European Journal of Plastic Surgery (2020) 43:665–670
https://doi.org/10.1007/s00238-020-01678-0

CASE REPORT

Severe and massive necrosis following high definition power-assisted liposuction: a case report

Eduardo Madalosso Zanin[1] · Ciro Paz Portinho[1] · Isabel Cristina Wiener Stensmann[1] · João Maximiliano[1] · Antonio Carlos Pinto Oliveira[1] · Marcus Vinicius Martins Collares[1]

Received: 26 February 2020 / Accepted: 22 April 2020 / Published online: 9 May 2020

Abstract

Although liposuction is one of the most sought-after surgical procedures in the world, there are plenty of acknowledged complications associated with it. There are, however, no case reports such as this one regarding severe complications deriving from the high-definition technique. We describe the management of a patient with massive necrosis following a high definition power-assisted liposuction. A 37-year-old woman, who presented an overweight body mass index and no other comorbidities, had a liposuction with abdominoplasty done in 2012. In early 2019, she underwent a high definition liposuction, being transferred 8 days after the procedure into a tertiary and university-related hospital with necrotizing fasciitis and sepsis. The patient received treatment for a life-threatening condition at the ICU and several interventions for debridement and skin replacement. She was discharged 2 months after admission. High definition liposuction is a new technique that has recently become widespread. However, it is not fail-safe, as the present case shows. It should be restricted to selected cases and its technique should be reviewed and trained extensively to reduce its possible risks.
Level of evidence: Level V, risk/prognostic study.

Keywords PAL; Power-assisted liposuction; High definition liposuction; Complication · Necrosis · Liposuction

Introduction

Liposuction is one of the most performed surgeries in the world, coming in second place in the USA and the world according to 2016 statistics [1, 2]. Despite recurring complications associated with it, the procedure's incidence continues to rise, with an increasing demand for the high definition technique.

Over time, liposuction went through several technical phases in pursuit of the most effective and practical methods of fat removal, such as the refined curettage of localized fat to the ultrasonic laser and the vibration liposuction [3–5]. Nowadays, the approach under most scrutiny is the recently developed high definition liposuction (HDL), which consists of the precise aspiration of various deep and superficial planes of the subcutaneous tissue, visually resulting in well-defined muscles [6–9].

Although complications associated with classic liposuction are frequently approached and well-known, there are few articles regarding complications of the HDL technique and no case reports in the literature [7] about any subsequent severe complications.

This is the first detailed case report of a severe complication with imminent risk of death following an HDL. We present the case and its multidisciplinary management.

Case Report

A 37-year-old overweight woman was admitted to a tertiary and university-related hospital showing a clinical case compatible with necrotizing fasciitis and sepsis. Eight days earlier, she underwent an HDL at another hospital. She also had a liposuction with abdominoplasty and presented no other comorbidities 7 years earlier, in 2012. The patient was discharged 2 months after admission.

According to the surgeon responsible for the procedure, the areas where liposuction was performed were flanks, back, and somewhat in the abdomen. A tumescent solution consisting of

✉ Eduardo Madalosso Zanin
eduardo.zanin@gmail.com

[1] Division of Plastic Surgery, Hospital de Clínicas de Porto Alegre, R. Ramiro Barcelos, 2350, Porto Alegre, Rio Grande do Sul 90035-007, Brazil

a saline solution (1000 ml), 1:1000 epinephrine (2 ml), and 7.5% ropivacaine (3 ml) was used. Four liters of the solution was infiltrated into the patient's back and 3 l into the abdomen and flanks. The volume of fat aspirated was 4.5 l and power-assisted liposuction (PAL) was performed through deep and superficial layers. The total surgery time was 3 h and 30 min.

On the second postoperative day, the patient developed hyperemia and congestion in the flanks, back, and anterior abdomen. Antibiotic therapy started at that time without hospital admission. She developed necrosis of the areas where liposuction was performed and the patient's general clinical condition worsened on the seventh postoperative day when she was admitted to the local hospital and the transfer was requested.

Once at our emergency room, she was obnubilated, feverish, and tachycardic, and presenting an extensive area of mummified necrosis on the anterior abdomen, flanks, and back, extending to the muscular fascia, corresponding to about 30% of the body's surface. The picture shows necrotizing fasciitis and sepsis (Fig. 1).

Once again, liposuction had been done in the back (from T4 to the coccyx), the axillary region, and areas II and III of the abdomen. According to the surgeon responsible for the procedure, the anterior pedicle flap of the abdomen was not suctioned, hence it being the only region not affected by the necrosis.

The entire necrotic area was then extensively debrided, including portions of the aponeurotic fascia, exposing the musculature. On the next day, necrosis had progressed further and another debridement was necessary, reaching the xiphoid process area on the anterior part of the torso and up to the scapular region on the posterior part. Two days later, another procedure was performed for revision, without any new areas of necrosis. The patient had been showing severe hemodynamic instability since our first surgical intervention. Tracheostomy was performed. One week after the last procedure, a new surgical revision was carried out, and small necrotic areas were resected (Fig. 2). The patient was maintained with daily silver alginate dressings.

Eleven days after her arrival, the patient was hemodynamically stable, without infectious signs, and under intense analgesia. A partial-thickness heterologous skin graft was provided by the heterologous skin bank of Santa Casa Hospital of Porto Alegre; it was placed over the entire exposed area along with adhesive sutures with stitching on the skin flaps and edges (Fig. 3). The dressing was made with large sutures securing the gauzes and sealed with moderately applied pressure. The bandage was kept for 7 days. The patient evolved well, improving hemodynamic patterns and lessening the need for intense analgesia (Fig. 4).

Three weeks after the patient arrived, she was extubated and awakened. She made good progress in the ICU, receiving dressings every 48 h with oily gauzes. Twenty-eight days after the initial admission, she was discharged from the ICU and transferred into the infirmary. There, she recovered well, receiving daily dressings and care from the psychiatry, psychology, internal medicine, and pain teams, as well as intensive care physiotherapy. On the following days, there were no new areas of necrosis and the wound developed a significant granulation.

Forty-five days after admission, the patient had deep vein thrombosis in the leg without systemic repercussion. Institutional thrombosis prophylaxis was in progress at the time. She initiated anticoagulation treatment.

The patient was discharged 2 months after admission with a well-granulated wound (Fig. 5). Four months later, an autologous skin graft was placed after the end of the anticoagulation period (Fig. 6).

Discussion

HDL is a highly effective procedure that fulfils the purpose of improving body definition, and its incidence is rising throughout the world [1, 2, 6]. It was originally meant to be performed with ultrasound-assisted liposuction (UAL), but the use of PAL in association with HDL is becoming progressively popular among plastic surgeons [6, 9]. From a technical standpoint, increasing treatment speed, sparing unnecessary movement, and reducing operator fatigue are all benefits attributed to the PAL technology [9–11]. Less extensive trauma on fat tissue with reduced vascular injury was described by Scuderi for both the UAL and the PAL techniques in comparison with standard liposuction (SAL). Operation time was reduced by 50% comparing PAL with UAL. Scuderi suggested, however, that there might be greater complications during the learning curve of the PAL technique [11]. Saad managed a longer follow-up time and a higher number of patients to reinforce his data about long-term results, complications, and learning curve [9]. Fodor also highlighted the learning curve associated with the PAL and UAL techniques [10]. Kim described in his experience that the most devastating complication of superficial liposuction was skin loss, which occurred only in his cases with PAL [12].

In this presented procedure, PAL technique was chosen, the same way the surgeon had been using in HDL cases.

The potential risks of this surgery, however, are not trivial. Clinical complications are well documented in the literature, including severe and fatal ones, such as pulmonary embolism [13, 14]. Case reports of severe and major surgical complications following liposuction are often related to the expertise of surgeons [15–17], aseptic standards [18, 19], fluid overload [20, 21], major liposuction [22], embolism [23–25], inadequate postoperative monitoring, and others [26–28]. Complications such as bacterial infections, skin necrosis, perforation of viscera, embolism, hemorrhages, cardiac arrest,

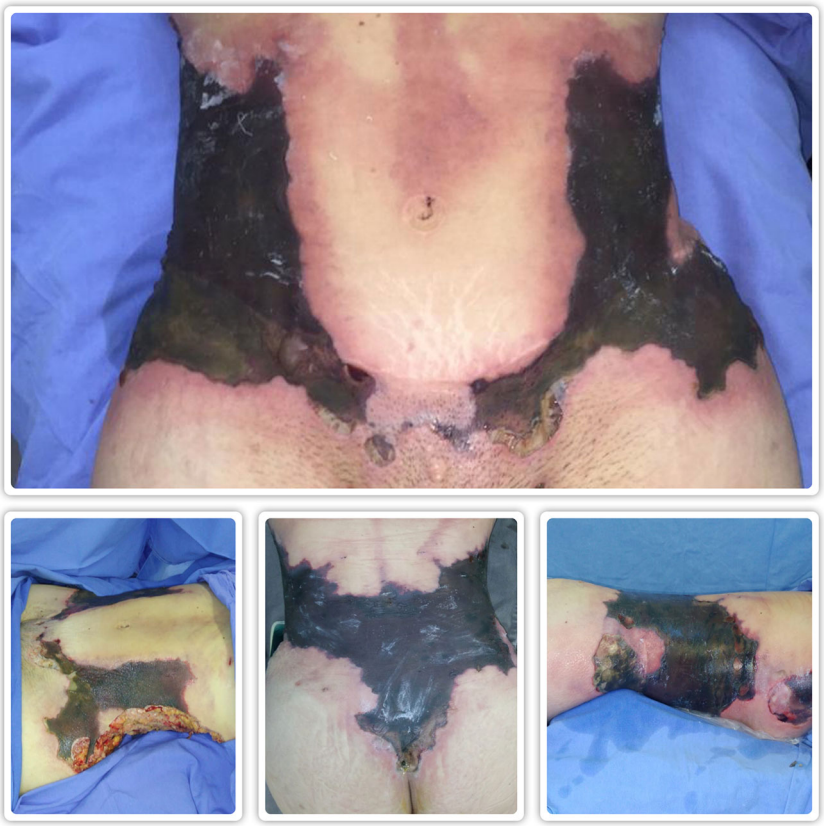

Fig. 1 Arrival

hyperhydration, and hypohydration are described in the literature [29]. Superficial liposuction, which is performed within the HDL, involves a heavy manipulation of the superficial fascial system, resulting in possible ascending infection. There have also been other reports of necrotizing fasciitis from these procedures [11, 30]. However, there are no specific complications described related to the association of PAL in HDL [6, 13, 14].

Factors such as the amount of fat, previous surgeries, the extension of the body surface being operated on, and concomitant surgeries are related to poor outcomes in the HDL [13, 14, 31]. The use of PAL, as in the case, may be associated with

Fig. 2 After the fourth debridement procedure

Fig. 3 Partial-thickness heterologous skin graft

complications once a larger area is aspirated, potentially damaging a greater amount of blood vessels, especially in the superficial layer [30].

Extensive skin necrosis with evolution to necrotizing fasciitis followed by HDL, as hereby reported, is a rare and seldom described complication.

Although well documented in deep liposuction, PAL has no consistent data regarding its complications on HDL. We believe using PAL in a superficial layer may have widely compromised the subdermal plexus, causing extensive skin necrosis. Corroborating this fact, the only area preserved with no signs of ischemia was the midline, which is known as a non-superficial liposuction area in HDL, as described by Hoyos [6, 32].

Conclusion

High definition liposuction (HDL) is a new technique that has recently become widespread. However, it is not risk free, as the present case shows. It should be restricted to selected cases and its technique should be reviewed and trained extensively to reduce the risks.

Besides the reduction in operative time with PAL in comparison with UAL and SAL, the association of PAL in HDL

Fig. 4 Seven days after partial-thickness heterologous skin graft

Fig. 5 Discharged 2 months after admission with a well-granulated wound

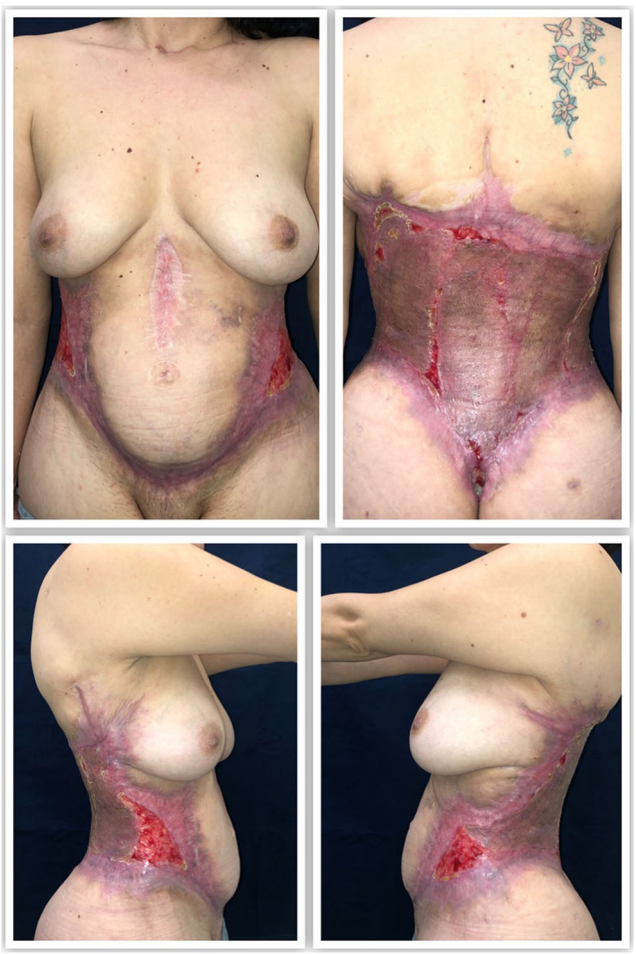

Fig. 6 Autologous skin graft, 4 months after arrival

may increase the severity and the complication rate of the surgery, especially during the learning curve.

The postoperative period of the HDL should be closely monitored and an alert posture regarding complications should be adopted. Early signs such as erythema, malaise, refractory pain, and edema may indicate the start of severe and massive necrosis conditions, so they should never be underrated.

Therefore, the complications related to this procedure should not be forgotten and specific pitfalls and risks of this particular technique should be well known by the surgeon in charge.

Compliance with ethical standards

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. For case reports, formal consent from a local ethics committee is not required.

Conflict of interest Eduardo Madalosso Zanin, Ciro Paz Portinho, Isabel Cristina Stensmann, João Maximiliano Pedron Martins, Antonio Carlos Pinto Oliveira, and Marcus Vinicius Martins Collares declare that they have no conflict of interest.

Patient consent Patient has consented to the submission of the case report to the journal. Patient signed informed consent regarding publishing her data and photographs.

References

1. Cosmetic Surgery National Data Bank Statistics (2016) Aesthet Surg J. 36(suppl 1):1–29

2. ISAPS, (2018) international survey on aesthetic/cosmetic procedures performed in 2017. International Society of Aesthetic Plastic Surgery. Available at https://wwww.isaps.org/wp-content/uploads/2018/10/ISAPS_2017_international_study_cosmetic_proceduers.pdf. Accessed November 16, 2018
3. Illouz YG (1992) A new safe and aesthetic approach to suction abdominoplasty. Aesthetic Plast Surg 16(3):123–127
4. Zocchi M. (1990) La liposculpture aux ultm-sons. In: Congrès D'Hiver de la Societè Française de Chirurgie Esthetique. Chirurgie Esthetique 65(7):23–5
5. Martins EA, Miranda LFD, Sakae TM, Valle LFC, Ely JB (2007) Avaliação de uma série de 38 casos de pacientes submetidos à cirurgia de lipoaspiração em Tubarão-SC entre outubro de 2004 e fevereiro de 2005. ACM Arq Catarin Med 36(1):113–118
6. Hoyos A, Perez M, Guarin D, Montenegro A (2018) A report of 736 high-definition lipoabdominoplasties performed in conjunction with circumferential VASER liposuction. Plast Reconstr Surg 142(3):662–675
7. Danilla S, Babaitis R, Jara R, Quispe D, Andrades P, Erazo C, Albornoz CR, Sepulveda SL (2019) High-definition liposculpture: what are the complications and how to manage them? Aesthetic Plast Surg 44(2):411–418
8. Husain T, Salgado C, Mundra L, Perez C, AlQattan H, Bustillo E et al (2019) Abdominal etching. Plast Reconstr Surg 143(4):1051–1060
9. Saad A, Pablo Arbelaez J, De Benito J (2019) High definition liposculpture in male patients using reciprocating power-assisted liposuction technology: techniques and results in a prospective study. Aesthet Surg J 40(3):299–307
10. Fodor PB, Vogt PA (1999) Power-assisted lipoplasty (PAL): a clinical pilot study comparing PAL to traditional lipoplasty (TL). Aesthetic Plast Surg 23(6):379–385
11. Scuderi N, Paolini G, Grippaud FR et al (2000) Comparative evaluation of traditional, ultrasonic and pneumatic- assisted lipoplasty: analysis of local and systemic effects, efficacy and cost of the methods. Aesthetic Plast Surg 24:395–400
12. Kim Y, Cha S, Naidu S, Hwang W (2011) Analysis of postoperative complications for superficial liposuction: a review of 2398 cases. Plast Reconstr Surg 127(2):863–871
13. Franco FF, Basso RCF, Tincani AJ, Kharmandayan P (2012) Complicações em lipoaspiração clássica para fins estéticos. Rev Bras Cir Plást 27(1):135–140
14. Toledo LS, Mauad R (2006 Jan) Complications of body sculpture: prevention and treatment. Clin Plast Surg 33(1):1–11
15. Clayman MA, Caffee HH (2006) Office surgery safety and the Florida moratoria. Ann Plast Surg 56:78–81
16. Coldiron B (2002) Office surgical incidents: 19 months of Florida data. Dermatol Surg 28:710
17. Horton JB, Reece EM, Broughton G II, Janis JE, Thornton JF, Rohrich RJ (2006) Patient safety in the office-based setting. Plast Reconstr Surg 117:61e
18. Charleux D, Thivolet J (1990) Unusual complication of liposuction (atypical cutaneous mycobacteriosis?) (in French). Ann Dermatol Venereol 117:449
19. Meyers H, Brown-Elliott BA, Moore D et al (2002) An outbreak of *Mycobacterium chelonae* infection following liposuction. Clin Infect Dis 34:1500
20. Gilliland MD, Coates N (1997) Tumescent liposuction complicated by pulmonary edema. Plast Reconstr Surg 99:215–219
21. Rohrich RJ, Leedy JE, Swamy R, Brown SA, Coleman J (2006) Fluid resuscitation in liposuction: a retrospective review of 89 consecutive patients. Plast Reconstr Surg 117:431–435
22. Rohrich RJ, Muzaffar AR (2000) Large-volume liposuction complicated by retroperitoneal hemorrhage: management principles implications for the quality improvement process. Plast Reconstr Surg 105:2249–2250
23. Rao RB, Ely SF, Hoffman RS (1999) Deaths related to liposuction. N Engl J Med 340:1471–1475
24. Most D, Kozlow J, Heller J, Shermak MA (2005) Thromboembolism in plastic surgery. Plast Reconstr Surg 115:20e
25. Ross RM, Johnson GW (1988) Fat embolism after liposuction. Chest 93:1294–1295
26. Glashofer M, Coleman WP III, Lewis A, Mason S, Plaisance J (2005) Seroma formation following abdominal liposuction. Dermatol Surg 31:770–772
27. Berg D (2000) Deaths associated with liposuction. Plast Reconstr Surg 106:1211–1212
28. Boezaart AP, Clinton CW, Braun S, Oettle C, Lee NP (1990) Fulminant adult respiratory distress syndrome after suction lipectomy: a case report. S Afr Med J 78:693
29. Lehnhardt M, Homann HH, Daigeler A, Hauser J, Palka P, Steinau HU (2002) Major and lethal complications of liposuction: a review of 72 cases in Germany between 1998 and 2002. Plast Reconstr Surg 121(6):396e–403e
30. Viterbo F, Ochoa J (2002) Vibroliposuction: a study of rate of aspiration. Aesthetic Plast Surg 26(2):118–122
31. Hoyos AE, Millard JÁ (2007) VASER-assisted high-definition liposculpture. Aesthet Surg J 27(6):594–604
32. Grazer FM, de Jong RH (2000) Fatal outcomes from liposuction: census survey of cosmetic surgeons. Plast Reconstr Surg 105:436–446