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RESEARCH ARTICLE

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PAIN MANAGEMENT IN MINIMALLY INVASIVE FACIAL COSMETIC PROCEDURES

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ABSTRACT

Orofacial Harmonization is a specialty that includes procedures who seek to set the balance of the facial thirds, correct asymmetries and disproportions, treat facial aging dysfunctions by repositioning soft tissues, and ameliorate the skin condition through collagen stimulation. However, the mentioned treatments often occur through injections, perforations or other interventions that may cause acute pain and can postpone or avoid the search for such procedures. This study aims to highlight the analgesic methods listed in the scientific literature and discuss the management of intraoperative pain in minimally invasive facial cosmetic procedures. A bibliographic search was performed on electronic scientific databases using the keywords related to the subject. The most frequent methods of pain control were topic anesthetic creams, vibratory stimulation, ice application and infiltrative local anesthesia. An adequate analgesic technique will depend on which is the area of the intervention, the type of procedure, and it is essential to consider the particularities of each patient, once there are no established protocols or guidelines for a perfect intraoperative pain control in cosmetic interventions. The professional injector must embrace multiple anesthetic techniques simultaneously in order to offer a greater comfort to the patient during the treatment, aiming to provide a humanized care.

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INTRODUCTION

Orofacial Harmonization is a new specialty in Brazilian dentistry that comprises procedures who seek to establish the balance of the facial thirds, correct disproportions and asymmetries treat facial aging dysfunctions by repositioning soft tissues, as well as ameliorating the skin condition through collagen stimulation therapies. That said, whenever working in this field, the dentist is capable of promoting aesthetic improvements in individuals with dentofacial deformities, resulting in magnificent gains in self-esteem, bringing positive impacts in one's life quality, wellness and mental health (Pedron, 2019; Cruz *et al.* 2021). The most commonly performed minimally invasive cosmetic interventions worldwide are applications of Botulinum Toxin A, facial filling with injectable hyaluronic acid fillers, insertion of polydioxanone (PDO) threads, injections of collagen biostimulators, in addition to other collagen induction therapies like microneedling, mesotherapy and lasers (Pedron, 2019; Garbin *et al.* 2019). However, considering that many of the mentioned interventions just happen through injections, perforations or incisions, the fear of feeling any kind of pain is still a barrier that prevents someone to adhere to such procedures. Circumstance that can also bring acute anxiety to patients that, overcoming their initial fear, decide to submit themselves to the referred treatments, a situation that can possibly favor unsatisfactory aesthetic results

(Vasconcellos and Bortoli, 2018; Brackenbury, 2019; Wang *et al.*, 2019). In view of the above, this study aims to highlight the local analgesic methods for minimally invasive facial cosmetic procedures listed in the scientific literature and, especially, discuss the management of intraoperative pain during the mentioned aesthetic interventions.

MATERIALS AND METHODS

An intense search for scientific publications in Portuguese and English languages was performed at the following online databases: *PubMed*, *Medline*, *BVS*, *Scielo* e *GoogleScholar*, using the keywords related to the present subject: orofacial harmonization, pain, pain control, analgesia, local anesthesia, intraoperative, topic anesthesia, facial aesthetics, cosmetic injections, aesthetic procedures.

RESULTS

In view of that, 35 studies and scientific papers related to the subject were selected, the majority in English language, as it was noticed very few studies in Portuguese. The most cited methods of pain control in minimally invasive facial cosmetic procedures were topical anesthesia (creams containing anesthetic agents), the use of vibratory devices,

ice application (crioanesthesia) and infiltrative local anesthesia. These findings corroborate with the ones brought by Fallahi *et al.* (2019) in a review study where the same methods were the most commonly mentioned.

DISCUSSION

The amount of minimally invasive facial aesthetic procedures keeps increasing every year all over the world, being the application of Botulinum Toxin A type (BTXA) the most performed, followed by the soft tissue filling with injectable hyaluronic acid (Zeiderman *et al.*, 2018; Goodman *et al.*, 2020). However, one's fear of suffering several injections, perforations and other interventions that can cause painful sensations is something that can avoid the search for such practices (Brackenbury, 2019; Wang *et al.*, 2019). The actions destined to maximize the patient's comfort are important in every kind of treatment. Although, it becomes a defying situation when it comes to minimally invasive aesthetic procedures, because there are limitations regarding the anesthetic possibilities. In addition, it is necessary to consider the pain threshold that varies in each individual for several factors, since physiologic reasons (menstrual period, for example) or even emotional particularities (pre-operative anxiety, phobias or high-stress syndrome) (Guney *et al.*, 2017; Wang *et al.*, 2019; Goodman *et al.*, 2020). The BTXA applications aim to lighten facial wrinkles, especially in the upper third, which comprehends the frontal, glabellar and periorbital areas. Its effect occurs through neuromuscular control, minimizing the muscular contraction what ends up smoothing the skin. However, for such a procedure to take place it is necessary to perform multiple injections in the treatment zones, causing considerable discomfort, particularly in patients with low pain threshold (Zeiderman *et al.*, 2018; Chorney *et al.*, 2019; Goodman *et al.*, 2020).

In a recent publication, Akdogan (2020) reported an incident in which a patient suffered from an extreme hyperalgesia during injections of BTXA for aesthetic purposes, condition that happened one week after her recovery from a symptomatic case of Covid-19. The mentioned patient was very used to cosmetic injections, being constantly submitted to BTXA applications and reporting little discomforts of intensity 3, according to the Visual Analog Pain Scale, whose levels vary from 0 to 10. However, in this last episode, the patient informed having felt a 10-intensity kind of pain, refusing to continue with the procedure, even after local ice applications in order to make some sort of analgesia. The aforementioned event must have been related to the fact that Covid-19 can cause conditions that comprehend chronic pain, myalgia and hyperalgesia, enlarging the discomfort during injectable treatments. Thus, even with the absence of a scientific consensus, it is highly suggested that the patient, in similar cases, should wait at least one month after the recovery of Covid-19 to go through aesthetic procedures (Akdogan, 2020). Nociceptors or pain receptors are free nerve endings very prevalent in superficial layers of the skin, making an individual experience an acute pain sensation when it is trespassed by a needle. A possible strategy to manage this situation consists in the thermic analgesia using ice (crioanesthesia). This practice is based in the fact that the ice contacting the skin avoids the perception of pain because of its effect on nociceptors, decreasing the nerve impulse conduction time and the synaptic activity of peripheral nerves (Monteiro *et al.*, 2012; Taghizadeh *et al.*, 2011). The use of ice cubes for crioanesthesia is quite popular in the aesthetic intervention field, as observed in a study where the main subjects were professionals and 75% of them adopted this method during minimally invasive facial cosmetic procedures. Applying ice for 20 seconds on the skin is the most effective contacting time for a good analgesia, but should not be extended any longer in order to avoid ice burns (Dixit *et al.*, 2013). It is necessary to stress that concerns about biosecurity must occur once that ice cubes are not sterile, but such difficulty can be softened by inserting the ice cubes in sterile surgical gloves or using, instead, a suitable cooling device that could be properly disinfected (Goodman *et al.*, 2020). Nestor *et al.* (2010), in a research about the crioanesthesia efficacy in individuals submitted to nasolabial folds filling with injectable hyaluronic acid, observed the decreasing of

painful sensations all along the injections in the facial side where the ice was applied. In contrast, in a study that counted with 22 participants and aimed to compare the efficacy between the vibratory method, ice applications and no other pain control intervention during glabellar injections, it was noticed that there was no statistical significance in the pain intensity felt by the patients during the procedure (Chorney *et al.*, 2019). Here is why it is so difficult to reach a consensus about which is the best pain control method for facial aesthetic injections, reason why the professional should associate different anesthetic techniques to maximize the patient's comfort (Fallahi *et al.*, 2020). In a study with 50 patients, Sharma *et al.* (2011) analyzed the efficacy of the vibratory induced analgesia during BTXA injections. All the individuals submitted to the treatment had the vibratory device applied in one side of their faces (split-face model). Finally, it was possible to notice that 43 (86%) of the patients would like to use a vibratory device once again in future injectable procedures, since they reported a pain relief and less discomfort in the side of the face where the device was applied.

Similar findings were obtained in another study with 53 Chinese patients that received BTXA injections simultaneously with vibratory stimulation in one side of the face. The individuals referred less pain in the half of the face where the vibratory device was applied and 75% of them informed that would prefer to use it again in future injectable procedures (Li *et al.*, 2017). Equally, in a study conducted by Kuwahara e Ogawa (2016), 28 of the 32 patients also reported feeling less pain whenever using vibratory devices in the facial side where they received BTXA and hyaluronic acid filler injections. The gate control theory of pain was described by Melzack and Wall in 1965 and explains the effectiveness of the vibratory-induced analgesia. It affirms that the vibratory stimulation is capable of inhibit certain types of neurons, consequently causing the closure of the neuronal gate that allows the passing of the painful stimulus (Kuwahara and Ogawa, 2016; Guney *et al.*, 2017; Ghorbanzadeh *et al.*, 2019). This same principle explains why other sorts of mechanic stimulus like pinching, pressing or stretching the skin next to the injection site can effectively block the cerebral perception of pain (Chorney *et al.*, 2019).

In a prospective study destined to investigate the efficacy of the vibratory stimulation in 41 patients that went through different types of filling interventions with hyaluronic acid in the middle third of the face, only excluding the lips, it was observed that 95% of the participants preferred using the vibratory device instead of using nothing (Mally *et al.*, 2014). Likely, in a study about the effectiveness of vibratory stimulus in lip filling procedures using injectable hyaluronic acid containing lidocaine in the formula, patients went through topic anesthesia with EMLA cream 15 minutes before the intervention, which was performed along with the application of a vibratory device in only one side of the lips. From 25 individuals involved in this research, 23 informed having felt less discomfort in the lip side where the vibratory stimulation took place (Guney, 2017). Therefore, the vibratory anesthesia has been established as an effective practice in order to increase the tolerance to painful sensations in patients submitted to cosmetic injections for its safety, cheapness and easy handling, being also recommended during local anesthetic injections and other minimally invasive aesthetic procedures. Furthermore, since the vibration does not induce a complete analgesia, it can be administered along with other techniques such as local application of ice or topical anesthetic creams (Westerbeck, 2020; Fallahi *et al.*, 2020). In this sense, the single use of a vibratory stimulation can be insufficient to maximize the patient's comfort during lip filling procedures because it is a much sensible facial area. So, the execution of nerve blocks before the injection of lip fillers is a frequent and adequate practice. However, it is necessary at least 4 perforations and infiltrations for an effective analgesia intending to reach the mental and infraorbital nerves. It is also required to consider that the patient becomes unable to perform activities related to speaking and eating for leastwise a couple of hours after the infiltrative anesthesia (Guney *et al.*, 2017). The infiltrative anesthesia before minimally invasive cosmetic procedures occurs when the anesthetic agent is injected right in the aesthetic

intervention's site, causing analgesia through desensitization of local nerve fibers. Also, it is the most painful type of anesthetic technique since the tissue is perforated by a needle, so it is suggested a slower injection speed, using needles thinner than 30G and adopting other anesthetic methods like crioaesthesia and vibratory induction. Another factor of consideration from this kind of anesthesia is a possible distortion in the operatory site as a result of the tissue expansion caused by the volume of anesthetic substance injected, situation that can be minimized by smoothly massaging the area right after the infiltration. This sort of technique is adopted before the injection of facial fillers, especially when they occur through cannulas, which are less traumatic than needles to the tissues. Thereby, an anesthetic butt can be often performed in the perforation through which the cannula will pass. Likewise, it is an anesthetic technique commonly adopted for the insertion of facial PDO threads (Niteen, 2012; Zeiderman *et al.*, 2018; Vasconcellos and Bortoli, 2018). Seeking to compare the impact of two different anesthetic techniques in the comfort of 48 patients submitted to facial filler injections with hyaluronic acid in lips and nasolabial folds, using the split face model. Half of the face was prepared with infiltrative nerve blocks, reaching the mental and infraorbital nerves, and the other half was just arranged with a topical anesthetic cream. Finally, it was revealed that 77% of the patients reported feeling less pain in the side of the face where the nerve blocks took place (Diepenbrock *et al.*, 2017).

Lidocaine (2%) with adrenaline, mepivacaine (2%) with epinephrine, and mepivacaine (3%) without vasoconstrictor are the most popularly used anesthetic substances in local infiltrative anesthesia for minimally invasive cosmetic procedures. The using of local anesthetics with vasoconstrictors, in spite of showing a much longer action time, are not so adequate for extra-oral infiltrative anesthesia, because the presence of a vasoconstrictor agent can cause ischemia in the area to be treated, confusing the operator and favoring adverse events. So, the use of anesthetic substances without vasoconstrictors is a more suitable option in such case. The nerve blocks, on the other hand, consist in the injection of the anesthetic solution in an specific point, close to the main nerve, in order to provide the desensitization of the operatory site. In other words, the injection is not applied directly in the area where the cosmetic procedure will occur. This mentioned kind of anesthesia is good for interventions in the central zone of the face, because it is an area where the local infiltrative anesthesia is well known for being more painful (Smith *et al.*, 2008; Niteen, 2012; Vasconcellos and Bortoli, 2018). Moreover, the professional injector needs to be aware that the infiltrative anesthetic methods are the most invasive and prone to cause complications such as edema, allergic reactions, hematomas, nerve lacerations, or even more serious systemic alterations that must be quickly recognized and treated (Smith *et al.*, 2008; Mysore and Nischai, 2009; Niteen, 2012). It is worth highlighting that the existence of lidocaine in the fillers' formulations has shown itself as effective increasing the patient's tolerance to pain during the procedure without negatively interfering in the results of the treatment. It is speculated that the time of the procedure is significantly reduced since that it is not necessary to wait much longer for the effects of the topic anesthetic creams and the infiltrative nerve blocks, which can extend the patient's stay in the clinic (Levy *et al.*, 2009; Rohrich and Herbig, 2009). A Korean study that aimed to investigate the efficacy of injectable hyaluronic acid containing lidocaine in its formulation in the pain control of 62 patients submitted to nasolabial folds filling, revealed that 92.5% of the individuals reported less pain using the filler formulated with lidocaine when compared to using the same filler without lidocaine. It is valuable to stress that the presence of lidocaine did not affect the safety or the effectivity of the treatment (Choi *et al.*, 2020). The application of creams containing topic anesthetic agents is one of the most popular methods of pain control during the insertion of needles, also being useful in laser treatments for facial rejuvenation. Meantime, the mentioned method can lead to complications or adverse effects depending on the volume of anesthetic agent administered and absorbed by the body, as well as the toxicity of the ingredients in its formula, what can cause hypersensitivity, systemic toxicity and even culminate in death.

Applying the anesthetic cream about 30 to 60 minutes before the cosmetic intervention is necessary, in addition to the occlusion of the area with plastic or a similar material. For that, creams containing lidocaine in their formulas have been noticed for being sufficiently effective, rarely promoting adverse effects as well (Sobanko *et al.*, 2012; Oni *et al.*, 2013; Ghorbanzadeh *et al.*, 2019). Besides, evaluating the efficacy and safety of an anesthetic cream containing lidocaine (7%) and tetracaine (7%) for topic analgesia during facial filling procedures using injectable hyaluronic acid in 70 patients, it was possible to observe that the cream, applied 30 minutes before the intervention, was capable of reducing the discomfort during the injections and no adversities related to its use were reported (Cohen and Gold, 2014; Buhsem *et al.*, 2016). Another factor that can help increasing the patient's comfort in the course of cosmetic procedures, besides the competence of the operator, obviously, consists in the correct selection of the used materials and instruments. A special attention with choosing the thinner and smaller needles is mandatory. Likely, those needles should be changed if it is necessary to make multiple punctures; in order to keep the active needle always sharp, resulting in a more precise and less painful injection (Smith *et al.*, 2007; Segzin *et al.*, 2014).

Linked to the painful sensation caused by the needles and other piercing-cutting materials required to the execution of minimally invasive cosmetic procedures, there is also the patient's anxiety, which can contribute to the decrease of his pain threshold making the treatment more difficult and even impracticable. Because of that, it is important for the professional to have enough resourcefulness trying to reduce that patient's anxiety, attempting to explain every stage of the treatment, clearing doubts about the intervention, performing guided breathing or other relaxation techniques such as having distractive conversations during the procedure. Equally, it is indispensable for the operator to recognize and master all the possible anesthetic techniques, always considering the needs and particularities of each patient; Adopting, for example, the application of local anesthetic creams before the injection of infiltrative anesthesia, as well as simultaneously using devices for vibratory stimulation or ice applications in the areas to be treated (Weiss and Lavin, 2009; Smith *et al.*, 2008; Sobanko *et al.*, 2012).

CONCLUSIONS

As it was possible to verify, the type of anesthesia to be chosen will depend on the facial zone where the aesthetic intervention will occur, as well as the kind of procedure to be executed. Beyond that, the professional should consider the needs and particularities of each patient, since there are no established guidelines or protocols for a perfect pain control in minimally invasive cosmetic procedures. Thus, it is suggested that more studies should be conducted in order to investigate new techniques of local analgesia. The professional working in orofacial harmonization must know, master, and perform multiple anesthetic methods so as to bring the maximum comfort to every patient, always seeking for a humanized care, being aware that the goal of orofacial harmonization is not to treat a face, from a merely anatomical perspective, but a Face as the most sacred vehicle of our emotions, through which the human soul is revealed.

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