



# Facial necrosis after fat grafting and treatment with Hyperbaric Oxygen therapy

*Necrose facial após enxerto de gordura e tratamento com Oxigenioterapia Hiperbárica*

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### ■ ABSTRACT

Facial fat grafting is not devoid of risks and complications, despite being a widely practiced procedure. In this case report, we describe a novel form of local ischemic complication that occurred secondary to fat grafting. Simultaneously, we propose Hyperbaric Oxygen therapy for the treatment of this situation. We propose that Hyperbaric Oxygen therapy should not be limited solely to fat graft-related ischemia, but should be effective in the management of the more frequently encountered complications associated with polymethylmethacrylate fillers.

**Keywords:** Lipoenxertia; Facial filler; Hyperbaric Oxygen therapy; Facial necrosis.

### ■ RESUMO

A lipoenxertia de face, apesar de consagrada, não é isenta de riscos e complicações. Neste relato de caso, descrevemos de forma inédita uma complicação isquêmica local, causada por enxerto de gordura. Simultaneamente, propomos a terapêutica com Oxigenioterapia Hiperbárica para o tratamento desta situação, não se limitando exclusivamente à gordura, mas principalmente ao PMMA, em que esta complicação é muito mais frequente.

**Descritores:** Lipoenxertia; Preenchimento facial; Oxigenioterapia hiperbárica; Necrose facial.

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## INTRODUCTION

The use of filling agents for facial rejuvenation has become increasingly common in clinical practice. The large number of substances and materials that can be used for this purpose can be classified into autologous, allogeneic, synthetic, and alloplastic; each type has advantages and disadvantages<sup>1,2</sup>. Procedures that involve the use of filling agents are considered very safe.

Fat grafting, although older, remains one of the most popular and safe procedures. Nevertheless, extremely serious complications can occur<sup>3</sup>. Due to the rarity of these complications, their appropriate management is not well established in the medical literature.

## CASE REPORT

In December 2010 a 49-year-old Caucasian female patient underwent a reduction mastoplasty and filling of the nasogenian sulcus with fat (correction of “Chinese moustache”). The fat graft was obtained by liposuction of abdominal fat using a syringe, and was injected using a blunt filling cannula. This procedure was performed in a private hospital after several medical consultations and preoperative examinations, and the obtention of informed consent.

The surgery was uneventful and was performed under thoracic epidural anesthesia and sedation. In the immediate postoperative period, the patient was well; she complained of mild pain in all surgical sites that was managed with non-opioid analgesics, and the clinical examination was unremarkable. On the first postoperative morning, while still hospitalized, the patient complained of a significant increase in pain severity. The pain had also spread to the upper lip, nose, and nasogenial sulcus bilaterally. On clinical examination, a mild cyanosis of the painful regions, and associated slowed capillary refill time, were observed (Figure 1). There was no pain in breasts and the clinical examination of this region was normal.

A diagnosis of facial ischemia was suspected. Under the guidance of a vascular surgeon, drug therapies were immediately initiated, with the aim of improving local perfusion (full anticoagulation with unfractionated heparin, pentoxifylline, acetylsalicylic acid and clopidogrel), and local heat and massage were applied. Following these interventions, the patient progressed with maintenance of the clinical picture, and showed significant improvements in terms of pain; however, this was accompanied by an evolution to symptoms of anesthesia, particularly in the nose and upper lip, similar to “anesthesia in dentistry”. The feeling of anesthesia and cyanosis gradually worsened over the following 2 days, by which time the whole upper lip, nasogenian sulcus bilaterally, and lower two-thirds of the nose were affected (Figures 1 and 2).

For diagnostic confirmation, we sought help from fellow radiologists, due to the extreme rarity of the case. Our colleagues advised us that, due to the thin caliber of the affected vessels in the region, Doppler ultrasound examination results would be inconclusive. In addition, more accurate methods requiring contrast injection, such as arteriography, risked undermining perfusion, and further aggravating the case. Therefore, we decided to depend on the clinical diagnosis. Hyperbaric Oxygen therapy was initiated on the third day of development. Following the first therapy session, there was a clinically important improvement in the cyanosis area. During the therapy session, the area of cyanosis from the edges of the lesion was transformed into an area with reactive hyperemia (Figure 3). The symptom of anesthesia abated, and the region became severely painful, necessitating opioid analgesia. We attribute this pain to tissue reperfusion after ischemia.



**Figure 1.** Immediate postoperative period. Areas of cyanosis are seen in the nose and the upper lip, with fixed cyanosis in the right nasal wing.



**Figure 2.** Third postoperative day, prior to first session of hyperbaric oxygen therapy. Compared with the immediate postoperative period, the cyanosis has worsened.

In total, 10 sessions of Hyperbaric Oxygen Therapy (90 min per session) were carried out on consecutive days, in a single person chamber, with 100% oxygen at 2.0 atm. During the final 2 sessions, the patient did not report any pain, and reactive hyperemia at the margins of the lesion was not observed. At this time the areas of necrosis were completely demarcated (Figures 4, 5 and 6), and were confined exclusively to the nasal wings bilaterally (dimensions of necrotic regions: right, 1.0 × 1.5 cm; left, 0.5 × 0.8 cm). All other areas of skin previously documented as cyanotic appeared normal, with the exception of mild desquamation, and sensation was normal. It became evident that that, even in the nasal wings, the necrosis was partial and the mucosa was preserved; we therefore opted for conservative non-surgical treatment. The patient

had outpatient follow-up on an almost daily basis, which involved dressings, hydration of the skin, and lymphatic drainage. Necrotic epidermis and superficial dermis spontaneously detached 20 days later (Figure 6). Wound epithelialization by secondary intention occurred after 30 days, presenting, at this time, a gap of skin edges in the necrotic area, which progressively improved (Figure 7).

After 6 months (Figure 8), the patient remains under outpatient follow-up, and has experienced minimal sequelae: the appearance of the upper lip, nasal dorsum, and nasal tip is normal; the left nasal wing has minimal scarring; the right nasal wing has minimal scarring and a 2 millimeter retraction of the nasal wing. The uneven appearance of the skin edges is virtually disappeared.



**Figure 3.** Third postoperative day, immediately after the first session of hyperbaric oxygen therapy. Reactive hyperemia is present in the affected areas.



**Figure 5.** Twelfth postoperative day, following completion of 10 sessions of hyperbaric oxygen therapy. Complete delimitation of the areas of necrosis in the nasal wing.



**Figure 4.** Fifth postoperative day (third session of hyperbaric oxygen therapy). Delimitation of areas of cyanosis and ischemia.



**Figure 6.** Twenty-second postoperative day, with conservative measures only.



**Figure 7.** Thirtieth postoperative day with complete healing following treatment with conservative measures only. Area with gap in right nasal wing.



**Figure 8.** Six months postoperatively. Minimal sequelae (2 mm retraction in the right nasal wing) without any corrective surgical procedure.

## DISCUSSION

Facial filling is part of the medical armamentarium for the treatment of facial wrinkles, and is considered extremely safe. However, complications may occur, and while the majority of these are of low severity, some are extremely serious and even fatal<sup>1</sup>; potential complications include allergic reactions, infections, granulomas, chronic inflammatory reactions, migration of implants, ischemia and tissue necrosis, blindness, and cerebral vascular accident (CVA). The literature indicates that cases in which complications arise generally involve the use of non-autologous agents, such as those derived from collagen and polymethylmethacrylate (PMMA)<sup>4,5</sup>.

Fat grafting for facial filling was first reported in 1893 by Neuber, and its use has become fairly popular over the last 20 years. Apart from the aesthetic indications<sup>6</sup>, fat grafting may be used for treatment of facial trauma, Parry-Romberg syndrome, and facial lipodystrophy caused by antiretrovirals.

The advantages of this approach include wide availability, low cost, and ease of handling; fat grafting is also autogenous, and thus circumvents the risk of allergic reactions, and other undesirable reactions associated with the use of allogeneic agents<sup>3</sup>. We also see increasing reports regarding late advantages to the use of fat grafting, including a proportional adjustment of the face to the oscillation of body weight, and an improvement in the quality of the skin at the site where the graft is applied, with minor damage on sun exposure, and minor signs of aging<sup>7</sup>. Disadvantages of fat grafting include the need for a surgical procedure, the irregular indices of the "handle" of the graft, and the lack of technical standardization in terms of harvesting, donor site, processing, form of application, and other aspects<sup>3</sup>.

Despite the apparent safety of the procedure, there are some complications related to facial fat grafts. Unsatisfactory outcome is the most common of these, and is mainly related to the resorption of the graft. However, hypertrophy of the graft may also occur, and is typically related to excessive weight increase. Other complications, including irregularities, infections and hematomas, can occur<sup>3</sup>. The literature also contains reports of rare ischemic complications, including stroke, aphasia, hemiparesis, and blindness; there is even one case of a fatal CVA<sup>8</sup>. We found no case in the literature of local tissue ischemia related to fat grafting, although this complication has been reported following the use of PMMA and collagen derivatives. With regard to central ischemic phenomena, such complications may be attributed to the accidental injection into vessels with embolic phenomena, external compression of the vessels by the agent, or the existence of a previously unidentified anatomical variation within the patient. The vast majority of cases of cerebral ischemia, or partial or total losses of vision, are reported to have occurred with injection in the area of the glabella; it should be noted that local factors, such as a greater number of anastomoses between extra-orbital branches of the ophthalmic artery, have been held responsible for such an occurrence<sup>9</sup>.

With regard to ischemic phenomena and local necrosis, the literature indicates an incidence of up to 9 cases per 100,000 treated with non-autologous filling agents<sup>4</sup>. Due to the properties of PMMA, including particle size, diluents, and low absorption, the use of this agent is associated with a greater risk of ischemic phenomena<sup>9</sup>. Technical problems are also a potential cause of such phenomena; in an attempt to make the product less visible it may be applied in a deeper plane, provoking embolism or compression of larger subcutaneous or muscle vessels.

All potential complications should be discussed with the patient prior to the completion of any type of facial filling, regardless of the agent used. This is particularly important, given that many doctors and patients view these procedures as harmless and without risks. To minimize the risks, technical care is needed to ensure that fat is applied in the appropriate, relatively superficial plane, in small and sufficient volumes, with thin blunt tip cannulas, in different planes, and using a retrograde approach. (all these precautions were taken in this case).

We were unable to identify the cause of the ischemic phenomenon in this case; plausible explanations include external compression, vascular injury, fat embolism, or some vascular anomaly of the patient. The lack of specific examinations, and the fear that arteriography by contrast injection could worsen the case, precluded a definitive answer. In addition, the lack of literature regarding similar cases made clinical decision-making challenging. We chose to build on the diagnosis and clinical evolution.

Hyperbaric Oxygen therapy has many indications in plastic surgery, including in the treatment of diabetic and irradiation lesions, and the treatment of reduced perfusion in wounds, flaps, and grafts. Mechanisms of action include a higher solubility of oxygen in the plasma, a reduction of local edema, and an increase in the intracellular production of reactive oxygen and nitrogen species<sup>10</sup>. Although an established treatment modality, Hyperbaric Oxygen therapy tends to be overlooked by doctors unfamiliar with this therapeutic option. In the present case, therapy was implemented on the second day of evolution; as a result, the first session took place on the third postoperative day. We could probably have a better answer with a reduction of this period.

We have described, for the first time, a case of an ischemic facial lesion caused by fat grafting. In similar cases in the literature related to filling with PMMA, the therapeutic use of drugs that can improve local perfusion has been reported, followed by early debridement and reconstruction techniques. In our case, we chose to perform Hyperbaric Oxygen therapy. From the first session, treatment was associated with a visible improvement in the ischemic area, and significant limitation of the area of necrosis. Taken together, these effects ensured a lower morbidity and deformity for the patient, without the need for surgical revisions and early debridement. This treatment approach also allows for a possible later surgical correction, for any retractions, with simpler and less morbid procedures. The authors have no doubt that Hyperbaric Oxygen therapy was essential for the excellent progress of the case.

## CONCLUSION

Although established and considered extremely safe, facial fat grafting can have very serious complications. For the first time, we have described a case of local necrosis caused by fat grafting. In addition, we propose that Hyperbaric Oxygen therapy is an extremely effective therapeutic option for cases of acute ischemia associated not only with fat grafting, but also with filling by other agents, particularly PMMA. Hyperbaric Oxygen therapy was associated with an excellent therapeutic response, ensuring lower morbidity and deformity for the patient, and should be always considered.

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