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Musculoskeletal

Compartment syndrome of the hand: A case report and review of literature

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ABSTRACT

Elevation of pressure within tightly bound myofascial compartments has detrimental consequences if not treated promptly, leading to a loss of circulation, ischemia, myonecrosis, nerve damage, and limb loss. They are commonly seen in the distal upper and lower extremities; however, compartment syndrome of the hand is rarely encountered and prompt recognition can prevent permanent damage and tissue loss. This case study presents a complicated case of compartment syndrome of the hand and discusses the interrelationship between compartment syndrome and rhabdomyolysis. An emphasis is placed on pathophysiology of this relationship to allow a better understanding of the imaging features as well as early clinical recognition of compartment syndrome. Magnetic resonance imaging findings are specifically discussed as it remains the best imaging tool to evaluate the extent of the damage and surgical planning.

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Introduction

Compartment syndrome is a dreaded condition caused by increasing pressures within tightly bound myofascial compartments [1–3]. Compartment syndrome is most commonly seen in the forearm and legs, especially the lower leg [4]. However, rare cases of compartment syndrome involving the hand have been reported [3–5]. Rapid recognition and emergent fasciotomy to relieve the compartment pressure is imperative to prevent irreversible damage. The hallmark of compartment syndrome, if untreated, is elevation of the compartment pressure leading to vascular compromise and de-

creased perfusion. This cycle of pressure elevation continues as capillary permeability increases secondary to tissue damage, further exacerbating compartment edema [3]. Without treatment, tissue death ensues. Rhabdomyolysis is an associated condition defined by muscle breakdown and leakage of muscle contents into the circulation [2,6,7]. There is an intimate interplay between compartment syndrome leading to muscle breakdown and rhabdomyolysis-induced edema causing elevation of compartment pressure, which makes the 2 inherently co-dependent in tight myofascial compartments. Imaging plays an important role in evaluation of compartment syndrome and monitoring the progression of the disease process from edema to myonecrosis. Magnetic resonance imaging (MRI) is the best

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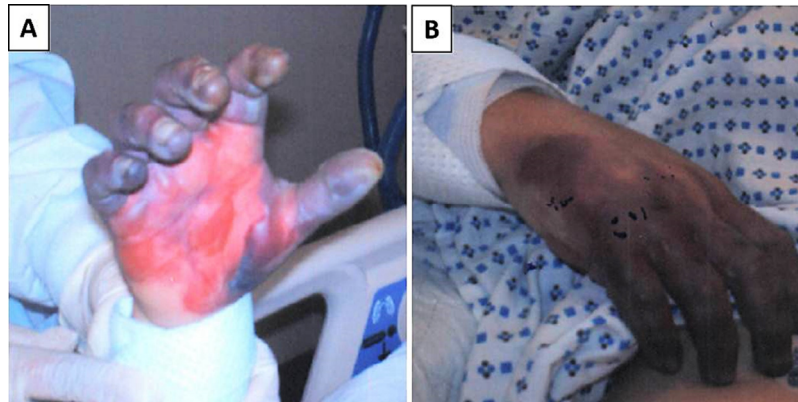


Fig. 1 – Palmer (A) and dorsal (B) aspects of the patient’s right hand at the time of presentation demonstrate a molted appearance of all 5 digits.

modality that allows evaluation of the extent of tissue damage and management planning [6,7].

Case report

A 44-year-old white female with a history of multiple sclerosis and polysubstance abuse presented to the hospital after being found unresponsive and lying on her right hand for an unknown duration. She was reportedly seen in that position 14 hours prior by her spouse. On physical examination, her right hand appeared cool and mottled (Fig. 1). At the time of presentation, her vitals were as follows: temperature: 101°F, blood pressure: 96/77, heart rate: 100 bpm, and respiratory rate: 16 bpm with 100% O₂ saturation on room air. Arterial Doppler demonstrated patency of the major vessels of the right upper extremity including the radial and the ulnar arteries. Compartment pressures were not recorded.

Her laboratories at time of admission demonstrated leukocytosis with a white blood cell count of 25.8 th/L, creatinine of 8.83 mg/dL, potassium of 5.4 mmol/L, CK of 37453 IU/L (CK-MB of 98.3 ng/mL), and myoglobin of 3925 ng/mL. A CK-MM

was not obtained. Her toxicology results were positive for benzodiazepines and opiates.

She was diagnosed with rhabdomyolysis complicated by renal failure. Her hand was deemed to be necrotic and gangrenous for which she eventually underwent wrist disarticulation (Fig. 2).

A hand radiograph demonstrated dorsal soft tissue swelling without underlying fracture or bone erosion. Before amputation, an MRI of the right hand with and without intravenous gadolinium contrast was obtained (Figs. 3 and 4). The MRI demonstrated diffuse skin thickening and enhancing subcutaneous edema throughout the right hand; there was nonenhancement throughout the subcutaneous fat dorsal to the third through the fifth metacarpals and at the thenar eminence, consistent with necrosis; there was also no enhancement of all the thenar, hypothenar, digitorum, and lumbrical muscles, consistent with muscular necrosis.

Pathologic analysis of the amputated right hand demonstrated gangrenous necrosis with fungal and rare hyphae infiltration of the necrotic skin, skin ulceration with purulent inflammation and focal fat necrosis, dermal fibrosis, and reactive epidermal changes at the resection margin.



Fig. 2 – Palmer (A) and dorsal (B) aspects of the patient’s right hand at the time of MRI demonstrate necrotic tissues within all 5 digits as well hand desquamation. MRI, magnetic resonance imaging.

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