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Forearm Compartment Syndrome Due to Trapping in an Industrial Press Machine

Endüstriyel Press Makinesine Sıkışmaya Bağlı Gelişen Ön Kol Kompartman Sendromu

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ABSTRACT

Forearm compartment syndrome is the most important complication of the humeral supracondylar and forearm fractures. If left untreated, Volkmann's ischemic contracture develops. Earthquake injuries by prolonged direct pressure of collapsed buildings on crushed extremities or industrial injuries (such as trapping in an industrial clamp) may result in acute compartment syndrome without fracture. Delayed diagnosis results in a disaster for both the patient and the physician, and may cause many medico legal problems. The diagnosis of compartment syndrome is essentially based on clinical experience. Particularly in compression and crush type injuries of the forearm with or without fracture, physicians should be suspicious about the compartment syndrome. In this paper we aim to report the management of a case of compartment syndrome as a complication of improperly tight long arm cast and crush injury of the right forearm.

Keywords:forearm;compartmentsyndromes;decompression;Volkmann's ischemic contracture; operative surgical procedure; surgical cast

ÖZET

Ön kol kompartman sendromu humerus suprakondiler kırıklarının ve ön kol kırıklarının en önemli komplikasyonudur. Eğer tedavi edilmezse; Volkmann iskemik kontraktürü gelişir. Deprem de yıkılan binaların altında uzun süreli basınç altında ezilme yaralanmalarında veya işyeri kazalarında bir cismin altında kalmalarda (sanayi tipi mengene gibi) kırık olmaksızın da kompartman sendromu gelişebilir.Tanıda gecikme hasta ve doktor için felaketle sonuçlanır ve pek çok adli sorun yaratır. Kompartman sendromunun tanısı öncelikle klinik tecrübeye dayanır. Özellikle ön kolun ezilme ve sıkışma tipi yaralanmalarında kırık olsa da, olmasa da hekimler kompartman sendromu şüphesini akıllarına getirmelidirler. Bu yazıda ezilme ve fazla sıkı alçı sonrası komplikasyon olarak gelişen bir kompartman sendromunun sağaltımını sunmayı amaçladı.

Anahtar kelimeler: ön kol; kompartman sendromları; dekompresyon; Volkmann'ın iskemik kontraktürü; cerrahi girişiler; cerrahi alçı

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Introduction

Literature review shows that loud and severe trauma symptoms generally obscure the signs and symptoms of the compartment syndrome, and therefore cause delays or misdiagnosis.[1-5]

Forearm compartment syndrome is the most important complication of the humeral supracondylar and forearm fractures. If left untreated, Volkmann's ischemic contracture develops.[6, 7]

Earthquake injuries by prolonged direct pressure of collapsed buildings on crushed extremities or industrial injuries (such as trapping in an industrial clamp) may result in acute compartment syndrome without fracture.[7, 8]

In this paper we aim to report the management of a case of compartment syndrome as a complication of improperly tight long arm cast and crush injury of the right forearm.

Case

A 28 year old man, after trapping his right forearm in the claws of an industrial press machine had been consulted in a health center. A long arm cast had been applied and he had been ordered to use some pain killers at home.

Two hours after the first treatment the patient admitted to the emergency service of our hospital with the symptoms of cyanosis and severe pain in his hand and the entire forearm.

We removed the long arm cast initially. Although the cyanosis recovered immediately, the pain subsided a little. A circular compression footprint trace on the

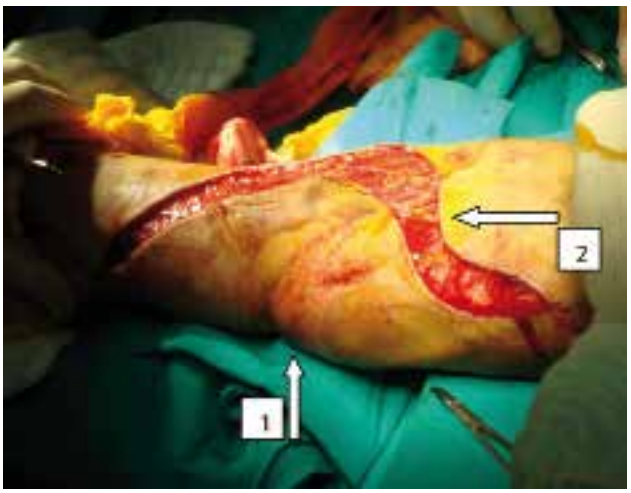


Figure 1. The arrow 1 shows circular compression on the skin. The arrow 2 shows classical volar faciotomy incision. Please note the extreme swelling of the extremity.



Figure 2. The edges of the incisional line was approximated loosly and left open after the fasciotomy procedure.

forearm skin, probably due to the injury, was the tenderest area (Figure 1). Although the whole forearm was edematous and aching, fortunately there was not a fracture. In addition, we observed the capillary circulation intact.

Because of the suspicious compartment syndrome, the patient was hospitalized. Following the application of another long arm cast the extremity was elevated and a close monitoring by the evaluation of the extremity's circulation, sense and pain was scheduled. The pain did not recover completely, in contrast its severity increased in time. In addition, the dorsiflexion of the fingers became painful. These findings led us to the diagnosis of compartment syndrome.

We did not measure the intra-compartmental pressure. The patient was prepared in sterile conditions and under general anesthesia in the operating theatre. To relief the intra-compartmental pressure we performed volar forearm fasciotomy and extended it with the carpal tunnel decompression operation (Figure 1), and relaxed the superficial, deep and pronator quadratus compartmens. We did not need to perform dorsal fasciotomy. At the end of the operation the edges of dissection line were approximated loosely and left partially open (Figure 2). Three days after the fasciotomy procedure, a split thickness skin graft taken from the thigh was used to cover the open wound surface (Figure 3).

No further complications were observed in the follow up visits, and the patient recovered fully without any disability and returned back to his work (Figure 4 and 5).

Discussion

The most important symptom of the compartment syndrome is pain, particularly if there is not an associated bone fracture. Continuous pain resistant to pain killers (usually with a disproportional severity expected from the actual injury) and immobilization is the most typical finding.[7-9]

The diagnosis of the compartment syndrome is primarily based on the clinical findings which are essentially the signs and the symptoms of muscle and nerve ischemia.[10] Because the source of the pain is the ischemia and pressure, the pain severity is independent from the position and the movement of the extremity. Clinical experience of the consulting physician is also important. Physicians not familiar to the compartment syndrome may cause delays or misdiagnosis.

In trauma cases other than the compartment syndrome , the elevation of the extremity generally decreases pain intensity, however this is not the case for the compartment syndrome.[7] In spite this, the existence of referred pain throughout the entire compartment with the passive dorsiflexion of digits is a confidential finding of compartment syndrome.[9]

Volar forearm fasciotomy is generally sufficient to decompress the forearm.[11] However, inspection of the deep flexor muscles should be included in the procedure since sometimes it may be necessary to reveal and decompress pronator quadratus muscles separately.[12]



Figure 3. 3 days after the fasciotomy, a split thickness skin graft taken from the tigh was used to cover the surface of the wound.



Figure 4. Volar view of the forearm after treatment.



Figure 5. Dorsal side of the forearm after treatment. Note that the circular footprint of industrial compression machine is stil visible.

In our case, improperly applied tight long arm cast increased the internal pressure created by the compartment syndrome by adding an extra external pressure. To avoid this complication, it is better to use splints instead of casts, if they work competent enough.

In crush and compression type injuries with or without fracture, the patients are better hospitalized for monitoring the probably obscured complications.

Conclusion

Intra-compartment pressure measurements provide objective results, however it is not a must for the final diagnosis. The diagnosis of compartment syndrome is essentially based on clinical experience and the delayed diagnosis may result in disasters for both the patients and the physicians. Particularly in compression and crush type injuries of the forearm with or without fracture, physicians should be suspicious about the compartment syndrome.

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