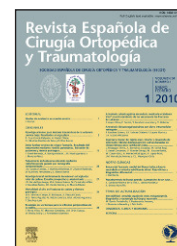


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CLINICAL NOTE

Extensor Mechanism Rupture after Total Elbow Arthroplasty for the Treatment of a Distal Humerus Non-Union

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KEYWORDS

Elbow;
Arthroplasty;
Non-union;
Extensor mechanism;
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Abstract

Introduction: Total elbow arthroplasty is an available option for the treatment of many pathologies of the elbow. Apart from the classic indication in rheumatoid arthritis, new indications have arisen in fractures and non-unions of the distal part of the humerus. Many complications have been described with the use of this technique. Extensor mechanism rupture is one of them.

Case report: We present the case of a 61-year-old woman with a nonunited comminuted distal humerus fracture in a severely affected rheumatoid elbow who was treated with a Coonrad-Morrey semiconstrained total elbow arthroplasty. One month after the operation she developed a palpable ossification in distal triceps which was extirpated. Some months later she presented an extensor mechanism rupture which was surgically treated using a direct suture.

Conclusions: In selected cases, the use of total elbow prosthesis is related to good results. A correct indication and a meticulous surgical technique are essential in order to obtain satisfactory results and to minimise the risk of complications.

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PALABRAS CLAVE

Codo;
Artroplastia;
Pseudoartrosis;
Aparato extensor;
Artritis reumatoide

Rotura del aparato extensor tras artroplastia total de codo para el tratamiento de una pseudoartrosis de húmero distal

Resumen

Introducción: La artroplastia total de codo es una opción disponible para el tratamiento de diversas patologías del codo. Además de la indicación clásica en la artritis reumatoide, han surgido nuevas indicaciones en fracturas y pseudoartrosis de húmero distal. Sin

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embargo, no es una técnica exenta de complicaciones. La rotura del aparato extensor es una de ellas.

Caso clínico: Mujer de 61 años con fractura conminuta no consolidada supraintercondílea de húmero distal, en un codo con afectación severa por artritis reumatoide, es tratada mediante artroplastia total semiconstreñida de codo tipo Coonrad Morrey. Al mes postoperatorio desarrolló una osificación en el tríceps distal que se extirpó. Varios meses después presenta una lesión del aparato extensor que fue tratada mediante sutura directa.

Conclusión: Para casos seleccionados, el empleo de prótesis totales de codo ofrece resultados alentadores. Una correcta indicación y una buena técnica quirúrgica son indispensables para obtener resultados satisfactorios y minimizar la aparición de complicaciones.

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Introduction

Replacement arthroplasty is one of the treatment options for several diseases affecting the elbow. The classical indications for total arthroplasty of the elbow are chronic inflammatory joint diseases, particularly rheumatoid arthritis with severe articular involvement. Other more recent indications are post-traumatic arthritis, comminuted fractures of the distal humerus in elderly patients or with prior joint involvement, the absence of consolidation in fractures of the distal humerus, large post-traumatic bone defects and bone defects following tumour excision.¹

There are different types of implants available depending on the prosthetic constraint. On the one hand, there are constrained or semi-constrained prostheses (assembled during the surgery itself) that guarantee articular stability even in the presence of large bone defects or ligament failure. On the other hand, non-constrained prostheses (unassembled) that appear to entail lower rates of wear, loosening and osteolysis, although they are incapable of offsetting large osteoligament defects.^{1,2}

Overall, the results are good, especially in rheumatoid arthritis, with a 10-year implant survival rate of 92.4%.³

Insofar as the complications observed in this type of arthroplasty are concerned, infection rates have been reported to vary between 2 and 4%. Other complications include ulnar neuropathy, injury of the extensor mechanism, instability, mechanical failure and peri-prosthetic fractures.²

In this article, we present a case of malunion of a complex fracture of the distal humerus in a rheumatic elbow with severe articular degeneration in which a Coonrad-Morrey-type, semi-constrained prosthesis of the elbow was implanted. We subsequently had a complication that has been reported, although it is uncommon in this type of arthroplasty: injury of the extensor mechanism.

Case Report

We present the case of a 61-year-old female with a personal history of rheumatoid arthritis in several joints and osteoporosis, referred from another centre to the 12 de

Octubre Hospital with a fracture of the proximal humerus, fracture of the distal radius, and suprainterchondral fracture of the left elbow after being hit in the street.

The patient had undergone surgery 9 months earlier, due to rheumatic ankylosis of the left elbow by means of synovectomy and open joint debridement.

The radiological evaluation revealed a fracture in 3 fragments of the left proximal humerus, a non-displaced extra-articular fracture of the left distal radius and a displaced suprainterchondral fracture of the distal humerus on the same side in a type IV-V rheumatic elbow according to the Mayo Clinic classification with severe degenerative changes.

The fracture of the proximal humerus was treated surgically by means of an endomedullary pin and anchoring on the tuberosity. Orthopaedic treatment was chosen for the fractures of the distal radius and the distal humerus with an arm-forearm splint that was replaced by an articulated orthosis of the elbow one month later.

Six months after the fracture of the proximal humerus and of the distal radius, both had consolidated with good range of motion in the joint and without residual pain. At this time, the patient presented pain and gross instability at the level of the focus of the suprainterchondral fracture. The simple X-rays and CT revealed malunion of the focus of the fracture (fig. 1).

One year later and in light of this situation of suprainterchondral pseudoarthrosis in a rheumatic elbow with significant involvement of the joint architecture, joint replacement was determined to be the treatment of choice using a semi-constrained Coonrad-Morrey total prosthesis implanted following removal of the endomedullary pin in the proximal humerus (fig. 2A).

A posterior approach was used, identifying the ulnar nerve; the triceps was elevated and deflected laterally to gain access to the joint, thereby minimizing the risk of injury to the extensor mechanism as per the technique described by Morrey. We later re-inserted the triceps to the olecranon by means of transosseous sutures. Following preparation and drilling of the groove of the humerus and ulna, both cemented components were implanted and later assembled. During implantation of the humeral trial component, a non-displaced fracture of the humeral



Figure 1 Unconsolidated suprainterchondral fracture of the distal humerus 6 months after fracture in an elbow with severe rheumatoid arthritis. The distal portion of the pin used to set the fracture of the proximal humerus can be seen.

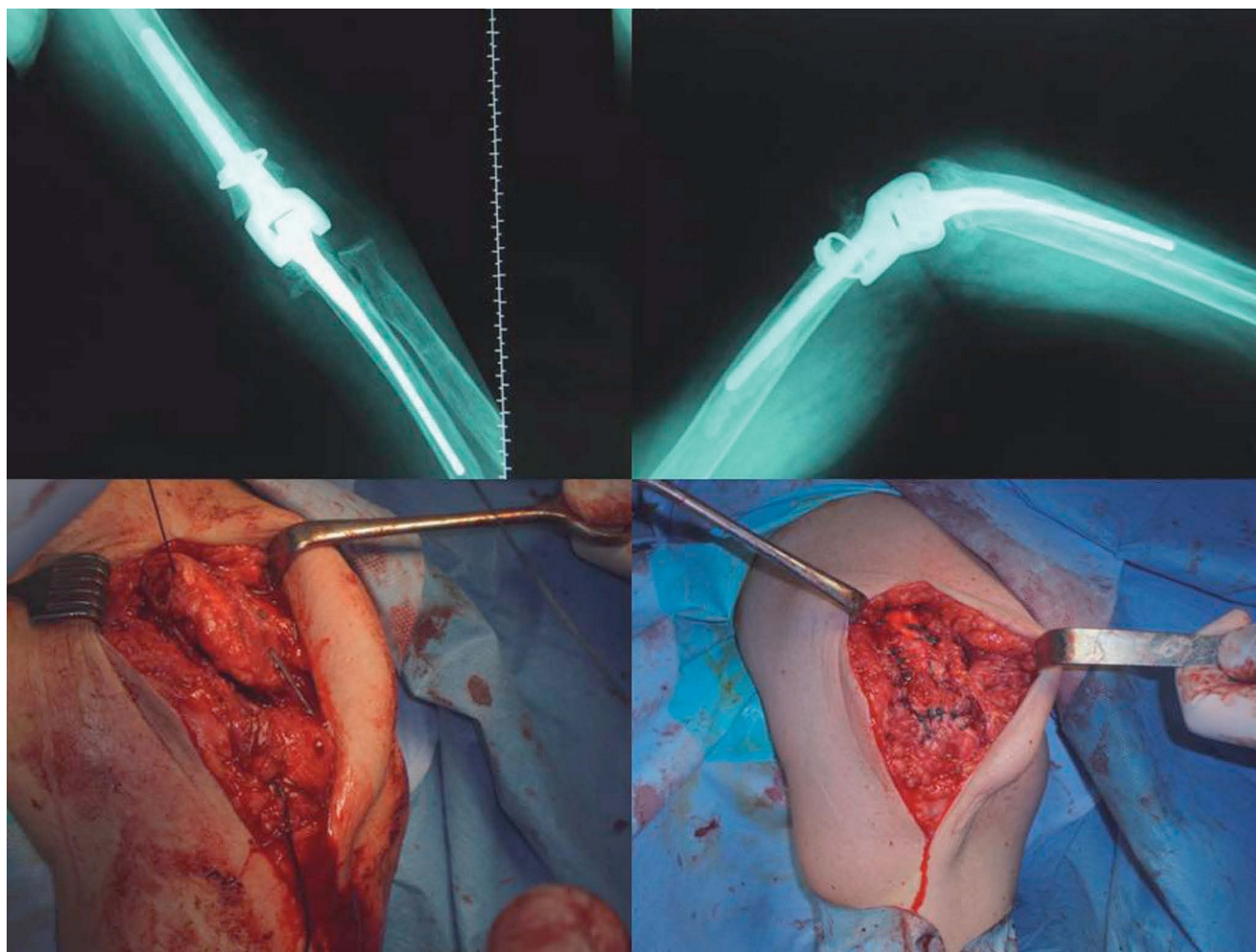


Figure 2 Image of the arthroplasty of the elbow. A) Radiographic guidance of the arthroplasty of the elbow. Heterotopic calcification can be seen in the dorsal region. B) Intra-operative image of the rupture of the distal tendon of the triceps sutured using a double Kracow and end-to-end sutures.

metaphysis was produced that was fixed by means of wire cerclage. The passive articular range of motion in the operating room was complete and the elbow, stable. The elbow was immobilized using a arm and hand splint in extension for the first two weeks to minimize pain and to protect the soft tissues.

The immediate post-operative period transpired without any complications of note except for the presence of paresthesia in the territory of the ulnar nerve that we attribute to the manipulation of the nerve during the intervention. Two weeks later, the patient's surgical wound looked good and she presented 95° of active flexion and full extension and pronosupination. The radiographic controls were satisfactory (fig. 2B).

One month after the operation, the ulnar symptomatology had improved substantially and she only suffered discomfort associated with a palpable calcification at the level of the distal triceps. Three months later, the heterotopic ossification was excised using a dorsal mini-approach, taking advantage of the prior incision without any apparent complications. At this time, the patient presented full, pain-free range of motion and excellent functional status.

At the eight-month check-up, the patient reported that when taking food to her mouth, her hand comes to her face without her being able to properly control said movement. The examination revealed a lack of strength in active extension of the elbow against gravity, causing us to suspect injury of the brachial triceps, in light of which we indicated surgical revision of the extensor mechanism. At this moment, the patient has no pain on palpation or observable interruption. It had coincided temporally with an exacerbation of her rheumatoid arthritis, requiring the doubling of her prednisone dose prior to the rupture in order to control the arthritic crisis.

Two weeks later the patient underwent surgery and the diagnostic suspicion was confirmed when a rupture of the triceps was seen intra-operatively approximately 2 centimetres from its distal insertion. Fibrous scar tissue was seen at the site of rupture with interruption, albeit without retraction of the musculotendinous ends. The wire cerclage was removed; the area was debrided, and the edges were cleaned by excising the interposed fibrous tissue, and the ends were sutured using a double Kracow technique with number 5 ethibond and end-to-end suture (fig. 2C). The elbow was immobilized for 6 weeks with a plaster splint to protect the suture.

Two months later, the patient is pain-free, with full active articular range of motion (complete extension, 120° flexion), without limitation of strength in extension and with a functional elbow that enables her to carry out all the activities of daily living without limitations. The elbow is stable at the time of examination and no significant alterations are seen on the radiological study nor are there any signs of loosening for the time being.

Discussion

We have presented the case of a female patient with significant rheumatic articular degeneration in her elbow who suffered a complex fracture of the distal humerus. The

treatment of choice for fractures of the distal end of the humerus is osteosynthesis. However, there are selected cases in which osteosynthesis outcomes can be compromised by the small size of the fragments, poor bone quality, and the presence of previous joint pathology. In our case, the patient presented these 3 characteristics that make arthroplasty of the elbow a better treatment choice. Frankle et al. compared the results of osteosynthesis and arthroplasty in females over 65 years of age and obtained better results with the latter.⁴

Initially, given the patient's significant underlying pathology and the presence of a fracture of the proximal humerus secondary to the surgical treatment, we opted for orthopaedic treatment of the elbow fracture awaiting treatment of sequelae in a second stage if necessary. After 6 months with no consolidation, osteosynthesis with added bone graft would offer less predictable outcomes than arthroplasty. Morrey and Adams obtained satisfactory results in 86% of their cases with pseudoarthrosis of the distal humerus.⁵

Both assembled and unassembled prostheses achieve their best functional outcomes in patients with rheumatoid arthritis.

Due to the presence of pseudoarthrosis at the focus of the fracture and significant loss of structure of the normal elbow architecture, we opted for the Coonrad-Morrey total semi-constrained or assembled prosthesis. It is a hinge prosthesis, albeit with a fair degree of valgus-laxity, which translates into a potential decrease in the risk of mechanical failure and loosening in comparison with other more constrained prostheses. The humeral component has an anterior tab that enhances the rotational stability of the implant and neutralizes extension forces.

We used the Bryan-Morrey approach to implant the prosthesis, which consists in detaching the triceps from the olecranon and retracting from medial to lateral together with the anconeus muscle. Despite the fact that other techniques have been described, such as the triceps split, Morrey's technique makes it possible to reconstruct the extensor mechanism safely.

Insofar as post-operative management is concerned, although the assembled prostheses allow for early active mobilization, we prefer to immobilize the elbow in extension for 2 weeks, so as to decrease surgical oedema.

The presence of heterotopic ossification has been reported and, in part, is due to the removal of periosteal tissue and muscle damage during surgery. The fact that it was uncomfortable for the patient forced us to excise it by means of a mini approach using the previous incision.

The rupture of the tendon of the distal triceps with insufficiency of the extensor mechanism is a complication estimated to occur in 3% of all arthroplasties of the elbow according to Little et al.⁶ Despite having performed a safe approach and attempted to protect the triceps during surgery, there are several factors that we believe might have predisposed it to rupture. The first is inherent to the patient's rheumatic disease. The tricipital insertion is generally attenuated in individuals with rheumatoid arthritis and chronic treatment with prednisone weakens the tendon, thereby increasing the risk of rupture.² On the other hand, the need to place a wire cerclage at that level for the

fixation of the longitudinal fracture that occurred during the intervention may have contributed to weakening of the tendon. Finally, damage to the extensor musculature that took place during the resection of the heterotrophic calcification is hardly quantifiable and is likely to have contributed to the rupture.

Although there are authors who advocate a rotation plasty of the anconeus or reconstruction using an allograft from the Achilles tendon to overcome the injury to the extensor mechanism, we chose to perform a direct reconstruction with two Kracow-type sutures and an end-on-end suture given that there was no significant retraction of the tendon fibres, the rupture was not longstanding, and the edges of the rupture were apparently viable during the revision surgery.

In short and despite the major complication suffered by the patient, she presents a functional, stable, pain-free elbow that enables her to carry out all of her daily tasks. Her range of articular motion is complete and she scored 100 on the Mayo Clinic Scale (a score that is classified as indicating an excellent outcome), which leads us to think of arthroplasty of the elbow as an important alternative in

selected cases and a satisfactory solution in highly complicated cases.

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