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Case Report

CASE REPORT

Hand compartment syndrome as a result of intravenous contrast extravasation

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Abstract

Hand compartment syndrome is a rare condition which can result from crush injuries, fractures, burns, intravenous fluid extravasation, etc. Failing to recognize and treat it early leads to significant functional deficits of the hand. Few cases of iatrogenic hand compartment syndrome have been described in the literature so far. We present a case of a hand intravenous (IV) contrast medium extravasation injury in a 72-year-old female patient, during a CT scan. As soon as the swelling of the hand was noticed, elevation of the limb was suggested and ice was applied. Few hours later though the patient developed compartment syndrome of the hand with paresthesias and severe pain with passive movement of the fingers. Left hand emergent fasciotomies were performed leading to a good functional outcome.

INTRODUCTION

IV fluid extravasation is a common complication in daily medical practice, causing local swelling and mild to moderate tenderness. Most of the times, this condition subsides with conservative treatment, such as limb elevation, ice and analgesia. It is possible though that a large volume of extravasation, especially of a fluid irritative for the soft tissues, can cause significant soft tissue injury, severe swelling and neurovascular impairment [1, 4–6]. In the current article, we present a case of a 72-year-old patient, who developed a hand compartment syndrome, due to IV contrast extravasation during a CT scan. The patient underwent an urgent fasciotomy of all hand compartments, leading to immediate relief of symptoms and good functional result.

CASE REPORT

A 72-year-old female patient, who was hospitalized in the internal medicine department, was evaluated by the on call Orthopaedic Surgeon, because of pain and swelling of her left hand after a CT scan with IV contrast, which was performed in order to exclude pulmonary embolus. The patient had a past medical history of blood hypertension and diabetes. The cause of the swelling was IV contrast medium extravasation from a mal positioned vein catheter on the dorsal surface of her left hand. About 110 ml of Iopromide were diffused in the soft tissue of the hand. The vein catheter was removed by the consultant radiologist as soon as the swelling was noticed.

The patient was evaluated 3 h post-CT scan and she was found to be in severe pain and significant swelling with skin

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Figure 1: Preoperative view of the hand: severe swelling, skin tension and blisters of the dorsal surface are observed.

Figure 2: Preoperative view of the hand, sitting in intrinsic minus position.

blistering (Fig. 1). Initially, the hand was elevated and ice was applied. No medical antidote, such as hyalouronidase was given to the patient, because it was not available. Needle drainage was not possible, because of diffuse swelling. Two hours later no improvement was identified. On the opposite, the pain was nonresponsive to painkillers, the hand was sitting in an intrinsic minus position (Fig. 2), soft tissue edema was increased and paresthesias were developed. The hand looked pale and there was severe pain on stretching the interrosseoi muscles, as well as delayed capillary refill. All these signs were considered to be compatible with the diagnosis of compartment syndrome and an urgent fasciotomy was decided. There was no need to measure the intracompartmental pressures as clinical examination was typical.

Operation was performed using an axillary block, as the patient suffered from a chest infection and a general anesthesia was considered to be of a high risk. In theater, all hand compartments were opened. Two dorsal incisions were performed, one over the second metacarpal (to open the adductor, the first and second dorsal interosseous and the first palmar interosseous compartment), one over the fourth metacarpal (to open the compartment of the third and fourth dorsal interosseous and the second and third palmar interosseous), one over the thenar area and one over the hypothenar area. Finally a carpal tunnel release was performed. A tourniquet was applied, but it was used only for the carpal tunnel release. A large hematoma along with fluid dye was drained, especially from the dorsal incisions. Immediately after the fasciotomy, the swelling was significantly subsided, capillary refill returned to normal and skin closure was possible with 3/0 nylon tension-free sutures (Figs 3–5).

Postoperatively, the patient was admitted to the Orthopaedic Department and IV cefuroxime was applied. Three days later, the patient was discharged pain free. Fifteen days post-surgery the wounds healed uneventfully, normal hand function has returned and the patient was discharged from clinics.

DISCUSSION

Compartment syndrome is a result of increased pressure in a closed myofascial space reducing the capillary blood perfusion below the level necessary for the tissue viability. Because of a compromised circulation, all the structures within the involved compartment will be affected [2].

Various causes of hand compartment syndrome have been described, including fractures, crush injuries, burns, arterial injuries, snake bites, infection, etc [2, 3]. Extravasation of contrast material is a common complication of enhanced imaging studies and there have been a few reports of compartment syndrome of the hand or forearm secondary to that [1, 4–6]. Patient's and contrast material's characteristics are important in this type of injury. The osmolality, ionic or nonionic nature as well as the extravasated volume of the contrast medium are factors that determine the pathogenesis and progression of extravasation injuries [7–9].

Early diagnosis is of a great importance in this type of cases. The clinical presentation of contrast extravasation ranges from mild to moderate redness and swelling of the tissue to severe edema and compartment syndrome. A hand with compartment syndrome presents as a tense, swollen extremity, sitting in an intrinsic minus position. Skin blistering might be present too. Some finger range of motion may be possible as extrinsic muscles are outside the compartments of the hand. Disproportionate pain, nonresponsive to painkillers, along with tenderness while stretching the intrinsic muscles of the hand (i.e. bringing the hand in an intrinsic plus position) indicates compartment syndrome. Sensory deficits might be absent if the carpal tunnel is unaffected, as other sensory nerves are located outside the hand's compartments [11]. In case of an atypical clinical image or

Figure 3: Intraoperative view of the hand where fasciotomy of thenar and carpal tunnel release are visible on the palmar surface.

Figure 4: Intraoperative view of the hand where fasciotomies are visible on the dorsal surface.

in sedated or pediatric patients, intracompartmental pressure measurement might be necessary. Pressure more than 30 mmHg or delta pressure (diastolic blood pressure minus intracompartmental pressure less than 30 mmHg) indicates compartment syndrome. Missing diagnosis may lead to muscle necrosis resulting to significant functional deficits [2]. A hand presenting with the 5 P's described by Griffiths (pain, pallor, parasthesia, paralysis and pulselessness) [10], indicates a delayed diagnosis of compartment syndrome and loss of function is likely to occur.

Regarding management of extravasation, there is no general agreement about which approach is the best. It is considered by many surgeons that the majority of extravasation injuries can heal without surgery. Conservative treatment includes limb elevation and ice. It is a matter of debate though whether to apply warm or cold compresses [9]. Medications such as hyalouronidase, corticosteroids, vasodilators and a variety of other agents have also been proposed, but their effectiveness has not been proven. There are reports of successful treatment of IV contrast media extravasation injuries using hyalouronidase [7–9]. However, in case compartment syndrome develops, emergency fasciotomies and carpal tunnel release must be performed within the first 6 h to relieve neurovascular compromise [1, 2, 6]. Two

Figure 5: Postoperative view of the hand. Immediate tension-free skin closure was possible as the swelling subsided.

dorsal incisions over the second and fourth metacarpal bones, one thenar, one hypothenar incision, as well as carpal tunnel release are described, in order to decompress all hand compartments [1, 2]. Generally, wounds are left open to avoid suturing under tension [2]. In our case, though completely tension-free skin closure was possible and it was performed.

Hand compartment syndrome is a rare condition which necessitates emergent evaluation and treatment. Failing to recognize and treat this condition is detrimental to the hand functional status. We believe that a low threshold of surgical intervention of those limb threatening iatrogenic injuries should be used, as among others there are also medicolegal issues that might come up.

CONFLICT OF INTEREST STATEMENT

No conflicts of interest.

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CONSENT

Patient's consent form available if needed.

GUARANTOR

Guarantor: Ioannis M. Stavrakakis.

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