



Case Report

Unintentional Full Thickness Burn Resulting From Do-It-Yourself Cryolipolysis

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Abstract

This case report describes the vulnerability and unawareness of the population when performing do-it-yourself cryolipolysis. Much of the busy public searches for easier, inexpensive methods to lose weight and form a positive body image. Liposuction is considered an expensive luxury by many and therefore turn to do-it-yourself media outlets for body altering advice. Many consumers are unaware of the temperature difference between cubed ice and dry ice. Improper handling of dry ice may result in tissue damage in a very short matter of time. Frostbite injuries resulting in full thickness burns are rare in the southern U.S. Identification of a full thickness burn resulting from dry ice application may not be recognized, leading to a delay in treatment. The patient obtained the idea of performing cryolipolysis at home from an online video site. Full thickness burns were sustained over her bilateral thighs, requiring hospitalization and repetitive surgeries. When performed correctly, cryolipolysis has been proven to be safe, but when performed without education, unknowing participants can harm themselves. More needs to be done to protect the public from harmful do-it-yourself methods on a national level. Consumers often do not have the expertise to identify and avoid poor advice, leading to potentially dangerous/harmful results.

Background

Cellulite, also known as gonoid lipodystrophy, is a common condition in U.S. post-pubertal females.¹ From an aesthetic perspective, if excessive, the condition can lead to a negative body image. Weight loss and exercise may alleviate the adipose tissue, but the results are slow and require time and effort. To remove unwanted cellulite, costly and invasive cosmetic procedures such as liposuction are often sought.² Many individuals find invasive cellulite removal procedures unaffordable. Instead, being “budget conscious”, individuals search online for low-cost do-it-

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yourself (DIY) body sculpting procedures.² Media platforms provide multiple DIY body sculpting methods, but the delivered information can have a dark side because the risks of the methods are rarely addressed.^{2,3} Media platforms provide little oversight over the quality of information imparted resulting in a situation similar to the “Wild West” with the delivery of dubious information to unsuspecting viewers.^{3,4} Because low-cost DIY body sculpting methods are touted as non-invasive, non-scarring,

requiring no anesthesia or analgesia, the consumer assumes the method to be safe, simple, and affordable.^{2,3} Most consumers do not have the expertise to distinguish between helpful suggestions and disastrous advice.⁴ The promise of DIY pain-free and non-invasive fat loss, delivered in an expert/authoritative manner, is picked up and delivered widely by the mainstream media to unknowing consumers.^{3,4}

The History of Cryolipolysis: The practice of freezing subcutaneous cellulite for tissue destruction and absorption is known as cryolipolysis.⁵ The practice is described as the use of cold to freeze and kill cells, which are removed by the body, reducing the circumference in the treated area.⁶ Cryolipolysis was first introduced in 2008 by applying copper plates chilled to -1 C to -8C on the skin of pigs for 10 minutes, protected with a glycerol/water lotion. In the study, over several months, the area decreased in size as the subcutaneous fat cells were absorbed into the system without harming the overlying skin. This was the first reported non-invasive method to remove cellulite.⁵ Two years later, in 2010, the Federal Drug Administration (FDA) approved the first cryo-lipolytic device (CoolSculpting; ZELTIQ Aesthetics, Inc., Pleasanton, California, USA). By 2014, additional approval for thigh subcutaneous fat cryolipolysis methods were received.⁷ Since receiving approval, the process has been heavily used, and more than 4 million treatments have been reported globally.⁷ Concerns have been voiced, though, as the use of media platforms for DIY body sculpting methods has increased with little warning of risk. The reporting of documented detrimental outcomes of DIY subcutaneous fat cryolipolysis has increased over time.^{2, 7-15} The increase in detrimental cases has been followed by an FDA warning of risks of body sculpting, saying the technologies can cause burns, blisters, nerve damage, and skin discoloration. But more is needed to protect the public.

Case Presentation

A 40-year-old woman presented to our southern U.S. level I trauma center emergency department with an active burn program. The

woman complained of worsening pain and discoloration to both thighs after direct dry ice application for one hour 2 days prior. The patient reported obtaining the idea of DIY dry ice cryolipolysis from an online media platform. Permission to publish this case report was obtained from the patient, who stated during the conversation, "There were no risk warnings stated anywhere or by anyone, so I was not aware that I could harm myself" (See Figure 1). When the dry ice was obtained from a popular online source for the purpose of "DIY cryolipolysis," the patient received no instructions for handling and was unaware of the temperature difference between regular and dry ice (See Figure 2). The dry ice application resulted in a full-thickness cold tissue injury to her bilateral inner thighs. The injured area was similar to a frostbite-like cold tissue injury and measured 8% TBSA (969 centimeters squared).

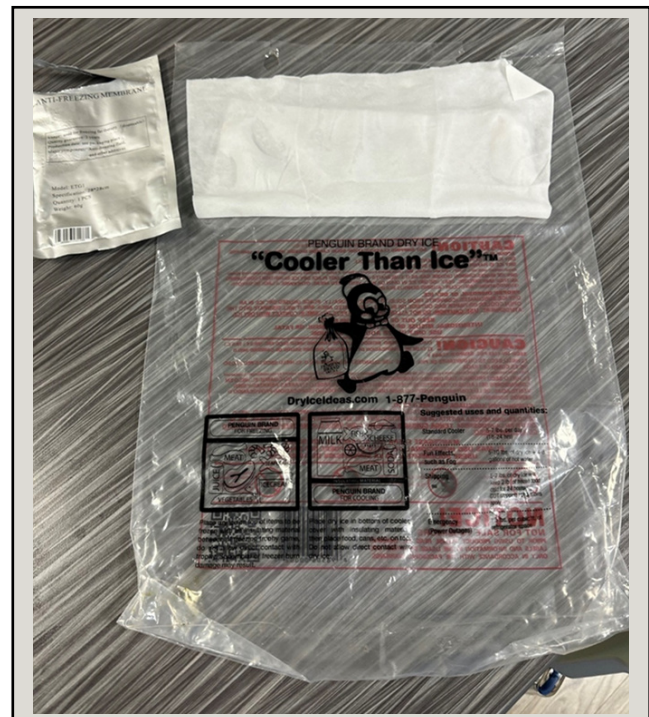


Figure 1. Product bought online by patient

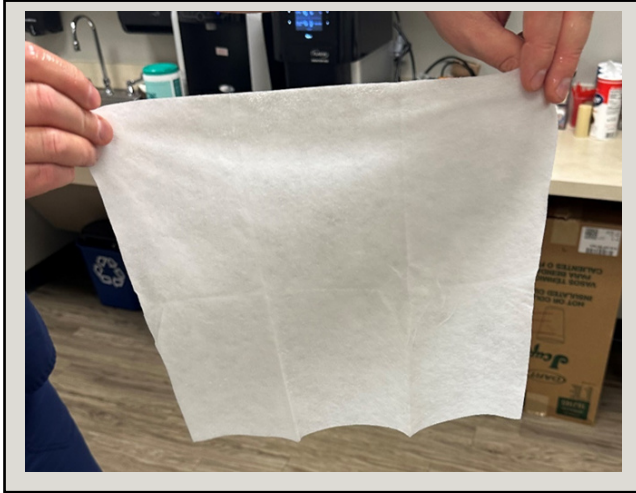


Figure 2. Dry ice membrane applied to thighs

On initial assessment, each wound was uniform in size and the appearance measured roughly 30 cm x 15 cm before debridement of the nonviable tissue. Central to each wound was a large area of hard, black, necrotic tissue that was absent of tactile perception. The predominate zones of coagulation on each leg transitioned into a narrow perimeter of scattered fluid-filled blisters that laid on top of a layer of pale waxy skin. In the outer area, the patient reported some areas of sensation and pain. Extending peripherally from this area, was a thin surrounding border of redness that quickly transitioned to pink blanchable skin which was reported as the most painful area (See Figure 3).



Figure 3. Wound on arrival

In the ED, the area was cleansed followed by the application of Dermanet impregnated with Silver Sulfadiazine cream. The patient was admitted and treated surgically on hospital day 2, 7, and 13 and then discharged on day 18. Surgical debridement on day 2 included the placement of cadaveric skin allografts along with a Silverson dressing and negative pressure wound therapy in preparation for autografting the following week (See Figure 4). On day seven, successful reconstruction was performed using split thickness skin grafting (combination of split thickness skin grafts and donor sites). Autologous skin cell suspension was sprayed over the split thickness skin graft sites and the bilateral thigh donor sites. Silverlon burn dressings were applied and negative pressure wound therapy continued. On day thirteen, under anesthesia, the patient was noted to have excellent skin graft healing. During the procedure, the donor sites were soaked in Vashe solution to cleanse, irrigate, and moisten the wound followed by the placement of Silvadene dressings to the bilateral thighs. Lastly, a large 18 x 18 dry burn gauze wrapped in place with Kerlix, Ace, and Stretch Net was applied. Following surgery, the dressings were changed daily, and the patient was discharged on postoperative day 18 with no further complications to clinic follow up. The patient achieved excellent wound healing along with functional outcome, reporting no trouble with ambulation and activities of daily living.



Figure 4. Fully excised wound

Discussion

Frostbite Occurrence and Treatment

Success: This case illustrates the potential of severe third-degree cold tissue injury from direct dry ice skin application. Recognition of the severity of the burn injury is critical. The idea was obtained from current social media trends of DIY cryolipolysis. Frostbite-type injuries occur mostly during the winter months in the northern latitudes of the U.S. and is a relatively uncommon presentation to trauma and burn centers in the south. Third degree cold-related tissue injuries are rare and are the most severe, often resulting in permanent tissue damage, requiring surgical excision and subsequent reconstruction. Due to its rarity, especially in the southern U.S., many clinicians may lack the experience to recognize and care for these injuries. Early surgical consultation is necessary in order to avoid complications of non-treatment such as infection and contractures, which may threaten viability or result in functional impairment of the limb. The use of autologous skin cell suspension (ASCS) (used in this patient's care) has shown to be an effective treatment for a severe burn or full-thickness trauma in combination with a split-thickness autograft.^{16, 17} The ASCS suspension allows regenerative keratinocytes, as well as dermal fibroblasts and melanocytes, to be delivered across the wound bed initiating centralized healing as well as from the periphery. Literature demonstrates that ASCS technology has also been shown to significantly reduce length of stay and minimize donor site requirements along with associated morbidities including scarring.^{16, 17}

Medical Cryolipolysis vs DIY Cryolipolysis:

The use of the cryolipolysis technique in medical centers for adipose tissue removal is growing in popularity. Since 2014, worldwide, there have been over half a million cryolipolysis treatments.^{13,18} CoolSculpting™ is the most common method used safely.² Since 2023, three devices (CoolSculpting™, Cooltech, and Cooltech Define) have been supported as safe when used at medical clinics with defined practices.^{6, 19}

On the other hand, cryo lipolysis application in facilities with little training and no oversight results in cases of severe burns.^{9,11,20} The inexperience of users, technical equipment failures, in addition to limited regulations for machine purchase have raised concerns.^{3,8, 21} Between 2011 and 2021, Medical Device Reporting received 1325 negative occurrences related to noninvasive body contouring devices.²¹

In addition, the DIY cryo-lipolysis method is touted as efficient and easy by online media who are not experts. Since 2016, nine cases of severe burns have been reported using DIY methods, which have led to the removal of reported severe cases of masses and lumps.⁷ In one case, after watching a DIY video, dry ice in saran wrap without a protective emollient was rubbed on the abdomen in 15-minute intervals over each quadrant, resulting in full and partial-thickness burns.⁴

When lay people think of ice application, their knowledge base is most commonly related to cubed or crushed ice and cold application to burns or injuries at 30 to 32 degrees Fahrenheit.^{22,23} Freezers chill items to 0 degrees Fahrenheit (-18 centigrade) but then when removed from the freezer, the items warm within minutes of skin application because it absorbs the body's heat.²⁴ Many laypersons are unaware of the negative 109-degree Fahrenheit temperature of dry ice, which is 3 times colder than cubed or crushed ice. Most associate ice pack application with injury treatment, swelling reduction, and analgesia at the site. Therefore, when applying dry ice directly to the skin, pain is somewhat expected, followed by pain relief. But when dry ice is applied directly to the skin and pain occurs followed by numbness, the layperson is unaware that the blood vessels have been constricted, reducing blood to the area, leading to a full thickness cold tissue injury with nerve and tissue damage.²⁵

Consumer Production: Strategies to help patients become more aware of questionable resources online should be developed on a national scale.^{3,4} The terms "CoolSculpting™" and "cryolipolysis" are used interchangeably.²¹

Medical literature expounds on the overall safety of CoolSculpting, which is then translated to DIY performance and picked up by mainstream marketing and media.⁸ But, not all machines are created equally.²¹ An Amazon search performed by the authors revealed the availability of dry ice body sculpting machine options starting at less than \$20; many with 5-star reviews. One manufacturer recommended the application of dry ice for 15 minutes with oil (but not mandatory) leaving the interpretation to the handling of the dry ice with bare hands and application to bare skin sufficient.

The DIY information provided to consumers runs the gamut of sophisticated to very amateur, self-proclaimed online experts without oversight.^{3,4} For example, a suggested DIY method consisted of a Peltier thermoelectric cooler used for camping coupled with a cooling device used for computer motherboards with copper plates for conduction.⁴ The result is a number of different devices being available and used without education.²¹ Overall, the DIY sculpting method is the “Wild West,” in which similar methods are untested, unregulated, and potentially harmful and often presented in an authoritative manner resulting in harm to unsuspecting users.^{3,4, 24} In 2013, the Department of Health reviewed the provision of aesthetic interventions and recommended a more robust regulatory framework to protect the public from risks associated with unregulated and untrained providers.¹⁰ A problem has been created by allowing the public to use unregulated off-the-shelf products along with the widespread dissemination of unreliable information on the internet.^{3,4}

Conclusion

Having the desire for a positive body image is normal. Due to busy lifestyles with limited ability to exercise, consumers look for rapid weight loss options. The cost of cryolipolysis by a licensed provider is prohibitive for many; therefore, the public turns to DIY information found on media sites. The identified issue for the media sources is the lack of warning provided to consumers detailing the possible

adverse outcomes and detrimental side effects of a DIY process. This patient experience highlights the need for increased protection of the unaware public. Even with substantial wound healing, the overall burden this patient must face is being financially responsible for an 18-day hospital visit requiring three operative days with full anesthesia, in addition to days not worked and permanent disfigurement or scarring.

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