



## Salvage of elbow function by semi-constrained total elbow arthroplasty following a complex proximal ulnar fracture : A case report

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**A linked total elbow prosthesis was used in an elderly patient to salvage elbow function following failed attempts at osteosynthesis for a comminuted fracture of the proximal ulna associated with a radial head dislocation. A good functional result was obtained at 46 months follow-up, despite questionable healing of the ulnar fracture.**

**Keywords :** ulna ; olecranon ; fracture-dislocation ; total elbow arthroplasty ; triceps.

### INTRODUCTION

Total Elbow Arthroplasty (TEA) is a well accepted option for several indications, the most frequent being advanced joint destruction by rheumatoid arthritis (4). TEA has also become an option for the management of severe posttraumatic or primary osteoarthritis (9), for the treatment of patients with nonunion or malunion of the distal humerus, and as a primary treatment in patients presenting with complex fractures of the distal humerus. In this latter indication, TEA could be a preferable option compared with internal fixation in elderly patients, with severe fracture comminution, osteoporosis, preexisting joint destruction (rheumatoid arthritis) and/or anticipated poor compliance with the post-operative physiotherapy (1-3,7,8). Marra *et al* have recently reported the use of TEA for the treatment of ulnar nonunions (5). We report a further indication for TEA in traumatology, i.e. the existence of a

recent comminuted, unstable fracture of the proximal ulna with radial head dislocation, in an elderly patient, in case of failure or impossibility of osteosynthesis.

### CASE REPORT

A 64-year-old man was involved in a high-energy car accident and presented with multiple fractures and severe traumatic brain injury (subarachnoid haemorrhage, right frontal and left occipitotemporal haemorrhagic contusion); the Glasgow coma score on admission was 11/15. He had sustained a Tile C fracture-dislocation of the pelvis, a closed comminuted bifocal fracture of his right tibia, and an open Gustilo III-A fracture of his right olecranon and proximal ulna with anterolateral radial head dislocation (fig 1). Immediate stabilisation of the elbow, pelvis and tibia was performed

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**Fig. 1.** — Radiographs on admission. Note the comminution of the fracture of the proximal ulna, and the associated radial head dislocation.

using Hoffmann external fixation. At the elbow, two 4-mm external fixation pins were inserted in the distal third of the humerus ; two identical pins were inserted in the proximal ulna. Although gross realignment was obtained, postoperative radiographs showed an unacceptable reduction, with persisting radial head dislocation. An attempt at internal fixation was planned pending the evolution of the open wound on the proximal ulna. The external fixation was removed 15 days after injury, and the ulna was openly reduced and fixed through a posterior incision, using a Mayo ulnar plate (Acumed®, Hillsboro, OR, USA). The fixation was judged to be stable and postoperative radiographs showed an acceptable position. As the patient was still agitated due to his cerebral trauma, it was opted to protect the osteosynthesis by a posterior plaster splint. Despite this immobilisation, secondary displacement of the fracture was noted after a few days, with re-dislocation of the radial head (fig 2). A humero-ulnar external fixator was again implanted but, as could be expected, it also failed to stabilise the elbow. The fixator was removed, and, two weeks later, 60 days after injury, a Coonrad-Morrey TEA (Zimmer®, Warsaw, Ind, USA), using a 4.5 inches extra-long ulnar component, was implanted to restore the length of the ulna and the stability of the elbow. A posterior transtricripital approach was chosen to preserve any ulnar bone fragments attached to the medial triceps. The ulnar plate was removed, the medullary cavity of the ulna



**Fig. 2.** — Secondary displacement of the comminuted fracture of the ulna with redislocation of the radial head in the neurologically agitated patient.

was exposed and the joint was opened. Heterotopic bone formation was evident between the proximal ulna and the radius, so the radial head was resected in order to prevent the development of a radioulnar synostosis. The ulnar and humeral bones were then conventionally prepared for the insertion of the TEA components. The ulnar component was cemented first, taking care to reposition the ulnar bone fragments around the implant, using several transversal Ticon Nr 5 osteosutures (Syneture®, Norwalk, Conn, USA). The humeral implant was cemented next using a standard technique and the ulna and humerus were linked. Intra-operative assessment showed a stable functional range of motion. The wound was closed in layers. Plaster immobilisation was used to protect the elbow during three weeks, after which mobilisation of the elbow began under supervision of a physiotherapist.

The postoperative course was slow due to the ongoing problems related with the brain injury. The patient received further neurological rehabilitation during one year as an in-patient in a specialised rehabilitation center. Two years after the trauma, the patient presented during a seizure episode a posterior fracture-dislocation of his left opposite shoulder. An humeral hemiarthroplasty was implanted in another hospital but resulted in poor function and persistent pain. At follow-up, forty-six months post TEA implantation, the patient had fully recovered from his cranial trauma. Assessment of elbow function showed a stable range of motion, with a



Fig. 3. — Radiographs 25 months after arthroplasty

flexion of 125° and a fixed flexion deformity of 25°. Pronation and supination were 60° and 45°, respectively. The strength in flexion-extension was good. Subjectively, the patient complained of occasional moderate elbow pain, not imposing any medication. Despite this, he stated he was satisfied with his elbow function and felt his elbow did not cause any limitations in his activities of daily life. The Mayo elbow performance index was good with a score of 80 out of a possible 100 (6) and the DASH score 52.5/100 (the persistent disabilities were mainly related to the pain and ankylosis of the left shoulder). Radiographs showed a good position of the prosthetic components with no signs of loosening. However, healing of the proximal ulna was questionable (fig 3). A CT-scan confirmed the existence of a fibrous nonunion of the ulna.

### DISCUSSION

Complex comminuted fractures of the proximal ulna with radial head dislocation are notoriously difficult to treat. The classical treatment is anatomical reduction followed by internal fixation using an appropriate plate (10). Intramedullary fixation using multiple pins and tension-band cerclage does not usually provide satisfactory stabilisation of such complex fractures. As demonstrated in this case report, salvage may be achieved by reconstructing the ulnar bone along the extra-long ulnar stem of a Coonrad-Morrey TEA, restoring elbow stability and allowing rapid rehabilitation with an acceptable functional result. This option should probably only

be considered in elderly patients. As in other indications of TEA in traumatic situations, there are potential risks, including the formation of heterotopic ossifications and deep infection, especially in the case of an open ulnar fracture and after multiple surgical procedures, including using external fixation as in the present case. In the present patient, the use of a bone autograft to enhance ulnar bone healing could have been helpful (5).

One could speculate that the use of a locked plate could have provided better stability, and could possibly have avoided prosthesis implantation in this patient, although this is unlikely considering the extent and degree of comminution of the proximal ulna in this patient.

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