Turkish Neurosurgery 2008, Vol: 18, No: 2, 194-196

Delayed Radial Nerve Palsy Due to Entrapment of the Nerve in the Callus of a Distal Third Humerus Fracture

Distal 1/3 Humerus Fraktürü Sonrası Geç Dönemde Ortaya Çıkan Kallus içinde Tuzaklamaya Bağlı Gelişen Radyal Sinir Felci

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ABSTRACT

A 45-year-old male patient was referred for management of radial nerve palsy. His past medical history revealed that he had been injured in a car accident and broken his left humerus 4 months ago. Primary stabilization of the fracture has been achieved by the application of a long-arm plaster cast. His medical reports displayed that he had experienced no clinical signs of radial nerve palsy at that time. After the cast was removed, he noticed that he could not extend his wrist. Surgical exploration revealed that the radial nerve was encased inside the callus. He had probably not realized the weakness of wrist extension earlier due to the structure of the long-arm plaster cast that totally encased the arm, wrist and hand. In the light of the presented case, we recommend not using a long-arm plaster cast in stabilization of the distal third humeral shaft fractures in order to diagnose this kind of a complication earlier.

KEY WORDS: Radial nerve, Palsy, Humerus fracture, Callus, Entrapment

ÖZ

Kırk beş yaşında erkek hasta kliniğimize radyal sinir felci tanısıyla gönderildi. Anamnezinden; 4 ay önce trafik kazası sonrası sol humerus kırığı nedeniyle tedavi edildiği ve kırığın kapalı redüksiyon sonrası uzunkol alçısına alındığı öğrenildi. O dönemki nörolojik muayene bulguları incelendiğinde hastada radyal sinir arazına bağlı bir nörolojik fonksiyon kaybının olmadığı görüldü. Ancak aradan geçen 4 ay sonrasında uzun kol alçısı çıkartıldığında radyal sinir felcinin tespit edilmesi üzerine, kliniğimize gönderilen hasta opere edildi. Operasyonda radyal sinirin, kırığın olduğu bölgede gelişen kallus içinde tuzaklandığı izlendi. Travma sonrası akut dönemde sinir arazı olmamasına rağmen, kırığın iyileşmesi sırasında gelişen kallus içinde sıkışan radyal sinir arazına ait bulguların hasta tarafından daha önceden hissedilememiş olmasının nedeni; hastanın tüm kol, el, el bileği ve parmakların da bir kısmını içine alan uzun kol atelinin yapısından kaynaklanabileceği düşünülmüştür. Bu tip geç dönem komplikasyonların hasta tarafından daha erken farkedilebilmesini sağlamak amacıyla, radyal sinir hasarlanmasının daha yüksek oranda görülebildiği özellikle 1/3 distal humerus kırıklarında uzun kol alçısının kullanılmaması gerektiği vurgulanmak istenmiştir.

ANAHTAR SÖZCÜKLER: Radyal sinir felci, Humerus kırığı, Kallus, Tuzaklanma

Received: 04.01.2008
Accepted: 16.04.2008

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INTRODUCTION

Distal third humeral shaft fractures are the most common causes of traumatic primary radial nerve palsy. Iatrogenic or secondary radial nerve palsy usually occurs during open or closed reduction of the fracture. Delayed radial nerve palsy may develop in some cases as entrapment of the nerve within the healing callus [1, 2]. Although most posttraumatic radial nerve palsies do not require exploration, gradually developing palsy should be taken into consideration as a consequence of entrapment of the radial nerve within the callus and early surgical exploration should be carried out for a better outcome.

CASE REPORT

A 45-year-old male patient was referred for management of radial nerve palsy 4 months after closed reduction of a left distal third humeral shaft fracture. His past medical history revealed that he has been injured in a car accident and treated conservatively with closed reduction and stabilization with a long-arm plaster cast. He had no neurological deficits before or shortly after the stabilization. In the course of time he became aware of weakness in the metacarpophalangeal extension but had not been admitted to hospital for this complaint. Four months later, after removing the cast, he noticed that he was also unable to extend his wrist. His neurological examination revealed loss of digit and wrist extension and numbness on the dorsoradial aspect of the hand. Electromyography tests and nerve conduction studies were abnormal confirming radial nerve injury. At the time of cast removal, conventional radiographs demonstrated callus formation of the healed fracture 4 months after the initial injury (Figure 1).

Intraoperatively, the radial nerve was found to be encased inside the callus (Figure 2). The callus was drilled until the entire radial nerve was seen. After the callus was totally removed from the nerve, proximal and distal dissection was performed and continuity of the nerve was observed (Figure 3). The nerve seemed to be bruised and contused on closer inspection. Neurolysis was performed and the incision closed layer by layer in the conventional manner following homeostasis and copious irrigation. The patient's neurological symptoms resolved gradually after the operation.

Figure 1: *Conventional radiographs demonstrated callus formation of the fracture 4 months after the initial injury.*

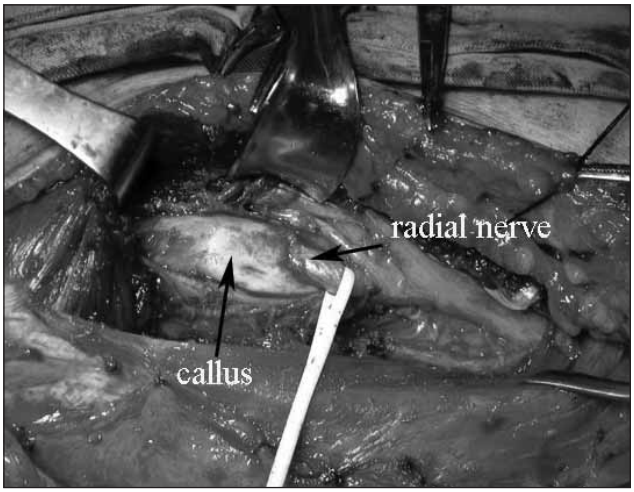

Figure 2: *Intraoperatively, the radial nerve was found to be encased inside the callus.*

DISCUSSION

The radial nerve is a large terminal branch of the posterior cord of the brachial plexus and contains cervical root contributions from C5 through C8. It provides the major nerve supply to the extensor muscles of the upper limb. The nerve enters the radial groove in the humerus after leaving the axilla. The humerus is the largest bone in the upper limb.

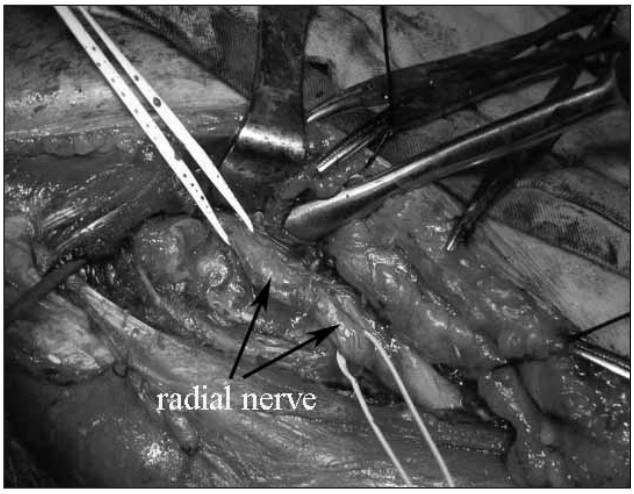

Figure 3: *The callus was totally removed and the continuity of the nerve was observed. The nerve seemed to be bruised and contused.*

The superior half of the humeral shaft is cylindrical. There is a shallow, oblique radial groove (spiral groove) for the radial nerve that extends inferolaterally on the posterior aspect of the body [3]. Primary radial nerve palsy is a common complication of humeral shaft fractures, with an incidence of 2% to 17% in the literature, and is usually seen with the fractures of middle and distal thirds of the humerus because of the close anatomic relation and diminished mobility due to its relatively fixed position where it penetrates the lateral intermuscular septum. The nerve may be damaged by direct trauma, by the sharp ends of the fracture fragments or by interposition between fracture fragments. Iatrogenic injury may occur during closed or open reduction [1, 2].

Radial nerve palsy secondary to humeral shaft fractures may spontaneously recover in most cases. Many authors therefore tend to treat this complication conservatively with close electromyographic follow-up unless the nerve shows no signs of recovery within 3–4 months [1, 5, 6, 7, 8]. Indications for surgery are inadequate fracture reduction, open fractures, associated vascular injuries, nonunions, malunions, and radial nerve palsy occurring after closed reduction [1, 5, 7]. Our patient had no neurological deficits at the time of initial admission. He gradually developed weakness in extension of digits after closed reduction and stabilization with long-arm plaster cast but did not realize the possible concomitant wrist extension weakness because of the structure of the long-arm plaster cast that totally encases the arm, wrist and hand, leaving only the fingers and thumbs free. In a prospective study, the authors determined the effectiveness of functional bracing for isolated, closed, distal third humeral shaft fractures [4]. As the wrist is not covered by the brace and may move freely in this type of stabilization, the patient may realize the signs of developing radial nerve palsy due to entrapment of the nerve within the healing callus earlier. In conclusion, we do not recommend the use of long-arm plaster casts in closed distal third humeral shaft fractures as detecting such complications earlier may require changing conservative treatment to surgical treatment.

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