unconstrained prosthesis, it is being increasingly used for a wide variety of indications like rheumatoid arthritis, severe osteoarthritis, post traumatic arthritis, chronic instability, comminuted fractures not suitable for fixation in the elderly, non unions of distal humerus, tuberculosis elbow with extensive joint destruction, tumours around the elbow, revision arthroplasty. The candidate for total elbow arthroplasty should exhibit joint destruction which significantly compromises the activities of daily living. In study of Linn, Gardner, Mc Andrew, Gallagher, Ricci seven patients had mean age of 74 years with range 56-86 years⁶. In our study the mean age was 54 years with range from 35 to 70 years. For the management of the 2 tuberculosis patients, they were given antituberculous

medication for 14 days before surgery and continued 12 months postoperatively. The patients were treated with the following antituberculous medications: isoniazid (300 mg/d), rifampicin (450 mg/d), ethambutol (750 mg/d), and streptomycin (750 mg/d×3 months). The inflamed soft tissues and the necrotic bone were completely curetted out at the time of operation. This was similar to the regime given by Yongqing Wang, Jingsheng Wang, Zhanmin Xu, Yuan Li, and Huimin Wang⁷. In Cobb and Morrey's study, on the basis of the Mayo elbow performance score, fifteen elbows had an excellent result and five had a good result; there were inadequate data for one elbow. There were no fair or poor results. The mean arc of flexion was 25 to 130 degrees. There was no evidence of loosening on the radiographs⁸. In Bakshi's series, of the 11 unstable elbows, the nine with good results had a mean arc of 125° (15 to 140) of painless stable movement, with a mean improvement in supination of 26° and of pronation of 19.5°. There was one fair result and one failure due to loosening with subsequent late infection². Ali, Shahane and Stanley did a study in which the mean follow-up was 63.2 months (range, 36-108). The mean Mayo Elbow Performance Score was 92 (75-100) with a mean flexion arc of 27 degrees - 125 degrees. In our study, the average range of movements was

104⁰. According to MEPS, 4(80%) had excellent, 1(20%) had good results. In the series by Ali, Shahane and Stanley, one patient had a postoperative superficial infection, which required a course of antibiotic therapy, and 1 patient who had a radial nerve neuropraxia recovered spontaneously after 6 weeks. 1 patient had a nonprogressive radio-lucent line on the ulna side of the prosthesis. Additionally, 2 patients developed heterotopic ossification without identifying pre-disposing factors. Athwal and Morrey reported 26 elbows in which humeral component fractures 0.65% and ulnar component fractures of 1.2%. At 5 yr follow up, MEPS score was 82³. In our study there was intraoperative fracture of ulna

in 1 patient which was unicortical and was treated conservatively in the form of slab immobilization. At 1 year follow up the fracture united well and MEPS score was 85.

CONCLUSION

Even though elbow replacements are far more rare than hip or knee arthroplasties, in a properly selected patient, it can come close to an ideal arthroplastic operative procedure resulting in a stable, mobile and painless joint with good patient satisfaction and being reproducible as a technique to perform.

Table 1:

Case no	Age	Sex	Diagnosis	Pain	ROM	Stability	Function	Complications	MEPS
1	55	M	Non-union of distal humerus fracture	None	10-120	Stable	a-yes b-yes c-yes d-yes e-no		95 Excellent
2	35	F	Tuberculosis of elbow	None	10-125	Stable	a-yes b-yes c-yes d-no e-yes		95 Excellent
3	58	M	Tuberculosis of elbow	None	15-105	Stable	a-yes b-yes c-yes d-no e-no	Fracture of ulna	85 Good
4	52	F	Severe rheumatoid arthritis	None	20-120	Stable	a-yes b-yes c-yes d-yes e-no a-no		90 Excellent
5	70	F	Comminuted distal humerus fracture	None	15-120	Stable	b-yes c-yes d-yes e-no		90 Excellent

ROM-Range of movements. MEPS-Mayo elbow performance score a- able to comb hair. b- able to feed oneself. c- able to perform personal hygiene tasks. d- able to put on shirt. e- able to put on shoes. TEA-total elbow arthroplasty. MEPS-Mayo elbow performance score Mayo Elbow Performance Score

Pain (45 points)

- None (45 points)
- Mild (30 points)
- Moderate (15 points)
- Severe (0 points)

Range of Motion (20 points)

- Arc > 100 degrees (20 points)

- Arc 50 to 100 degrees (15 points)

- Arc < 50 degrees (5 points)

Stability (10 points)

- Stable (10 points)
- Moderately unstable (5 points)
- Grossly unstable (0 points)

Function (25 points)

- Able to comb hair (5 points)
- Able to feed oneself (5 points)
- Able to perform personal hygiene tasks (5 points)
- Able to put on shirt (5 points)
- Able to put on shoes (5 points)

Maximal total = 100 points.

Outcomes classification: 90-100 = excellent, 75-89 = good, 60-74 = fair, <60 = poor.

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