



Anconeus arthroplasty: a salvage procedure in recurrent heterotopic ossification

Ankoneus artroplastisi: Tekrarlayan heterotopik ossifikasyonda kurtarıcı bir girişim

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Anconeus interpozisyon artroplastisinin travma sonrası oluşan radiokapitellar ve radioulnar eklem sorunlarının tedavisinde kullanılabileceği bildirilmiştir. Bu yazıda, anconeus interpozisyon artroplastisi ile tedavi edilen 31 yaşında bir erkek hasta sunuldu. Hastada radius boyun kırığı osteosentezi sonrasında heterotopik ossifikasyon (HTO) gelişmişti. Ossifikasyon odakları temizlenip radius başı eksize edildikten sonra HTO ve dirsek sertliği tekrarlayan hastaya, tekrar ossifikasyon eksizyonu sonrasında ankoneus kası ile interpozisyon artroplastisi uygulandı. Ameliyattan 16 ay sonraki kontrolde, önkol supinasyonu, dirsek fleksiyonu ve ekstansiyonunda sırasıyla 80, 45 ve 60 derece kazanım sağlandığı görüldü. Kontrol radyografilerinde HTO'nun tekrarlamadığı ve radioulnar ve radiokapitellar eklemlerin açık olduğu izlendi.

Anahtar sözcükler: Artroplasti/yöntem; dirsek eklemi/yaralanma/cerrahi; kas, iskelet/transplantasyon; ossifikasyon, heterotopik; radius/cerrahi; sinostoz/cerrahi.

Anconeus interpositional arthroplasty has been used in the treatment of radiocapitellar and radioulnar joint problems occurring after trauma. A 31-year-old male patient developed heterotopic ossification (HTO) in the elbow following surgical treatment of an isolated radial neck fracture. Treatment with implant removal and excision of the radial head resulted in recurrent HTO and a stiff elbow. We performed anconeus interposition arthroplasty with excision of the heterotrophic new bone and mobilization of the proximal radius. The anconeus muscle was mobilized and interposed between the proximal radius and ulna. Sixteen months after the operation, forearm rotation, elbow flexion and extension increased by 80°, 45°, and 60°, respectively. Control X-rays showed maintenance of the radiohumeral gap without any signs of HTO.

Key words: Arthroplasty/methods; elbow joint/injuries/surgery; muscle, skeletal/transplantation; ossification, heterotopic; radius/surgery; synostosis/surgery.

Proximal radioulnar and radiocapitellar joints are prone to Heterotopic Ossification (HTO) following elbow trauma and surgery. The resultant pain and dysfunction can produce a persistent elbow stiffness.^[1,2,3]

The cases of anconeus interposition arthroplasty reported by Bell and Morrey between 1999 and 2002, suggested that this technique can be an attractive treatment alternative in HTO affecting the radioulnar and radiocapitellar joints.^[4,5]

In this paper we discuss a patient with a recurrent heterotopic ossification in the elbow which was controlled only after anconeus interposition arthroplasty.

Case report

A thirty-one-year-old male patient presented after a fall with pain, deformity and restriction of movement at the left elbow. He had tenderness on the lateral side of the elbow and the proximal

aspect of the radius. There was no concomitant neurological deficit detected. Radiological examinations revealed a comminuted fracture of the radial neck (Fig 1A) and the patient was hospitalized with the indication of operative treatment. He was operated on 12 hours after his admission and open reduction and internal fixation with a plate and screws was performed (Fig 1B). The internal fixation was secured with a hinged elbow brace and early range of movement exercises were introduced on the third postoperative day. Assisted active range of movement exercises were initiated at three weeks post-op. Despite rehabilitation the patient had not sufficiently increase his range of movement and a control X-Ray, taken in the 3rd postoperative month, revealed HTO in the left elbow (Fig 1C). The patient thus underwent a second operative procedure within the following month. During this operation osteosynthetic material was removed and the radial head excised along with the heterotopic ossifications (Fig 1D). Again an early range of exercise programme was introduced and HTO prophylaxis was started with Indomethacin (75 mg, daily). The patient was unable to further increase his range of movement despite 3 months rehabilitation. At the follow-up examination 6 months after the operation, the patient had only 20 degrees of flexion between a range of 70 and 90 degrees. He had full pronation of the forearm and only 10 degrees of supination. Radiological examination revealed a recurrent HTO at the proximal radioulnar and radiocapitellar joints (Fig 1E) and anconeus interposition arthroplasty was planned as a salvage procedure. The patient was operated on for the 3rd time, 11 months after his initial operation. The radioulnar and radiocapitellar joints were exposed with a lateral approach under a pneumatic tourniquet and the heterotopic ossifications were removed. An anconeus flap was mobilized distally to proximally. The fascial attachment of the flap to the margin of the triceps was maintained (Fig 2A). The flap was passed under the lateral ulnar collateral ligament and its proximal part was interposed between the capitellum and resected radial head (Fig 2B). The distal portion was inserted between the proximal part of the radius and ulna and tied to the proximal part of the radius through drill-holes (Fig 2C, Fig 3). Again an early range of exercises was introduced and HTO prophylaxis was done



Figure 1. Radiographic evolution in chronological order. (a) Initial radiographs with radial neck fracture; (b) Osteosentez sonrası erken dönem radyografiler; (c) Heterotopic ossification 3 months after the operation; (d) Osteosyntesis materials, ossifications and radial head were removed 4 months after the operation; (e) Heterotopic Ossification recurred 10 months after the first operation; (f) The last control radiograph 16 months after the anconeus interposition arthroplasty. (Note that heterotopic ossification did not recur.

with Indomethacin (75 mg, daily) for three weeks. The patient had a rehabilitation program for 6 weeks after the operation. His follow-up examination revealed 10 degrees of extension limitation and a full range of elbow flexion and forearm rotations. On his last follow-up examination 16 months after

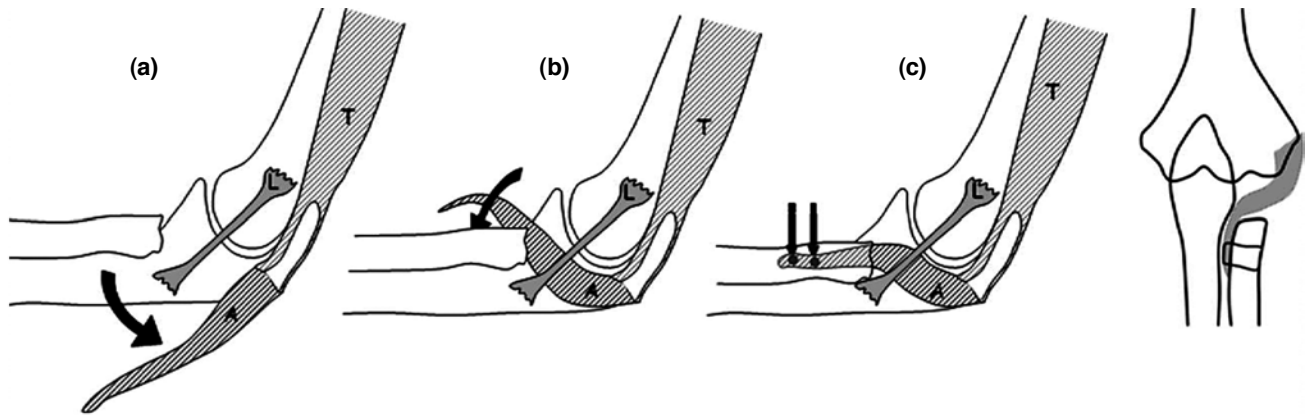


Figure 2. Illustration of Type II anconeus interposition arthroplasty. **(a)** Anconeus muscle is reflected from distal to proximal, protecting its fascial attachment to the margin of triceps. **(b)** Anconeus flap is passed under the lateral collateral ligament and is then interposed between radius and capitellum. **(c)** Distal portion of the flap is extended to radioulnar joint and is tied to the proximal part of radius through drill-holes.

the anconeus interposition arthroplasty the patient had 10 degrees of extension limitation and full ranges of elbow flexion and forearm rotations and had no complaint about his elbow (Fig 4 A to D). His control radiographs showed no signs of recurrent HTO (Fig 1F).

Discussion

Heterotopic ossification (HTO) is a dramatic complication following fractures to the proximal radius. HTO can cause radioulnar synostoses which can progressively restrict movements of the elbow.^[1,2,3]

Various types of biological and synthetic implants have been used for interposition between the radius and ulna after removal of HTO in order to prevent its recurrence.^[1,6] Early attempts of interposition arthroplasty with silastic materials provided better re-

sults than the biological ones.^[2] It was thought that biological materials caused scar tissue formation and that a vascularised graft would perhaps not cause such scarring. Breit et al, and Watson et al reported good results after silastic and local muscle interposition in the treatment of a distal radioulnar synostosis.^[7,8]

Anconeus muscle was initially mobilized for the exposure of the proximal radioulnar joint.^[9] Thereafter an anconeus flap has been transposed to cover the defects after the surgical treatment of olecranon bursitis^[5] and lateral epicondylitis.^[10,11] The failure of triceps following elbow arthroplasty has also been treated with the transfer anconeus flap.^[12,13]

The use of an anconeus flap for interposition arthroplasty was first reported by Bell and Benger⁴ who described rotation of the anconeus in the management of radioulnar synostosis. The authors noted that the

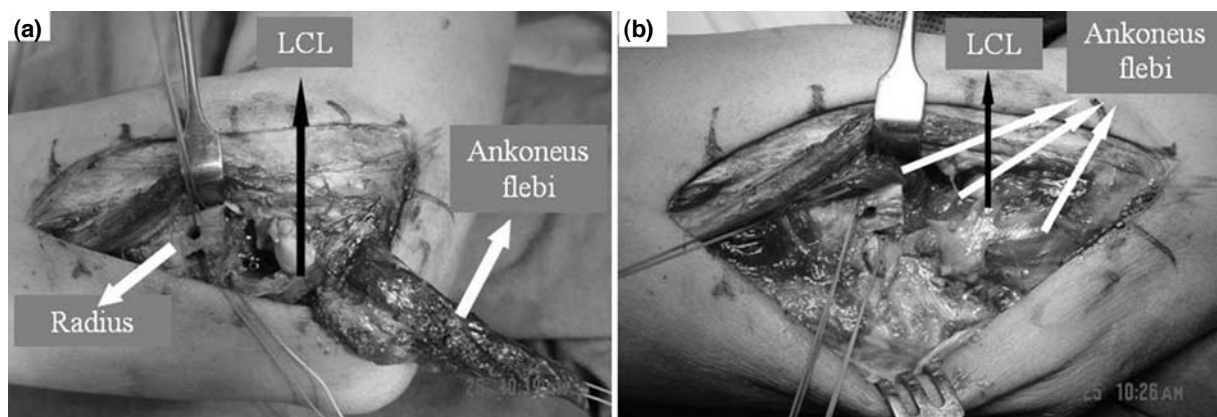


Figure 3. Intraoperative photographs. **(a)** Anconeus flap is reflected from distal to proximal. Drill holes through the proximal part of radius. **(b)** Anconeus flap is passed under the lateral collateral ligament, interposed at the radiocapitellar and radioulnar joints, and is then tied to the proximal part of radius through drill-holes..



Figure 4. (a to d) Last control examination 16 months after the anconeus interposition arthroplasty. The patient had 10 degrees of extension limitation and full ranges of elbow flexion and forearm rotations and had no complaint about his elbow.

mobilization of the muscle from proximal to distal did not impair its viability. All of their 3 patients were pleased with their result.^[4]

Morrey and Schneeberger described their anconeus arthroplasty technique for reconstruction of the radiocapitellar and proximal radioulnar joint.^[5] Unlike Bell and Benger, they mobilized the muscle distally to proximally, in order to protect the posterior interosseous artery, the main blood supply of anconeus. The authors defined 3 different types of interposition. In Type I, anconeus flap is passed under the lateral collateral ligament and is interposed between the resected radial head and the capitellum and folded on itself. In Type II, the anconeus is rotated first into the radiocapitellar space and then it is inserted between the proximal radius and ulna. In Type III, the muscle, after being interposed at the radiocapitellar and radioulnar joints is wrapped around the proximal tip of radius.^[5] To our knowledge, 6 cases of anconeus interposition arthroplasty for HTO and radioulnar synostosis, have been reported. In three patients reported by Bell and

Benger, the anconeus was reflected from proximal to distal, while in the remaining three, reported by Morrey ve Schneeberger, from distal to proximal. HTO did not recur in any of the patients. In our case we mobilized the anconeus flap from distal to proximal, with the technique described by Morrey and Schneeberger.

Morrey and Schneeberger found in their cadaveric study that the length of the flap was adequate for interpositional arthroplasty, when mobilized from distal to proximal.^[5] The authors wrapped the distal tip of the flap around the proximal tip of ulna (type III interposition), in their 3 patients with radioulnar synostosis.^[5] In our patient we found the length and width of the flap more appropriate for Type II interposition. Our review of the literature did not reveal any previous report of Type II anconeus interposition for radioulnar synostosis. In our patient HTO and synostosis at the radiocapitellar and radioulnar joints did not recur and he eventually regained a full range of forearm rotation.

With its convenient localization, easy exposure and minor morbidity after its mobilization, the anconeus appears to be an adequate flap for interposition arthroplasty. Anconeus interposition arthroplasty can be an effective salvage procedure for recurrent HTO following proximal radius fractures.

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