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## Case Report

# Severe frostbite complication after cryolipolysis: A case report

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## ABSTRACT

This case report describes a full-thickness frostbite complication following cryolipolysis for subcutaneous fat reduction performed in a non-medical esthetic clinic. The deep and large abdominal wound (15 × 12 cm) required hospitalization and multiple surgical debridement before a two-step direct closure. Even though cryolipolysis is considered as a non-invasive and safe technique to reduce local adiposity, it could present some side-effects and complications. Health-care professionals should be aware of these risks and inform their patients about its potential sequelae.

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## Introduction

Cryolipolysis is a non-surgical subcutaneous fat reduction method by adipose tissue freezing. This concept, developed in 2000 and approved in 2009 by the US Food and Drug Administration (FDA), represents an exponential increasing demand currently, reaching millions of procedures and billion dollars market worldwide.<sup>1</sup>

At first glance, this method without the constraints and complications of surgery and anesthesia, and with less cost than surgery, seems very attractive. More than 70% of the patients declared satis-

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**Figure 1.** Day 2 after cryolipolysis: Status in emergency department, rectangular 15 × 12 cm skin lesion with burst blisters oozing serous liquid and a dark purple skin below, without capillary refill, compatible with full-thickness lesion in the middle surrounded by a superficial-thickness frostbite.

fied.<sup>1,2</sup> The efficacy of cryolipolysis has been demonstrated with a subcutaneous fat reduction up to 20%–25%. Therefore, it could be considered as an alternative to liposuction, particularly for patients presenting a moderate localized adipose deposit.<sup>3</sup> Moreover, as its application is simple, cryolipolysis technique is also proposed by others than specialized physicians, using different devices available in the market.

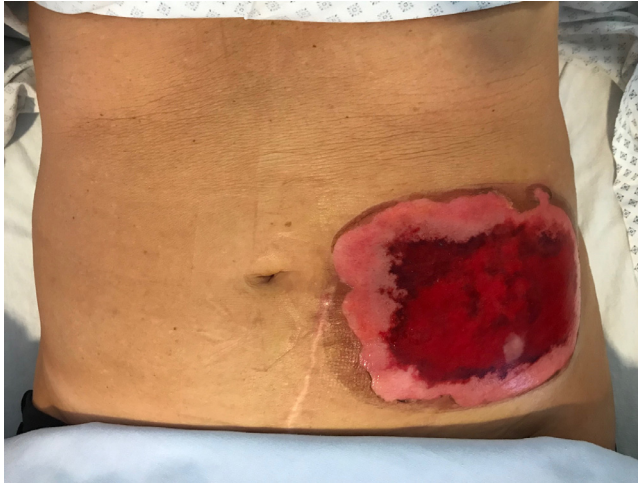
Nevertheless, even though this process is considered safe and non-invasive, it may cause some side effects and complications. Often, these side effects are minor and resolve spontaneously: skin erythema, edema, stiffness, pain, and sensory disorders.<sup>4,5</sup> However, in rare cases, cryolipolysis can provoke significant complications with permanent sequelae : contour irregularities, asymmetry, cutaneous atrophy, dyschromia, and paradoxical adipose hyperplasia.<sup>5,6</sup> Herein we report a severe abdominal frostbite following cryolipolysis that required patient hospitalization and several surgical interventions.

## Case report

A 61-year-old female smoker consulted our emergency department for an aggravating skin lesion on her abdomen associated with unbearable pain following a cryolipolysis treatment performed by a beautician in a non-medical center two days before. She had never received any esthetic surgery or cryotherapy previously.

According to the patient, for this abdominal cryolipolysis, a device (Yeti<sup>®</sup>, ITS Group, Italy) containing two modules was applied on each hemi-abdomen for 50 min. During the first minute of therapy, the patient complained of severe pain on the left side but as the beautician considered it as a normal reaction, the module was left. A few hours later, redness, swelling, and blisters developed progressively on the area confined to the exact size of the left applicator. As recommended by her beautician, the patient began wound care using hyaluronic acid dressing and paracetamol and weak opioid tablets as painkiller. But two days later, as the wound became too disturbing and painful to be managed by the patient at home, she came to our emergency department.

Clinical examination in the emergency ward demonstrated on the left para-subumbilical region, a rectangular 15 × 12 cm skin lesion with burst blisters oozing serous liquid and a dark purple skin below, without capillary refill and insensitive, compatible with a full-thickness frostbite lesion in the middle surrounded by a superficial-thickness frostbite (Figure 1).



**Figure 2.** Day 8 after cryolipolysis: Necrotic surface demarcation after 5 days of daily treatment with a sulfamide and hyaluronic acid-based lotion covered by paraffin gauze and twice a day hyperbaric-oxygenotherapy.

For pain and wound management, the patient was hospitalized in our plastic surgery department. While waiting for skin lesion demarcation, the wound was initially treated daily with a sulfamide and hyaluronic acid based lotion covered by paraffin gauze. To improve tissue oxygenation and to reduce the necrotic zone, the patient underwent oxygenotherapy in a hyperbaric chamber twice a day. Five days later, the necrotic central area was reduced in size and well delimited (Figure 2). On day 13, under general anesthesia the first surgical debridement was done (Figure 3), and a negative pressure wound therapy (V.A.C.<sup>®</sup>, KCI, San Antonio, USA) applied over the debrided wound. On day 18, during the NPWT change, as the remaining fat tissue was still necrotic (Figure 4), a second debridement was performed under general anesthesia. Another NPWT change was performed on day 22 without anesthesia. After obtaining a viable fat tissue, to avoid a skin graft, the wound was closed directly in two steps on day 26 and 34. At 1 year, the scar was still visible with a surrounding wide insensitive depigmentation skin band and an abdominal wall deformity (Figure 5).

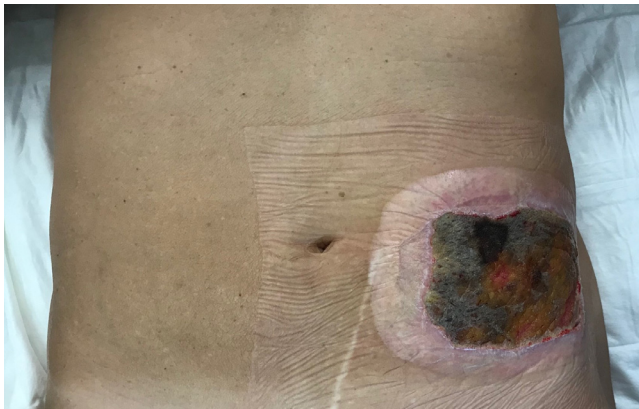
## Discussion

The precise mechanism of action of cryolipolysis is unclear but it is thought that the cold (temperature between  $-2^{\circ}\text{C}$  and  $7^{\circ}\text{C}$ ) applied by the suction cup of the device damages targeted cells by crystallization and hypoxia. These induce cell apoptosis, leading ultimately to tissue resorption.<sup>7</sup> The efficacy of the procedure is related to the thermal sensitivity of exposed tissues, the duration of cold exposure and the vacuum force applied.<sup>8</sup> Theoretically, as the freezing point of adipocytes is higher than the temperature that could damage epidermis and dermis cells, adipose tissue can be selectively targeted while sparing the skin.<sup>9</sup> Moreover, during the cryolipolysis treatment, to reduce the risk of frostbite by direct contact of the skin with the freeze source, a gel sheet is applied between the skin and the cryolipolysis applicator. However, considering the large number of procedures performed everyday worldwide, numerous frostbite complications should have been expected. Nevertheless, only two cases of skin frostbite after cryolipolysis have been published until today by Choong et al, and Nseir et al.<sup>8,12</sup> Additionally, Leonard et al.<sup>11</sup> reported a case of abdominal frostbite due to direct application of dry ice (carbon dioxide) over the skin by the patient himself for fat reduction.

As on the regularity level, the “classification” of cryolipolysis as a medical device is vague and legal framework inaccurate, different devices are offered on the market and used by medical and non-medical caregivers.

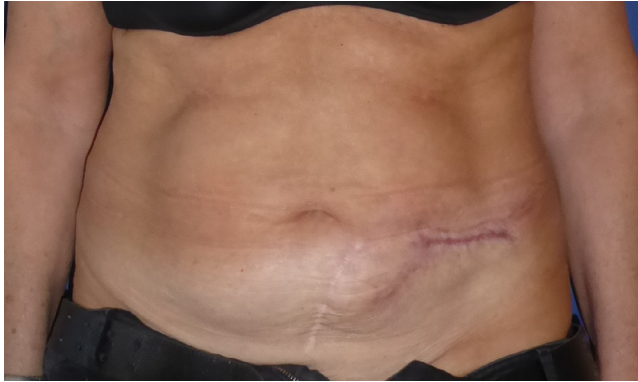


**Figure 3.** Day 13 after cryolipolysis: after first surgical debridement under general anesthesia to obtain viable hypodermis and dermis.



**Figure 4.** Day 18 after cryolipolysis: Before second debridement of necrotic fat tissue appeared after the previous debridement that was covered with a negative-pressure wound therapy.

In our case, the device was an unknown brand and not approved by US FDA. The beautician used this brand-new machine for the first time. All settings of the machine were already automatically programmed in advance by the manufacturer and ready to be used. The patient was clearly in pain during the first minute of therapy only on the left side, but the treatment was not interrupted. The procedure is generally well tolerated with over 96% of patients reporting mild or no pain.<sup>2</sup> Normally, the discomfort induced by the initiation of the suction stops a few seconds later, because the target



**Figure 5.** One year after two-step direct wound closure performed on day 26 and 34 after cryolipolysis: a visible scar with abdominal wall deformation.

area is anesthetized by cold. If the pain is persistent and dreadful, as it has been described in the case reported by Nseir et al.,<sup>12</sup> a frostbite complication should be suspected, and the procedure interrupted. However, as reported by Choong et al.,<sup>8</sup> during the cryolipolysis treatment the pain could be absent, and it becomes significant upon rewarming, a phenomenon that is consistent with frostbite provoked by other causes.

The frostbite may have several clinical presentations. As the evolution is slow, the degree of severity of the lesion should be reassessed a few days later before proposing any surgical treatment. Some authors recommend, in acute phase, a conservative treatment with rapid rewarming, aspirin and aloe vera for their antiprostaglandin effects.<sup>10</sup> Once the irreversible lesion is well demarcated, conservative treatment or surgery should be considered depending on the anatomic area damaged, the depth and surface of injury and the medical history of the patient. In our case, even though the wound was large, after multiple debridement and NPWT, to avoid a skin graft, we performed a two-step direct closure method with a satisfactory result after 34 days. The final scar can be excised by an abdominoplasty technique if desired by the patient. As the frostbite on the flank reported by Choong et al. was smaller ( $7 \times 5$  cm) and more superficial than our case, they managed it conservatively and obtained healing after 6 weeks. Nseir et al. performed an excision of the two necrotic tissues ( $1 \times 6$  cm and  $15 \times 4$  cm) in the trochanter region 36 days after cryolipolysis.<sup>12</sup> As the wound was less wide than our lesion (1 cm and 4 cm vs. 12 cm) they made a single direct closure. They hypothesized that the lesions were due to a misfit applicator and lack of gel between the applicator and the skin.

Cryolipolysis is the most common non-surgical body contouring method and the demand is growing. Even if this procedure is considered as non-invasive, it can be responsible for serious complications such as frostbite. Conservative treatment should be rapidly initiated and surgical options reassessed if necessary. Cosmetic and psychological consequences can be dramatic, especially for patients who wished to improve their appearance. Clinicians should inform their patient of the risks involved and the procedure should be performed with cautions by trained physicians using an approved device.

### **Declaration of Competing Interest**

The authors report no conflict of interest.

### **Acknowledgments**

None.

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