International Journal of Medical Science and Clinical Invention 10(3): 6612-6621, 2023
DOI:10.18535/ijmsci/v10i3.05
https://valleyinternational.net/index.php/ijmsci

Case Report,

Ozoniotherapy in the Transoperative Period of Autologous Gluteal Fat Grafting – Ozonized Fat Grafting: Case Reports

Fabio dos Santos Borges[1], Talita Aguilar[3], Carlos Augusto Zommer de Figueiredo[3], Tatiane Costa de Aguilar[4], Robson Vittorazzi Altoé[5]

[1]Postgraduate, Estácio de Sá University, Rio de Janeiro, Brazil
[2]Elecance Santé Group, Rio de Janeiro, Brazil
[3]Zommer Clinic, Rio de Janeiro, Brazil
[4]Elecance Santé Group, Rio de Janeiro, Brazil
[5] Elecance Santé Group, Rio de Janeiro, Brazil
Email Address: **fabioborges2000@gmail.com**

Abstract:

Background: With the appearance of liposuction, it was possible to transplant small volumes of fat to correct body irregularities, and the number of cases of autologous fat grafting has hugely been growing. Authors in the literature suggest the use of ozone in fat grafting to preserve the explanted adipocytes and thus avoid postoperative complications.
Objective: To report three cases of autologous buttock fat grafting in which transoperative period ozonetherapy was used (Ozonated Liposuction).
Methodology: Three cases of buttock fat grafting were reported which used ozone in the preparation of the fat gruel before inserting it into the target area, as well as a post-surgical physiotherapeutic treatment intended to help in the recovery of operated patients.
Results: In the reported cases, it was noticed a very satisfactory immediate postoperative evolution, free of intercurrences or complications. And, it was not identified absorption of fat graft, therefore maintaining the symmetrical shape achieved with the surgery. At the general medical discharge, six months after the surgery, it was attested that there was no significant loss of fat grafted volume and the aesthetic appearance obtained through Ozonized Lipografting remained extremely satisfying.
Conclusion: Despite the small number of studied cases, but having no intercurrence and/or serious adverse effect with the use of ozone in the transoperative period of autologous buttock fat grafting, along with the finding of very satisfactory results in patients' recovery and in obtaining excellent aesthetic result, it is clear to conclude that ozone can be an excellent adjunctive in contributing for a safe and efficient fat grafting postoperative evolution regarding obtaining and maintaining the intended results from the surgical procedure.

Keywords: Plastic surgery, fat grafting, gluteal fat grafting, ozone, ozonetherapy.

Introduction:

In 1893, Franz Neuber took the first step towards the beginning of fat grafting by injecting arm fat into a patient's face to reconstruct a large depression in his cheek caused by bone inflammation [1]. In the 1980s, with the emergence of liposuction, to transplant small volumes of fat to correct body irregularities became possible [2]. According to the American Society of Plastic Surgeons, in their plastic surgery statistics report for 2020, the number for cases of autologous fat grafting for buttock boost in the US amounted to 21,823 cases, where 98% of the total were women [3].

In recent years, it has appeared too much

information about fat grafting in the scientific literature, including studies on the anatomy of the buttocks, indications, techniques, results and, on its safety. Much of the published information has approached the safety of fat grafting for buttock augmentation and its fatal complications, mainly associated with fat emboli [4].

Although there is an important discussion and investigation about fat embolism, there are other complications in gluteal fat grafting that are more common, however, much less devastating than fat emboli [4]. Some of these minor complications are: Seroma, erythema, pain, contour irregularities or asymmetries, fat necrosis ("resorption"), transient sacral numbness and cellulitis [5].

Ozonetherapy uses ozone gas as the main agent of action, also it has been used and researched for many decades for health promotion. Its therapeutic action is consistent, having plenty of evidence and shows few side effects [6]. Ozone is considered a biomolecule since it is naturally produced by neutrophils when these participate in the body's defense [7, 8].

Currently, therapy with ozone gas or its derivatives has demonstrated many possibilities for use in different conditions in the aesthetic area, including plastic surgery [9]. But, related to fat grafting, authors [10] mentioned that the use of ozone in explanted adipocytes exposed to ozone gas had their integrity preserved. Thus, authors recommended that the fat handled for grafting should be treated with ozone before its injection in the recipient area with the main purpose of preventing post-graft adipocyte death.

This study aims to report three cases which ones applied ozonetherapy in the transoperative period of autologous fat grafting of the buttocks, called *Ozonized Lipografting*. Additionally, the procedures describing ozonetherapy process were done during the surgery, also the physiotherapeutic treatment and postoperative evolution.

Methodology:

As follows, it is described three cases of autologous buttock fat grafting associated with the use of ozone gas during the transoperative period, performed in Rio de Janeiro (Brazil), from August to December 2021.

Case 1:

Patient BGM, female, 21 years old, white, single, student and born in the state of Amazonas (Brazil). She complained of lack of contour, symmetry and volume related to the buttocks, and so, was underwent gluteal remodeling treatment through Ozonized Gluteal Lipografting. The patient was treated with autologous fat transplantation, and harvest was made from the abdomen and back/flanks through liposuction.

In order to obtain the adipose tissue, the donor area was marked under general anesthesia, thus antisepsis and adrenaline solution were infiltrated (proportion of 1 adrenaline for each 500 mL of serum). It was applied in the ringer lactate of 1000 mL for 2 ampoules of adrenalines, 1 vial of Transamin and 1 vial of Dexamethasone.

With the aid of the Vibrofit® vibrating liposuction device (Faga Medical, Bauru-SP, Brazil), connected to a 3 mm cannula, the area to be liposuction was irrigated, and then, fat was harvested using 3 mm, 4 mm and 4.5 mm (to cause less trauma to the patient). After extraction, fat was stored in a place without direct contact with ambient air in order to reduce oxidation and the loss of fat tissue due to cell death, After, it was submitted to a decanting process, and then it was strained resting just a kind of "fat gruel", which is what would actually be grafted on the patient.

After doing such fat process, ozonation was started and for that, it was used a sterile urine collector to deposit the decanted and sieved fat (gruel). Next, ozone was injected by piercing the side of the collector with the needle (Figure 1). Six syringes of 60 mL of fat gruel for each four syringes of 60 mL of ozone with a concentration of 10 micrograms mL^{-1}. As ozone application starts, it was possible to observe the change in the color of the fat in a way that after being ozonized, presented a lighter color (Figure 2). The mixture of gruel and ozone was kept for 5 minutes before being grafted on the patient. Regarding the ozonetherapy equipment used was the O&L 1.5 RM Portable model, manufactured by Ozone & Life® (São José dos Campos-SP, Brazil).

Figure 1. Ozone injection in the fat gruel during the transoperative period of ozonized gluteal fat grafting

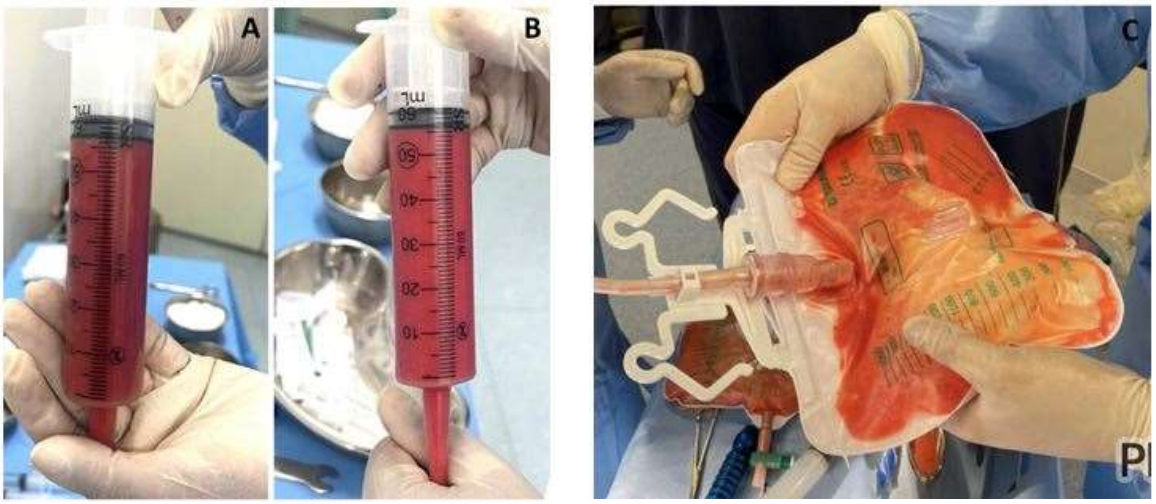

Figure 2. A) Fat gruel before ozonation (darkest color); B e C) Ionized fat gruel (lighter color)

After preparing the ozonated fat gruel, grafting was started and done in "multilayer sticks"; so that the recipient tissue vessels, that is, the recipient gluteal region vessels, could nourish the living fat cells, which ones would be grafted into the subcutaneous and intramuscular layers. Thus, grafting was performed in two layers, partially intramuscular and partially subcutaneous (proportion of 25% intramuscular and 75% subcutaneous).

At the end of the surgery, a surgical girdle was placed on the patient with medium compression, respecting the anatomical curves and medical recommendation for continuous use for 30 days. After this period of continuous use, the patient was instructed to use the girdle only at night. The patient was also instructed to lie down or sleep in the prone position for 30 days after the surgery, avoiding lying on her side so as not to rest the side of her buttock on the surface where she would lie down. During 30 postoperative days, the patient also avoided sitting and lying in the supine position.

Four days after the surgery, the treatment of postoperative dermatofunctional physiotherapy was started, in a total of 10 sessions, performed once a week. In the initial physiotherapeutic evaluation, the buttocks area where the fat grafting was performed had a slight local redness, symmetrically on the right and left sides without signs of local heat, but

the patient reported pain on palpation.

To dermatofunctional physiotherapeutic treatment, it was used a low power laser (660 nm) with a dose of 3 J/cm^2 directly applied on the fat grafted area (Laser Therapy EC, manufactured by DMC®, São Carlos-SP, Brazil.). Further, the Modified ILIB laser technique (*Modified Intravascular Laser Irradiation of Blood*) was used in the radial artery for 20 minutes (it was used the same laser therapy equipment handled in the local application).

In all sessions, ear ozone was applied with a volume of 180 mL and a concentration of 10 micrograms mL^{-1} of ozone (the patient refused to apply rectal ozone – a common procedure in this type of postoperative period). Gluteal region was not manipulated during the 30 days after surgery; therefore, no local lymphatic drainage was performed, nor massages and/or any other type of manual technique.

After completing the 10 postoperative physiotherapy sessions, a monthly follow-up was carried out for 2 months, in order to analyze the evolution and/or "regression" of fat grafted area. It is worth to mention that after this period, fat could suffer weight gain or loss as well as any other area of body fat. It was not identified any clinical complications or complications during the entire postoperative period. More, no absorption of fat graft was observed, thus maintaining the symmetrical shape achieved by the surgery (Figure 3).

The patient was followed up and was discharged 6 months after the surgery. It was proved that there was no significant loss of fat grafted volume and the aesthetic appearance obtained through Ozonized Fat Grafting remained extremely satisfactory

.

Figure 3. Case 1: A) Detail from donor area (flanks, abdomen e back) before and after surgery; B) Two month after fat grafting of ozonated buttocks; it was observed that there was maintenance of aesthetic volume obtained in the surgery, having as justification the absence of graft loss by resorption.

Caso 2:

Patient BH, 28 years old, white, married, student, born in the state of Minas Gerais (Brazil). She reported lack of contour and asymmetry in the gluteal region intensified after the second and last pregnancy which happened 8 months before surgery.

She underwent gluteal remodeling treatment through Ozonized Lipografting with autologous fat transplantation, and to that, fat harvest was made in the regions of the breeches, abdomen and flanks through liposuction. To obtain adipose tissue, the procedure adopted followed the same methodology described in Case 1, previously reported.

After the decantation process and harvested fat be stored in the sterile urine collector, the ozonation of the fat mash was started (Figure 1). In this case, it was used the ratio of 8 syringes of 60 mL of fat gruel to 5 syringes of 60 mL of concentrated ozone at 10 micrograms mL^{-1}. Once again, it was possible to notice that fat changed its color after ozonation, what caught the attention of everyone in the surgical

center as it was noticeable that the fat was more alive (Figure 2).

Grafting was done in multilayer sticks, partially intramuscular and subcutaneous, in the proportion of 25% and 75%, respectively.

After the surgery was completed, it was proceeded with the placement of the medium compression surgical belt respecting the anatomical curves and those obtained by the fat graft. Its continuous use was recommended for 30 days, and after this period the patient wore the girdle only at night for other 15 days. The prone position was adopted to sleep and/or lie down for 30 days, avoiding lying on the side and/or sitting still for 30 days else.

Five days after the surgery, the postoperative dermatofunctional physiotherapy treatment was started, preserving the area where the grafting was performed without any type of manipulation. Evaluating the grafted region before the physiotherapeutic treatment showed a slight heat and local redness in a symmetrical way, which lasted for a period of 2 days and the patient reported mild pain on palpation for a period of 6 days.

Weekly physiotherapy sessions were held for 8 weeks, where ILIB laser (for 20 minutes) and low-power laser were applied directly to the site throughout the fat grafted area, similarly to what was reported in Case 1. Also, applications of rectal ozone were also performed using a concentration of 20 micrograms/mL and a volume of 180 mL in the first 2 weeks after surgery. In addition, in all sessions auricular ozone was applied with a volume of 180 mL and a concentration of 10 micrograms mL^{-1} of ozone.

During the 30 days after the medical procedure, the buttock was not manipulated, no lymphatic drainage technique, neither massage nor mechanical manipulation was performed, respecting the graft accommodation time. Over a period of 2 months, that patient's evolution was closely followed, even after the end of the postoperative physiotherapy. It was observed that the fat graft was maintained without major losses (Figure 4) besides having no clinical complications or postoperative complications.

Therefore, patient was followed up and discharged 6 months after the surgery, and was attested that there was no significant loss of fat grafted volume and the aesthetic appearance obtained through Ozonized Fat Grafting remained extremely satisfying

.

Figure 4. Case 2: A) Before surgery. Note the donor areas, such as flanks and breeches; B) Two months after ozonized buttock fat grafting; it was observed that there was maintenance of the format and volume obtained after the fat graft, without major losses.

Case 3:

Patient ASBM, 30 years old, white, married, without children, dentist, born in the state of São Paulo (Brazil), sedentary and complaining of lack of body contour, predominantly in the gluteal region, besides localized fat on the flanks, abdomen and breeches (which ones served as the donor area). She also reported that, due to her work as a dentist, she

spent many hours sitting, which is believed to be one of the reasons that interfered with the worsening of the gluteal contour over time.

To harvest adipose tissue, the procedure adopted followed the same methodology described in Case 1. After removing the material from the donor areas, it was decanted, passed through the filtering process in a sieve, and after that it was placed in the sterile urine collector where we performed the ozonation of fat gruel, and then it was grafted in the buttocks. In this case, we use the ratio of 12 syringes of 50 mL of fat gruel to 6 syringes of 50 mL of concentrated ozone at 10 micrograms mL^{-1}. However, only 250 mL of each buttock was grafted. Elastic bandages (Taping) were placed on the flanks, abdomen, breeches (donors) and infragluteal areas, even though, bandages were not placed on the fat grafted buttock.

After surgery has been done, a medium compression girdle was placed in the operating room, and patient was instructed of not removing that for 2 days, waiting for the first post-operative dermatofunctional physiotherapy appointment to properly remove it. She was also advised to keep the continuous use of girdle for 30 days, and ending that period use it only at night, for other 30 days.

The first session of postoperative dermatofunctional physiotherapy was started 48 hours after surgery and taping was not removed in this first visit. Patient was treated with the ILIB laser (as described in Case 1) for 20 minutes and auricular ozone using a volume of 180 mL with a concentration of 10 micrograms mL^{-1}, tissue mobilization (except in the grafted area) and breathing exercises. On that day, a slight redness and heat were realized in the gluteal region, and also there was a report of pain on palpation. It was still possible to notice a slight darkening of the fat grafted area without signs of bruising.

On the fifth postoperative day, the elastic bandages (Tapings) were removed, and the fat grafted region had no signs of redness or heat, as well as there were no more reports of pain from patient.

During 7 treatment sessions, weekly scheduled, the treatments of manual lymphatic drainage (except in the gluteal region), application of ILIB laser and low power laser in the entire fat grafted area were maintained in a similar way as well as auricular ozone to that reported in Case 1.

After 40 postoperative days, patient was released for moderate physical activity. And for 3 months continuously after surgery, it was noticed that there was graft maintenance without loss (Figure 5). During the entire immediate postoperative period, was not reported any clinical complications or postoperative complications.

Patient was followed up and discharged 6 months after the surgery, and was attested that there was no significant loss of fat grafted volume and the aesthetic appearance achieved through Ozonized Fat Grafting remained highly satisfactory.

Figure 5. Case 3: A) Improvement of the aesthetic aspect of the donor area (flanks, abdomen and breeches) before and after surgery; B) 40 days after Ozonized Fat Grafting of the buttocks; the maintenance of aesthetic volume obtained in the surgery is observed, justified by the absence of reabsorption of the fat grafted.

Results and Discussion:

As it is described in all cases reported in this work, ozonized fat grafting is an innovative surgical procedure that must be carefully evaluated to find out what the real indication is and which would be the possible results expected from the application of this technique.

Postoperative reactions expected in classic fat grafting without ozonetherapy usually includes slight and temporary pain, especially in the first 48 hours. It commonly includes swelling, numbness and bruising in the donor and recipient areas, which usually last a few weeks [11]. There are also reports of asymmetry, chronic pain, superficial epidermolysis blisters [12], seroma collection and fat embolism [13].

In the cases previously reported, postoperative period of Ozonated Liposuction did not show the most serious sequelae reported in the literature for this kind of surgery, and showed smaller proportions with regard to edema, erythema and local pain, mainly when compared to the traditional fat grafting technique.

The main disadvantage and major concern about the traditional fat grafting technique is the unpredictable reabsorption of the grafted adipose tissue [11]. Also, and the occurrence of contour irregularities usually due to fat necrosis [13] which can happen depending on the technique used and the practice of the plastic surgeon, but in these three cases of Ozonized Fat Grafting reported in this work, such sequelae did not exist. So, it was verified that there was a significant gain in aesthetic volume, what may be seen through the photographic record of before and after (Figures 3 to 5). Yet, after general medical discharge (6 months after surgery) it was identified that loss of volume was insignificant, and consequently did not compromise the aesthetic appearance obtained with ozonized fat grafting

A good therapeutic response after a fat grafting surgical procedure may possibly be justified due to by using ozone, and it seems to be supported in the reports of Cisterna et al [10] who exposed adipocytes explanted from rats to ozone (*in vitro*) and identified that the use of 10 micrograms/mL of concentration preserved physical integrity of adipocytes after 2 hours, 24 hours and 48 hours of exposure to the gas. Thus, in all cases reporter in this work, authors acknowledge the possibility that using ozone had a beneficial influence on the good evolution of postoperative condition and still on keeping the aesthetic result obtained from surgical procedure.

Ozonized Lipografting used in these three cases justifies itself because some authors have already also reported about other supporting techniques to minimize the effects of fat reabsorption in traditional fat grafting, such as the use of platelet-rich plasma [14] and the use of stem cells derived from of adipose tissue [11].

It is believed that postoperative dermatofunctional physiotherapeutic treatment also contributed to the success of fat grafting using ozone. Using ILIB laser in the postoperative period is supported by its antioxidant [15], anti-inflammatory [16, 17], anticoagulant [18] and circulatory stimulant effect [19]. In addition to this type of systemic laser, it was used a low-power laser directly at the fat grafting site too, as according to some authors [20] this type of laser therapy has proven to be effective in healing the surgical wound through photobiomodulation of the healing process.

The use of functional elastic bandages (“Taping”) in the postoperative period was indicated by Meyer et al [21] aiming to improve local circulation, facilitate the absorption of edema and hematoma, hence reducing local pressure and, consequently, pain. In the cases studied here, the bandages were used to aid in the recovery of the donor areas only, once it was sought to avoid excessive manipulation of fat grafted area.

Besides used in transoperative period, ozone was also applied for the postoperative recovery of the three patients, through two ozonetherapy modalities: ear insufflation (in the three cases) and rectal insufflation (used only in Case 2). Although ear insufflation has not widely been spread in the

literature, it has been described by some authors as being responsible for several beneficial effects in various conditions, ranging from brain disorders to Covid-19 sequelae [22-24]. By the other side, rectal insufflation is widely described in the literature as an important resource for the treatment of several postoperative conditions [9, 25, 26].

According to Borges et al. [9], ozonetherapy used in the postoperative period of plastic surgery, generally aims to treat surgical dehiscence, residual bruise/ecchymosis, delayed tissue repair in scars, post-liposuction residual fat or flaccidity, postoperative infection, etc. This justifies the choice of postoperative ozonetherapy in the three cases described here.

Conclusion:

It is known that still have a lot to evolve in studies with ozonetherapy in plastic surgery, but according to the cases reported in this work, it was found satisfactory results with regard to the safe ozone utilization in the transoperative period of autologous fat grafting.

Despite the small number of studied cases, but having no intercurrence and/or serious adverse effect with the use of ozone in the transoperative period of autologous gluteal fat grafting, along with the finding of very satisfactory results in the patients' recovery and in obtaining excellent results aesthetic. It is clear to conclude that ozone can constitute an excellent adjunctive in contributing for a safe and efficient fat grafting postoperative evolution with regard to obtaining and maintaining the intended results with the surgical procedure. Additionally, the use of the terminology Ozonized Lipografting is suitable and comes with support and security, as according to Cisterna et al. [10] ozone is able to preserve fat grafted adipocytes integrity in a surgical procedure, and this is hypothesized as a possible factor in decreasing grafted fat reabsorption of.

It is also highlighted the importance of dermatofunctional physiotherapeutic treatment as a great player in the entire recovery process after ozonized fat grafting surgery, or even traditional surgery.

Finally, the authors suggest new studies using a larger sample in order to ratify the results described in these cases and further support the use of ozonetherapy in the various stages of a plastic surgery procedure.

Conflict of interest

The authors declare there are no conflicts of interest in publishing this article.

References:

[1] Neuber, F. (1893) Fettransplantation. Chir Kongr Verhandl Dtsch Ges Chir 22:66.

[2] Illouz, Y.G. (1986) The fat cell ‘‘graft’’: a new technique to fill depressions. Plast Reconstr Surg 78:122–123. http://dx.doi.org/10.1097/00006534-198607000-00028

[3] American Society of Plastic Surgeons. (2020) Plastic Surgery Statistics Report 2020. https://www.plasticsurgery.org/documents/News/Statistics/2020/plastic-surgery-statistics-full-report-2020.pdf. Accessed Dec 21.

[4] O'Neill, R.C. et al. (2021) Safety Considerations of Fat Grafting in Buttock Augmentation. Aesthetic Surgery Journal, Vol 41(S1) S25–S30. https://doi.org/10.1093/asj/sjab092

[5] O'Neill, R.C. et al. (2020) The role of fat grafting in buttock augmentation. Semin Plast Surg.;34(1):38-46. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7023974/

[6] Elvis, A.M. and Ekta, J.S. (2011) Ozone Therapy: A Review. Journal of Natural Science Biology and Medicine, 2, 66-71. https://doi.org/10.4103/0976-9668.82319

[7] Wentworth, P. (2003) Evidence for Antibody-Catalyzed Ozone Formation in Bacterial Killing and Inflammation. Science, 298, 2195-2199. https://doi.org/10.1126/science.1077642

[8] Babior, B. et al. (2003) Investigating Antibody-Catalyzed Ozone Generation by Human Neutrophils. Proceedings of the National Academy of Sciences of United States of America, 100, 3031-3034. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC152239/

[9] Borges, F.S. et al. (2021) Fundamentals of the Use of Ozone Therapy in the Treatment of Aesthetic Disorders: A Review. Journal of Biosciences and Medicines, 9, 40-70. doi: 10.4236/jbm.2021.912005. https://www.scirp.org/journal/paperinformation.aspx?paperid=113644

[10] Cisterna, B. et al. (2020) Ozone Activates the Nrf2 Pathway and Improves Preservation of Explanted Adipose Tissue In Vitro. Antioxidants, 9, 989. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7602229/

[11] Toledo LS. (2015) Gluteal Augmentation with Fat Grafting - The Brazilian Buttock Technique: 30 Years' Experience. Clin Plastic Surg 42 253–261. http://dx.doi.org/10.1016/j.cps.2014.12.004

[12] Vendramin, F.S. et al. (2022) Gluteoplasty with fat grafting: experience in 137 patients. Rev. Bras. Cir. Plast. 37(2):169-176. http://www.dx.doi.org/10.5935/2177-1235.2022RBCP0028

[13] Condé-Green A et al. (2016) Fat Grafting for Gluteal Augmentation: A Systematic Review of the Literature and Meta- Analysis. Plast Reconstr Surg.138(3):437e-46e. DOI: https://doi.org/10.1097/prs.0000000000002435.

[14] Willemsen JC, Lindenblatt N, Stevens HP. (2013) Results and longterm patient satisfaction after gluteal augmentation with platelet-rich plasma-enriched autologous fat. Eur J Plast Surg.36:777–782. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3827835/

[15] Tomé RFF et al. (2020) ILIB (intravascular laser irradiation of blood) as an adjuvant therapy in the treatment of patients with chronic systemic diseases—an integrative literature review. Lasers in Medical Science, https://doi.org/10.1007/s10103-020-03100-4

[16] Derkacz A, et al. (2013) Effect of the intravascular low energy laser illumination during percutaneous coronary intervention on the inflammatory process in vascular wall. Lasers Med Sci 28(3):763–768. https://doi.org/10.1007/s10103-012-1142-z

[17] Chiran DA, et al. (2013) Intravenous laser blood irradiation increases efficacy of etanercept in selected subtypes of juvenile idiopathic arthritis: an innovative clinical research approach. Evid Based Complement Alternat Med 2013:168134. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3749593/

[18] Kazemi Khoo, N. et al. (2013) A metabolomic study on the effect of intravascular laser blood irradiation on type 2 diabetic patients. Lasers in Medical Science.28(6): 1527–1532. https://doi.org/10.1007/s10103-012-1247-4

[19] Yang WH, et al. (2017) Case report: rapid improvement of crossed cerebellar diaschisis after intravascular laser irradiation of blood in a case of stroke. Medicine (Baltimore) 96(2): e5646. https://doi.org/10.1097/MD.0000000000005646.

[20] Khan, I., Rahman, S.U., Tang, E. et al. (2021) Accelerated burn wound healing with photobiomodulation therapy involves activation of endogenous latent TGF-β1. Sci Rep 11, 13371. https://doi.org/10.1038/s41598-021-92650-w

[21] Meyer PF, Cavalvanti RL, Serrano NA. (2018) Aplicações das Bandagens Elásticas Funcionais nas principais disfunções estéticas da pele. In Lemos TV & Santos GP. Raciocínio Clínico em Bandagens Terapêuticas. São Paulo: Andreoli.

[22] Buch R. Ozone therapy in multiple disabled children [abstract]. Proceedings of the 5Th WFOT Meeting; 2016 Nov 18-20; Mumbai, India. J Ozone Ther. 2018;2(2). doi: 10.7203/jo3t.2.2.2018.11151. https://ojs.uv.es/index.php/JO3T/article/view/11151/pdf_1

[23] Shallenberger, F. (2017) The Ozone Miracle: How You Can Harness the Power of Oxygen to Keep You and Your Family Healthy. CreateSpace Independent Publishing Platform, Scotts Valley, CA.

[24] Dotta Barros, F. C.; Iwasa, S. (2021) Persistent anosmia after COVID-19 Infection: Treatment options according to BDORT. *Acupuncture and Electro-Therapeutics*

Research ; 46(1):33-34, 2021. https://doi.org/10.3727/036012921X16128784949502

[25] Sahin, H., Simsek, T., Turkon, H., Kalkan, Y., Ozkul, F., Ozkan, M. T. A., … Demiraran, Y. (2016). The acute effects of preoperative ozone theraphy on surgical wound healing. Acta Cir. Bras., 31(7), 472–478. https://doi.org/10.1590/S0102-865020160070000007

[26] Delgado-Roche, L., et al. (2017) Medical Ozone Promotes Nrf2 Phosphorylation Reducing Oxidative Stress and Pro-Inflammatory Cytokines in Multiple Sclerosis Patients. European Journal of Pharmacology, 811, 148-154. https://doi.org/10.1016/j.ejphar.2017.06.017.