Salvage of Elbow Function in Chronic Complex Elbow Fracture Dislocation With Total Elbow Arthroplasty: A Case Report

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SUMMARY

In patients with an elbow fracture dislocation the incidence of radial head fracture is 36%, where as coronoid process fractures occur in 13%, and olecranon fractures in 4% of patients[1]. Combination of all these fractures with a 'terrible triad' is rarely reported in the literature. We describe a 40 year old lady involved in a polytrauma who had head injury, pnuemothorax and an open fracture dislocation of the left elbow. The Injury Severity Score initially on admission was 44. She presented with chronic elbow instability with pain 1 year later. A semi constrained total elbow arthroplasty (TEA) with a Coonrad-Morrey prosthesis was performed in this complex injury involving fractures of the coronoid, olecranon, proximal third of the ulna and radial head malunion with heterotrophic ossification around the elbow joint. Although the survivorship of total elbow replacements has improved, it is still a procedure reserved to older patients with low functional demand. At 1-year follow-up, the patient had full range in flexion and extension. The Mayo Elbow Performance Score (MEPS) was 100. TEA is a procedure which gains function and stability in a terrible triad elbow.

KEY WORDS:
Chronic elbow dislocation, malunion of radial head, total elbow arthroplasty

INTRODUCTION

Total elbow arthroplasty (TEA) has emerged as a realistic option for the management of painful arthritic elbow joint. Patient who sustained Gustilo grade III with a terrible triad has a poor prognosis to regain functional use of the elbow. Beyond a 50% loss of the coronoid process, neither repair of the lateral collateral ligament (LCL) nor replacing the radial head alone resulted in a statistically significant increase in stability. In a study by Closkey *et al*, fractures involving more than 50% of the coronoid process resulted in axial instability[2]. Acute dislocations associated with significant fractures are classified as complex injuries. The management of fractures around the elbow can be challenging due to the complex anatomy and biomechanics of the joint. Consequent incongruity of the articular surface with internal fixation can lead to loss of functions with stiffness. For chronic instability TEA surgery is the only real option. The functional indication for the total elbow replacement for fractures in a young patient using Coonrad-Morrey prosthesis is well described by senior author and primary surgeon in this case report .

CASE REPORT

A 40-year-old woman presented to the orthopaedic clinic in January 2010 with history of pain, chronic instability and deformity of the left elbow. A year prior to presentation, she was involved in a motor vehicle accident and sustained complex left elbow fracture dislocation. She sustained injury of the left elbow with fracture of the radial head and coronoid process in association with fracture of the olecranon and fracture of the proximal third of the ulna with dislocation of the ulnohumeral joint (figure 1) which are classically termed as 'terrible triad of the elbow' . The injury also involved osteochondral fracture of the capitellum and trochlea, elbow joint capsule, annular ligament of radius, lateral and medial collateral ligament. These ligamentous tissue injury were predisposing to gross instability of the elbow joint. There was however no neurological or vascular injury. In view of the patient's condition at that time and overall poor prognosis for ligamentous tissue injury and fractures, the initial surgery involved a wound debridement, K wiring of the ulna fracture, external fixation of the left elbow across the joint maintaining the elbow in 90 degrees flexion with the forearm in pronation in hope to primarily allow the joint to fuse or for a replacement later.

She developed infection in the first 7 weeks and required further wound debridement and removal of K-wire and external fixator. She was later treated with immobilisation in a back slab for 8 weeks. She subsequently defaulted her follow up and presented after a year with pain and chronic instability of the left elbow.

The wound had healed with hypertrophic scar on the dorsal aspect of the left elbow. Clinically she had a varus deformity on extension of the elbow. Movements were unstable as on attempting flexion there would be internal rotation of the elbow. The pain score was 6 out of 10. Mayor Elbow Performance Score (MEPS) was 30 out of 100. The ipsilateral

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Table I: The Mayo Elbow Performance Score (MEPS). The classification was as followed: > 90 excellent; 75 – 89 good; 60 – 74 fair; < 60 poor.

Function	Points	Definition (scores)
Pain	45	None (45) Mild (30) Moderate (15) Severe (0)
Motion	20	Arc > 100o (20) Arc 50 – 100o (15) Arc < 50o (5)
Stability	10	Stable (10) Moderate instability (5) Gross instability (0)
Function	25	Comb hair (5) Feed (5) Perform hygiene (5) Don shirt (5) Don shoe (5)
Total	100	

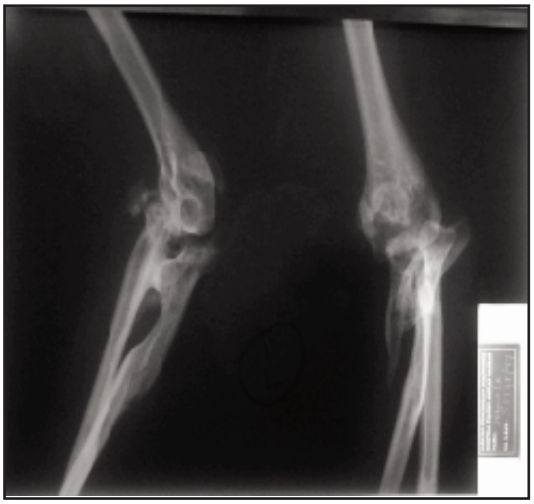

Fig. 1 : Radiographs of the patient's left elbow showing dislocated elbow with malunion of olecranon and radial head with synostosis of proximal ulna.

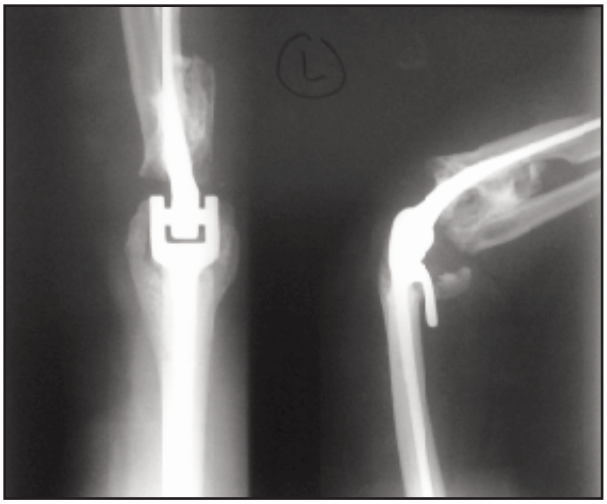

Fig. 2 : Post operative radiograph of the patient showing the semi constrained total elbow arthroplasty .

Fig. 3 : Follow up at 2 years showing good range of motion of the left elbow.

shoulder and wrist joints were clinically normal. Plain radiographs of the left elbow showed pseudo arthrosis with malunion of the left radial head and synostosis of proximal ulna with heterotrophic ossification around the elbow joint. (Figure 1). In view of the instability and pain, she was counseled for total elbow arthroplasty (TEA) to improve her left upper limb function.

Surgical Technique :

She underwent TEA under general anaesthesia. Through a posterior approach the scar tissue was excised and fasciocutaneous flaps were elevated to expose the Kocher interval (anconeus and extensor carpi ulnaris). The ulnar nerve was identified, protected and translocated anteriorly into the subcutaneous tissue. The triceps sparing technique in which triceps attachment was reflected in continuity with the periosteum as described by Bernard Morrey provided excellent exposure to the elbow joint. The lateral collateral ligament which has been avulsed from the humeral attachment, together with the overlying musculotendinous envelope, healed in a displaced position posterior to the epicondyles. Mobilization of this entire ligament and musculotendinous envelope was performed. This is followed by resection of the radial head.

Synostosis of proximal ulna was not osteotomized. The medullary cavities of both humerus and ulna were prepared. The medial and lateral aspect of the supra-condylar columns were visualized throughout the preparation of the distal humerus so as to assure proper alignment and orientation. Care was taken to avoid violating either supracondylar bony column to prevent fracture of the column leaving the cortical bone intact on either side of the humeral prosthesis. A semi constrained cemented Coonrad-Morrey prosthesis was used (Figure 2) to provide rigid fixation and allow early mobilisation.

The most important part of the operation is probably to identify the centre of rotation of the joint. The technical difficulty in performing this operation was not only in the careful attention to center the prosthesis in the distal humerus but also align the ulnar component in an angulated malunited proximal ulnar fracture. The medullary canal of the ulna was identified by using a high-speed burr to remove the hard subchondral bone. Since the canal was small, a rigid reamer was used to prepare the proximal ulnar. For this implant to be inserted, the ulnar stem had to be cut for introduction into the medullary canal of the ulna due to the angulation of the proximal malunited ulnar fracture. For this reason cement was injected down the medullary canal of the ulna and humerus were separately cemented by hand packing. The ulnar component was inserted first as far distally of the coronoid process. The center of the ulnar component aligned with the projected center of the greater sigmoid fossa.

The humeral graft measuring about 2 millimeters in thickness and about 1.5 centimeters in length and 1 centimeter in width was placed anterior to the anterior cortex of the distal humerus and the humeral component was inserted down the canal with cement. The base of the flange was flush to the anterior bone of the olecranon fossa. The ulnar component was articulated with the humeral component by placing the axis through the humerus and ulna and securing it with a split locking ring and the humeral and ulnar components were implanted and hinged. The triceps mechanism was placed in its anatomic position and secured with etibond 5 sutures placed through transverse drill holes in the proximal ulna with the extraarticular wafers of olecranon and triceps reflection in continuity were reattached. The sutures were placed in a criss-cross fashion in the triceps and wound was closed in layers with redivac drain. The drain was removed 24 hours after surgery. Post operative x-rays showed a well aligned prosthesis considering the difficulty in performing this procedure.

To prevent heterotopic ossification, oral Indomethacin 25 mg daily for one month was prescribed. The elbow was immobilized in 90 degree of flexion with above elbow slab for the first two weeks and early physiotherapy was commenced. On review at 6 months postoperative, the wound had healed and patient had gained full range of motion of the left elbow (Figure 3). Pain score was 3 out of 10. The MEPS was 95 out of 100. We continuously reviewed her every 6 months. At 2 years post operation the pain score was improved to 1 out of 10 and MEPS was 100 (Table 1). X-rays showed no osteolysis or loosening of either the humeral or ulnar component and the humeral bone graft which had been dislodged did not affect the stability of the humeral implant.

DISCUSSION

Patient with complex elbow disorders continue to pose surgical challenge. Malunion of the olecranon and the proximal ulna do not render TEA as main choice of treatment. The debate of TEA versus internal fixation for distal humerus fracture and non union of the olecranon has been reported in various English literatures [2, 3]. Previous series showed TEA yielded poor results, in term of implant survival, revision rates, and complication. The indication of TEA only showed favorable results in older age group, inflammatory arthritis rather than post traumatic arthritis.

In this patient, we opted for TEA because it was a final solution which was more reliable in pain relief and functional stability. Age is a major factor when considering TEA. TEA often yield poor result in patients less that 40 years. However, Celli and Morrey had reported a series of 55 patients with the age of 40 or less that underwent TEA. 65% had excellent MEPS, 27% good, 5% fair and 2% poor[4].

The ulno-trochlear articulation is a hinge joint. At least 50% of the coronoid process must be present for the ulno-humeral joint to be functional [5]. The chronic elbow dislocation in this case had involvement of fractures of the coronoid more than 75 % associated with ligamentous laxity. We chose a cemented semiconstrained Coonrad-Morrey prosthesis for early mobilisation and stability and this is shown by Shi et al to provide excellent pain relief and good functional return in patients with severe destructive arthropathy[6]. Good long-term results in terms of elbow stability have been achieved, although there have been reports of cases of erosion of the humeral condoyle due to the prosthesis, which is attributed to the oversizing of the implant. The prosthesis should not be too tight and a smaller size implant was chosen for this case. The higher prevalence of failure with this type of implant in other series is likely due to younger patient selection leading to loosening and early failure. TEA is also an indication for more complex injuries with severe bone loss and ligamentous laxity with carefully counseled young patients knowing their limitations such as in this case report. Two years following the TEA she continues to show excellent results with no evidence of aseptic loosening or instability. The young lady was well motivated and had a good functional outcome knowing her restrictions in the use of this prosthetic limb.

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