

## Case Report

## Upper Limb Compartment Syndrome Secondary to Extravasation Contrast Medium: A Case Report

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**Abstract:** The problem of extravasations has become crucial in radiology and has important medico-legal implications. Treatment of contrast product extravasations should be immediate. Ionic products with high osmolar contrast should also be definitively abolished from medical practice given the risk associated with their major hyperosmolality. The severity of the lesions is therefore a function of two essential factors: the osmolarity of the contrast product and therefore in particular its concentration and the extravasated volume and therefore the injection rate.

**Keywords:** Contrast medium, Intravenous injection, Extravasation, Compartment syndrome, Fasciotomy.

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### INTRODUCTION

The contrast product is a substance injected into the body, which artificially increases the contrast allowing the study and visualization of healthy or pathological tissue in relation to its environment. Subcutaneous extravasation is a known complication of intravenous contrast medium administration.[1], several factors can influence extravasation such as the type of injection (manual or mechanical), the osmolarity of the contrast product, the nature of the compound [2,3]. The latter can be responsible for different complications ranging from simple skin irritation to compartment syndrome or even amputation.

### CASE REPORT

A 5-year-old female patient, followed for perimesenteric abdominal adenomegaly objectified by an abdominal ultrasound, in the context of the exploration of abdominal pain, an abdominal CT scan with injection of contrast product was indicated. This injection was made through a vein in the bend of the right elbow. During the realization of the radiological examination, the child presented acute pain accompanied by tingling involving the right upper limb following the injection of the contrast product.

The examination objectified the progressive installation of a painful swelling of the right hand, the forearm, and the posterior face of the arm with loss of sensitivity to the touch, the skin recoloration time was lengthened by more than 5 seconds and the passive hand stretch was painful (Figure 1). Raising the limb and injecting corticosteroids did not improve the symptoms. The standard X-ray showed significant infiltration of the contrast product in the hand, forearm, and the posterior face of the arm.



**Figure 1: Compartment syndrome of the forearm with significant edema of the hand and forearm**

The diagnosis of compartment syndrome was made at the 4th hour after injection of contrast product and the patient was quickly sent to the operating room where she had a relieving fasciotomy involving the anterior and posterior compartment of the forearm with a release of the carpal tunnel, the anterior and posterior compartment of the arm. During the release of the compartments, the muscles were clearly swollen under tension without obvious macroscopic necrosis (Figure 2).



**Figure 2: Fasciotomy of the forearm and the hand**

The postoperative course was simple, marked by a reduction in pain and swelling with a marked improvement in the recoloration time and the warmth of the limb. The dressing change was done every other day with a few points of reconciliation during the first and second dressing changes. On the eighth day, the operative wound was completely sutured without tension (Figure 3). At one month postoperatively, the patient recovered the amplitudes of movement of the right upper limb and regained the sensory-motor function of the limb.



**Figure 3: Progressive approximation of the edges until skin closure**

## DISCUSSION

Subcutaneous extravasation is a known complication of intravenous administration of PDC [1], the latter is not uncommon during CT examination, various series report a rate between 0.1 to 0.9% [4]. The ionic or non-ionic osmolarity, as well as the nature and the extravasated volume of the contrast product are important factors in the pathogenesis of extravasation [2,3]. Patient characteristics are also important in this type of injury, infants and small children are more likely to develop extravasation because they are unable to complain.

Extravasation of low osmolar contrast media is better tolerated than those with high osmolar contrast [5], but serious injuries have been reported with extravasated low osmolar contrast material such as skin ulceration, skin necrosis, and compartment syndrome. For some, using a power injector does not seem to change the frequency of extravasation compared to manual injection [6] and the potency of the injection rate does not appear to correlate with the frequency and amount of extravasation [7]. The vast majority of contrast medium extravasations involve small volumes and symptoms may resolve within 24 hours, occasionally large volume extravasations may cause more damage and are more likely to occur when contrast medium is injected with automated power and an injection site not closely monitored [8,9].

Carolyn and Richard [1] analyzed in a retrospective study the frequency, management and outcome of extravasations in 69,657 patients who underwent intravenous injection of contrast product for tomography, the data collected showed a frequency of 0.7% (475/69,657) with volumes varying from 3 to 150 ml and concluded that extravasation of iodinated contrast material is rare with more marked adverse effects if large volumes are involved. Often, the extravasation is done in small volumes responsible for pain, swelling and localized erythema which decrease rapidly, if large volumes are extravasated the tissues and the skin are more extensive [10] and extensive tissue necrosis, ulceration or even compartment syndrome may occur [3,11].

Compartment syndrome is a collection of symptoms secondary to increased pressure in the soft tissues threatening blood flow, as well as the structures found within that space. In the hand, the most frequent causes of compartment syndromes are crushing, burns, snake bites, infections... the measurement of intra-compartmental pressure will be high and the ideal treatment would be to make an early surgical fasciotomy of decompression.

There is no consensus on the best approach for managing extravasation. Limb elevation is often helpful in reducing edema, cooling the injection site with ice packs would be helpful in limiting inflammation.

However, corticosteroids and vasodilators are also proposed for the treatment of extravasation, but most studies have failed to demonstrate their effectiveness [8,10]. Most surgeons believe that a large proportion of wounds caused by extravasation heal without surgery and recommend a cautious approach.[12]. However, urgent surgical drainage and aspiration of the contrast medium performed within the first 6 hours was effective when compartment syndrome occurred mainly in large extravasations [13].

In terms of preventing contrast extravasation, there are certain devices that detect the presence of extravasation as it occurs, such as power injectors with automatic shutdown that instantly interrupt contrast flow when product extravasation occurs [14].

## CONCLUSION

Contrast product extravasation is a rare imaging complication that can be responsible for serious complications. Close monitoring in the dorsum of the hand should be practiced, if compartment syndrome develops fasciotomy and carpal tunnel release within six hours should be done. Radiology departments must have an adequate protocol to deal with this type of complication.

### Declaration of interests

The authors declare that they have no conflicts of interest in relation to this article.

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