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Case report

Unconventional Solution for a Complex Elbow Problem, 12 Year Followup: A Case Report

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Abstract

Introduction: In the past, the indications for elbow arthroplasty were quite limited and included cases of rheumatoid arthritis and post-traumatic arthrosis. Nowadays, the use of elbow arthroplasty may be necessary in selected cases of complex fractures of the elbow, with good functional results. Several methods have been developed to deal with massive bone defects during revision surgery. Complex surgical steps also bring more injury, thus increasing soft tissue-related complications. The aim of this case report is to evaluate the role of elbow arthroplasty as a primary option and the challenges in subsequent revision surgeries. ***Case Report:*** We describe the case of a 14 year old male student, who presented to our emergency department with a side swipe injury to the right elbow on 28 may 2008. He presented with a large open wound with triceps muscle loss and missing entire distal humerus along with a part of olecranon, neurovascular structures intact. After 1 month complete healing of the flap a custom made uncemented total elbow arthroplasty was done through anterior approach. In 12 years he underwent 2 revisions with ROM of 0-80 degrees and 4cm shortening of upper limb. Restricted pronation and supination compensated by shoulder. He completed his graduation and now working as a software engineer. ***Conclusion:*** Total elbow arthroplasty is a good alternative for elbow complex fractures. Revision scenarios pose various challenges and sometimes need outside the box thinking. Inserting an ulnar prosthesis into the radius is a novel procedure for patients non reconstructable ulna. It is a safe, quick, and effective treatment with a promising outcome.

Keywords: ***Massive Bone Defect, Prosthesis, Radius, Revision Surgery, Salvage Surgery, Total Elbow Arthroplasty***

Introduction

In the past, the indications for elbow arthroplasty were quite limited and included cases of rheumatoid arthritis and post-traumatic arthrosis [1,2]. Even in those cases, it was recommended in elderly patients with a low functional demand, due to its low durability [3,4]. Nevertheless, in the last few years, a reasonable evolution has occurred in terms of its indications and outcomes [5-7]. Nowadays, the use of elbow arthroplasty may be necessary in selected cases of complex fractures of the elbow, with good functional results [8,9].

Several methods have been developed to deal with massive bone defects during revision surgery. Surgeons have tried using an allograft-prosthesis composite to repair the bone defect,[18] however, the associated complication rate is rather high. Complex surgical steps also bring more injury, thus increasing soft tissue-related complications. The aim of this case report is to evaluate the role of elbow arthroplasty as a primary option and the challenges in subsequent revision surgeries.

Case Report

We describe the case of a 14 year old male student, who presented to our emergency department with a side swipe injury to the right elbow on 28 may 2008. He presented with a large open wound with triceps muscle loss and missing entire distal humerus along with a part of olecranon, neurovascular structures intact (figure 1,2,3). We performed surgical debridement, provisional fixation with an external fixator. After 2 days, assessment of the wound, our plastic surgeons performed a pedicled latismus dorsi muscle flap reconstruction of triceps attached to the remaining proximal ulna with skin grafting was done.

Figure 1,2: Wound images

Figure 3: x ray at presentation

After 1 month complete healing of the flap a custom made uncemented total elbow arthroplasty was done through anterior approach (figure 4). Postoperatively no infection and movements of 0-90 degrees were obtained (figure 5,6).

Figure 4: post op x ray primary custom prosthesis

Figure 5,6: ROM after primary elbow arthroplasty

After 4 years patient developed aseptic loosening of the implant, and revision1 was done using cemented custom made elbow prosthesis, patient gained rom of 0-90 degrees (figure 7,8).

Figure 7,8: post op xray following revision1

After 4 years of revision1 patient sustained slip and fall from motorcycle and presented to us with broken ulnar stem of the prosthesis (figure 9,10).

Figure 9,10: presenting xray after slip and fall

Revision 2 was planned, as humeral component was intact, broken ulnar component was deep inside the bone, Revision 2 was performed through anterior approach and new cemented ulnar component was fixed into the proximal radius (figure 11,12).

Figure 11,12: post op xray revision 2

Patient had 4 year followup after Revision 2 with ROM of 0-80 degrees and 4cm shortening of upper limb. Restricted pronation and supination compensated by shoulder. He completed his graduation and now working as a software engineer (figure 13,14,15).

Figure 13,14,15: clinical picture 12 years, 2 revisions later

Discussion

The case presented to us with loss of distal humerus and proximal ulna, it became mandatory to do a custom made elbow prosthesis to restore elbow function and mobility.Some last resort procedures have been described, such as immobilisation with orthosis, arthrodesis or amputation [10]. However, these are associated with functional limitations and with worse aesthetic outcomes [11]. In this sense, a procedure that permits the reestablishment of the limb structural integrity, with pain remission and with strength and function improvement, is desirable. The total elbow arthroplasty emerges as a viable option in these cases. In contrast with previous reports, several authors have recently shown favourable results with this procedure in traumatic injuries [11-14]. Despite some pronation-supination limitations and strength deficits, satisfactory motion, that permits daily activities, can be obtained [15].

The long-term survival rate of elbow arthroplasty is still lower than that for hip or knee arthroplasty,[25] and almost half of the patients need revision surgery within 10 years[26]. Bone defects are a critical problem in arthroplasty because both humerus and ulna are smaller than the femur and tibia. Furthermore, less bone storage exists in the ulna, thus making it more difficult to stabilise the prosthesis during revision surgery. Several methods have been suggested for patients with a massive bone defect, including an allograft-prosthesis composite, autograft from the iliac crest, arthrodesis, resection arthroplasty, and Ilizarov frame;[18,22,24,27,28] however, none of these methods is completely satisfactory, patients suffer from a high complication rate as well as risk for nonunion in the long-term.

In this case the major challenges were faced during revision surgeries as extensile posterior approach cant be used as it would compromise the viability of the flap, both revisions were done using anterior approach

Particularly in revision 2 we were faced with a dilemma on how to approach and revise the entire elbow prosthesis as it would require an ulnar osteotomy, removal of cement, use of a larger stem and fixation might compromise ulnar component stability. This is where our out of the box thinking helped and with the anterior approach we revised ulnar component into the radius bone. There are several surgical considerations and techniques involved in inserting the ulnar prosthesis into the radius [20]: (1) surgery is indicated for patients who have had several surgeries in the past, leaving a massive bone defect in the proximal ulna, to which the prosthesis is unable to fix, and a poor soft-tissue condition such that the prosthesis is barely covered. Therefore, this method should be provided to patients as a salvage procedure, not as the first choice for revision surgery. (2) Given that the radius is connected to the elbow for improved extension and flexion, the rotation function of the radius is sacrificed. We put the forearm in the neutral position. There is no obvious functional disability as well-functioning shoulder can compensate for part of the loss in forearm rotation. This surgical method involves less soft-tissue trauma, is simpler procedure requiring less surgery time, and the bone marrow cavity of the radius is theoretically a completely clean environment, which could prevent periprosthetic infection after the operation.

Conclusion

Total elbow arthroplasty is a good alternative for elbow complex fractures. Revision scenarios pose various challenges and sometimes need outside the box thinking. Inserting an ulnar prosthesis into the radius is a novel procedure for patients with non reconstructable ulna. It is a safe, quick, and effective treatment with a promising outcome.

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