mandibular nerve is various dependent on age, gender, and so on, which increases the risk of complication.[2] Cone-beam computed tomography may be an accurate technique to recognize the anatomical details of the mandibular nerve. Secondly, anesthesia drugs may induce hypersensitivity and toxicity due to individual factors. Vasoconstrictor, such as epinephrine, can prolong the effective time of IANB and decrease the bleeding.[3] But it is forbidden for patients with arrhythmia, hypertension, and hyperthyroidism. Thus, medical history inquiry and skin test are vital before surgery. Thirdly, clinical experience plays an important role to achieve a successful blockade. Senior doctors are more familiar with anatomical variations and able to handle accidents. What's more, the anxiety and nervousness of patients contribute to the occurrence of complications. Doctors should explain the process to patients and give patients spiritual comfort.

Here, we reported a relatively rare complication of IANB. After injection, the suborbital and midface became pale. The patient had higher blood pressure and palpitations. No pain, paresthesia, or ocular complications were concomitant. The symptom disappeared some minutes later without any sequela. The phenomenon is known as Kuhn anemia. It can occur after block anesthesia of infraorbital foramen, maxillary tubercle, palatine foramen magnum, and nasopalatine foramen.[4] Both the effect of vasoconstrictor and the stimulation of the needle may cause vasospasm, resulting in facial and mucosa ischemia. However, the complication is seldom seen after IANB. We searched the Web of Science database from 2000 to 2021. These keywords were combined: (1) IANB or mandibular nerve block and (2) complication. Ten literature were included as shown in Supplementary Digital Content, Table 1, http://links.lww.com/SCS/D674.[1–10] There were 13 cases in all. Nine patients showed other symptoms, such as numbness, diplopia, and so on besides ischemia. One reason for Kuhn anemia during IANB is the inaccurate injection site and then intravascular injection into the maxillary artery. It may be attributed to the lack of experience of doctors. Aspiration before administration is significant. Another explanation is anatomical variation. It is also possible that the position of administration changes during the process due to the nervousness of patients. Moreover, the anesthetic agent may diffuse from the mandibular nerve to the branches of the maxillary artery.

CONCLUSIONS

The clinical doctors should recognize the possibility of Kuhn anemia during IANB. Though complications cannot be completely avoided, doctors need to do their best to take preventive measures.

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Oculofacial Prosthetic Rehabilitation Complemented With Temporary Fillers and Neurotoxin

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Abstract: Surgical treatment of head and neck cancer causes severe tissue loss, therefore, deformities and psychosocial consequences. In cases involving orbit exenteration, satisfactory reconstruction can only be achieved with prosthetic replacement, despite successful reconstructive plastic surgery. Extraoral implants, 3D scanning, and prototyping technologies have contributed to increase satisfactory aesthetic results of oculofacial prosthesis. However, to achieve prosthetic rehabilitation refinement, patients' biological tissues have been treated with injectable cosmetic adjuncts methods as complements to results. This study aimed to describe the use of botulinum toxin type A, hyaluronic acid, and calcium hydroxyapatite previously to oculofacial prostheses manufacturing, in 5 oncologic patients of a rehabilitation unit. Outcomes produced by additional cosmetic methods on tissues, prostheses planning, and overall facial rehabilitation were observed and registered by photographs. Botulinum toxin type A, hyaluronic acid, and calcium hydroxyapatite has shown to be

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useful in improving asymmetries, volumizing surgical depressions and dissembling atrophic scars. Presenting an additional resource to improve overall results, enabling the manufacturing of smaller, thinner, and better-fitting oculofacial prostheses. Limitations as chronic infection and necrosis episodes, related to filler injection into previously irradiated sites, were described. The temporary effect of the materials used generates a need for reapplications but increases the safety of such procedures and enables patients' cancer treatment follow-up.

Key Words: Botulinum toxin, calcium hydroxyapatite, cancer, hyaluronic acid, oculofacial prosthesis, oncologic

Head and neck cancer surgeries often lead to severe facial deformities and disfigurements due to the removal of large amounts of oral and facial structures.[1–4] In addition to the mutilated area itself, oculofacial resection may affect the entire face due to areas of volumetric deficiency, contour defects, irregularities, scars, asymmetries, and muscle disorders.[3–5] Despite recent advances, plastic surgical techniques present limitations, mostly when it comes to reconstructing major facial deformities including orbit exenteration.[5,6] In cases involving eye and orbit, the reconstruction can only be achieved with facial prostheses, which are also the indication when reconstructive surgery is not suitable, that is, due to psychophysical conditions, or complementary, that is, when microsurgery reconstruction does not provide proper aesthetic repair.[1,7,8]

Prostheses promote adequate alloplastic replacement of the eye globe and surroundings, providing good symmetry, color, and anatomical details.[2,6] Oculofacial prosthesis restore aesthetics, protect tissues, and rehabilitate the patient for social reintegration and has a positive influence on the psychosocial awareness after rehabilitation.[5,7] The use of extraoral implants for retention,[2,8] along with 3D digital and prototyping technologies, have contributed to increasing satisfactory aesthetic results of prostheses use.[7,9,10]

Characteristics such as: volumetric deficiency, contour defects, irregularities, scars, asymmetries, and muscle disorders could be improved with the manipulation of peripheral regions and remaining biological soft tissues.[11,12] Previous irradiated sites frequent suffers from reduced local vascularization and predisposition to infection, wounds, and necrosis.[13] The use of temporary fillers is mostly described for facial rejuvenation purposes[14,5] and is widely indicated for treating several noncosmetic ophthalmic conditions,[16,17] and the results are seen immediately after the procedure.[14]

The hyaluronic acid filler (HA) is a temporary injectable filler commonly used to reduce the visible signs of volume loss.[15,16,18] They have also been used in oncologic patients for nipple projection enhancement, after breast cancer surgery[19] and to benefit facial atrophic scars caused by skin cancer resections.[20] Limitations as chronic infection and necrosis episodes, related to filler injection into previously irradiated sites, were described.

Botulinum toxin type A (BTX-A) is an established therapeutic neurotoxin used to treat many head and neck conditions, including improvement of facial symmetry after cancer-related maxillectomy.[21–23] The calcium hydroxyapatite (CaHA) filler is formed of biodegradable synthetic microspheres suspended in an aqueous carboxymethylcellulose gel. Besides volume increase, the CaHA provides long-term neocollagenesis.[24] The use of TBX-A and temporary filler as adjuncts to oculofacial prostheses rehabilitation can affects the prostheses size, margin thickness and adaptation, as well as facial harmony.

Paulista University's (UNIP) maxillofacial rehabilitation unit has been using BTX-A, HA, and CaHA fillers before oculofacial prosthetic facial manufacture since 2018 in cases where overall facial aesthetics and prostheses manufacture can be benefit from it. The authors have not come across studies showing association of these adjuvants in patients with oncological disfigurement concomitantly with facial prostheses. Given the recent use of these nonsurgical cosmetic procedures and the scarce literature, the purpose of this study was to describe the use of BTX-A, HA, and CaHA as additional methods to oculofacial prostheses manufacturing in a series of patients.

MATERIAL AND METHODS

Current study was carried out in patients who sought the UNIP maxillofacial rehabilitation clinic in 2018, presenting oculofacial defects to be corrected with the manufacturing of prostheses. The main characteristics evaluated for patients to be included in the study were the following: scars, surgical depressions, facial contour deficiencies, dyskinesias, facial asymmetry at rest, asymmetry of facial mimicry, lip asymmetry, and lip incompetence. From January to December in 2018, 05 patients were eligible and included in the study.

The use of BTX-A, HA, and CaHA fillers, were planned to minimize these facial changes concomitantly with the manufacture of oculofacial prostheses. This study was carried out in accordance with the Helsinki Declaration, revised in 2008. This study has received the approval of the Research Ethics Committee of UNIP (CAAE: 06072918.7.0000.5512.)

Initial evaluation and initial prosthesis planning were carried out on the first appointments, without considering the use of injectable cosmetic adjuncts methods. On the subsequent appointment, receptor sites, approach, doses, quantities, and depth of, injectables cosmetic adjuncts were discussed and planned. Followed by BTX-A Injections, concluded up to 2 appointments then CaHA injections on single appointment and lastly HA injections up to 4 consultations. Fillers were injected through microcannulas (22G × 5 cm), preceded by the subincision of the subdermal tissues of the area to be filled, with the same microcannulas, under 3% mepivacaine (DFL) local anesthesia. The time frame for injectable cosmetic adjuncts methods was 75 days and the appointments occurred weekly.

After injectable adjuncts completion final prosthetic planning was carried out according to the modifications observed (Figs. 1B-5B). The subsequent prosthetic appointments occurred weekly and the average time frame for prostheses manufacture was 21 days. All oculofacial prostheses presented in this study were implant-supported and manufactured using 3D digital technology.

Standardized photographs were taken, in high resolution, using a Canon EOS Rebel T3i camera. Initial photographs were taken on the first appointments (Figs. 1A-5A), intermediate photographs were taken after cosmetic procedures completion, represented by Figures 1B to 5B. Final photographs were also taken after combined reconstruction with prosthesis in place (Figs. 1C-5C).

Prosthetic planning, initial and final, were indicated thought an overlapped in yellow and red line, respectively (Figs. 1F-5F). Overlapped graphic illustration on initial photographs indicated areas and type of injections (Figs. 1D-5D).

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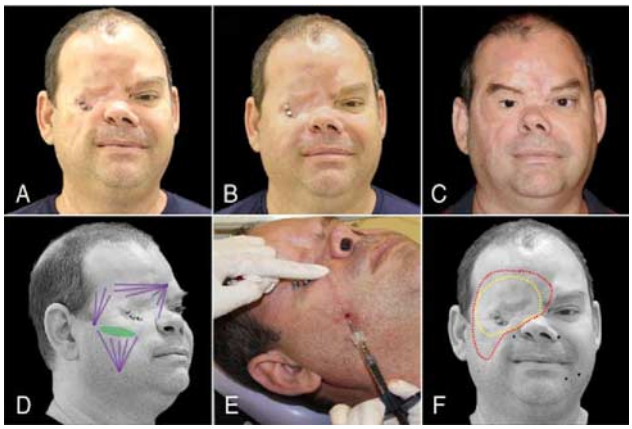

FIGURE 1. Patient L.C (A) Initial photograph before treatment, presenting volumetric deficiency of the cheek and periorbital region, atrophic scarring, hyperkinesia, and lip asymmetry. (B) Intermediate photograph taken after adjuvant procedures completion, presenting facial contour and asymmetry improvements. (C) After rehabilitation with injectable cosmetic adjuncts methods and prosthesis positioned according to final prosthetic planning. (D) Overlapped graphic illustration on initial photograph with HA application sites indicated by the purple lines and CaHA application pointed out in green. (E) Intermediate photograph of HA being injected. (F) Overlapped graphic illustration on initial photograph with TBX-A application sites indicated by black dots. The initial and final prosthetic planning are outlined in yellow and red dotted lines, respectively. CaHA, calcium hydroxyapatite; HA, hyaluronic acid.

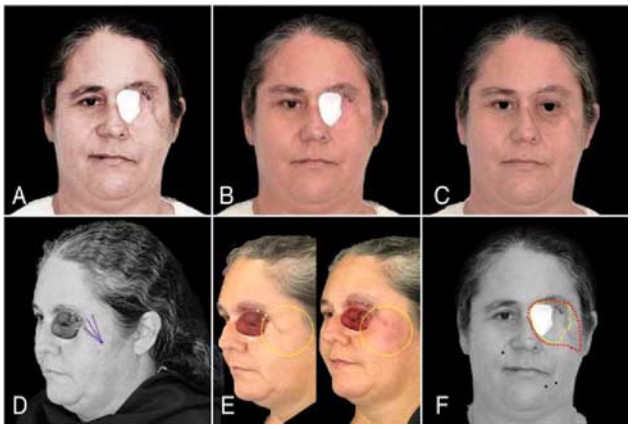

FIGURE 3. Patient NS. (A) Initial photograph before treatment presented volume deficiency associated with an atrophic scar, laterally to the left orbit and hyperkinesia on the right-side. (B) Intermediate photograph taken after adjuvant procedures completion, presenting facial contour, scar, and asymmetry improvements. (C) After rehabilitation with injectable cosmetic adjuncts methods and prosthesis positioned according to final prosthetic planning. (D) Overlapped graphic illustration on initial photograph with HA application site indicated by the purple lines. (E) Intermediate lateral view photograph comparing before and immediately after of HA injection, with the treated outlined in yellow. (F) Overlapped graphic illustration on initial photograph with TBX-A application sites indicated by black dots. The initial and final prosthetic planning are outlined in yellow and red dotted lines, respectively. HA, hyaluronic acid.

CASE SERIES

Patient 01

L.C, male, 47 years of age old, underwent excision of orbital skin basal cell carcinoma in 2011, and reconstructive plastic surgery presenting mutilation in the middle and upper third of the right side of the face, including orbit and nasal dorsum exenteration. During the initial evaluation for manufacturing of oculofacial prosthesis, disharmony characteristics (volumetric deficiency of the cheek, atrophic scarring, hyperkinesia, and lip asymmetry) were observed (Fig. 1A). To treat muscle disorders asymmetries, 15U of BTX-A (Dysport) was applied contralaterally to mutilation, 6U in the depressor labii inferioris, 6U in the depressor anguli oris and 3U in the levator labii superioris alaeque nasi. 6U of BTX-A also applied in levator labii superioris on the right side (Fig. 1F). In a single session, a supra periosteal bolus injection of 3.75 ml of CaHA (rennova diamond) was performed in the infraorbital margin (Fig. 1D). In 1 moment, 4.75 ml of HA

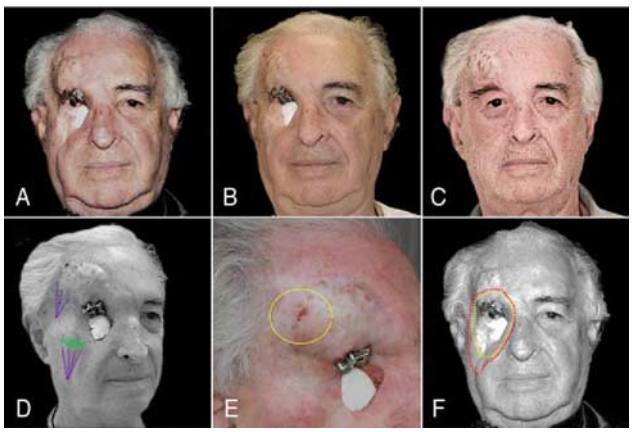

FIGURE 2. Patient VGG (A) Initial photograph before treatment, atrophic scars and volumetric deficiency in the right cheek, infraorbital and temporal regions. (B) Intermediate photograph taken after filler injections completion, presenting improved facial contour. (C) After rehabilitation with injectable fillers and prosthesis positioned according to final prosthetic planning. (D) Overlapped graphic illustration on initial photograph with HA application sites indicated by the purple lines and CaHA application pointed out in green. (E) Intermediate photograph of an approximately 1 cm wound at the temporal region, on the fourth postoperative day after application of 0.5 ml of HA. (F) Overlapped graphic illustration on initial photograph with the initial and final prosthetic planning outlined in yellow and red dotted lines, respectively. CaHA, calcium hydroxyapatite; HA, hyaluronic acid.

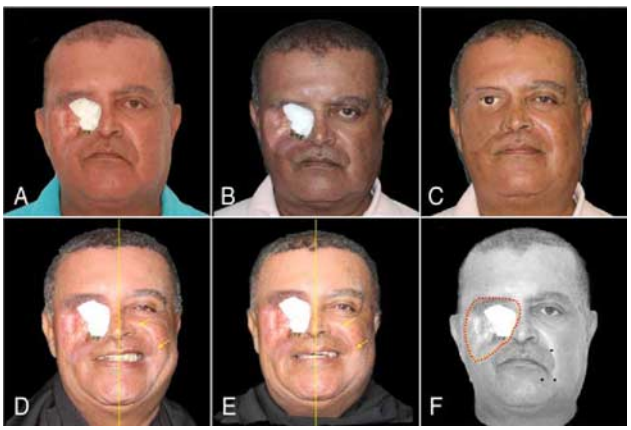

FIGURE 4. Patient CC (A) Initial photograph before treatment presenting muscle disorders. (B) Intermediate photograph taken after TBX-A injection completion, presenting lip asymmetry improvement. (C) After rehabilitation with TBX-A and prosthesis positioned according to final prosthetic planning. (D) Smiling photograph before TBX-A injections. (E) Smiling photograph 7 days after TBX-A injections, demonstrating better mimicry symmetry. (F) Overlapped graphic illustration on initial photograph with TBX-A application sites indicated by black dots. The initial and final prosthetic planning are outlined in yellow and red dotted lines, respectively.

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(rennova ultradeep) was retro injected along the right cheek (Fig. 1E). The nasal dorsum received 1.25 ml of HA (rennova ultradeep) in 2 appointments with injection of half volume each. Due to a firm adherence of the skin to the bone the areas around the orbit, including temporal region, required 3 sessions to be volumized with a total volume of 3.75 ml of HA (rennova ultradeep). At the same time the nasal dorsum received 1.25 ml of HA (rennova ultradeep) in 2 appointments with injection of half volume each. No clinical complications or side effects were noted.

Patient 02

V.G, male, 81 years old underwent ablation of a left-sided basal cell carcinoma in 2008 and reconstructive plastic surgery resulting in mutilation in the middle and upper third of the right face, including orbit exenteration. During the initial evaluation for manufacturing of oculofacial prosthesis, disharmony characteristics (atrophic scars and the lateral volumetric deficiency in the cheek, temporal, and infraorbital regions) were observed (Fig. 2A). The patient received fillers injection in the cheek, infra-orbital, and temporal regions. In a single session, 2.5 ml supra periosteal bolus injection of CaHA (rennova diamond) was performed at the infraorbital region. Two sessions were necessary to add up to a total volume of 5.75 ml HA (rennova ultradeep) in the cheek (Fig. 2D). In the temporal region, immediately after the 0.5 ml HA injection (rennova ultradeep), the overlying tissue ischemia was noted. Followed by locally injection of 200 UTR of hyaluronidase as an HA-reversing agent also followed by massage in the area with 2%-nitroglycerin paste and application of heat compress with adequate postoperative control. An estimated 01 cm diameter wound was observed at the application site from the fourth postoperative day and healed completely within 14 days with no consequences an no need of further intervention (Fig. 2E).

Patient 03

N.S, 49 years old, female, submitted to a surgery for excision of basal cell carcinoma from in the left periorbital region in 2009. Volume deficiency associated with an atrophic scar, laterally to the left orbit, was identified, as well as hyperkinesia and lip asymmetry (Fig. 3A). Total of 12 U of BTX-A (Dysport) were injected ipsilateral to the mutilation equally distributed between depressor anguli oris and the depressor labii inferioris and 6 U injected into levator labii superioris on the right side (Fig. 4F). In a single session of 3.2-ml HA (rennova ultradeep) injection underneath the atrophic scar on the lateral side of the right orbital region (Fig. 3D). No clinical complications or side effects were noted.

Patient 04

Patient C.C, male, 49 years old, underwent maxillectomy with orbital exenteration resulting from squamous cell carcinoma of the maxilla in 2007. During the initial examination, lip asymmetry was present on the face at rest and exacerbated during smiling, associated to hyperkinesia (Fig. 4A-D). Total of 18 U of BTX-A (Dysport) were injected contralateral to the mutilation; 6U into the zygomaticus major and 12U equally distributed between depressor anguli oris and the depressor labii inferioris (Fig. 4F). No clinical complications or side effects were noted.

Patient 05

Patient D.A.V, female, 54 years old, submitted to a maxillectomy and orbital exenteration associated with irradiation therapy in 2008 due to right maxillary sinus squamous cell carcinoma. Two microvascular transplants of the fibula were performed to reconstruct the maxilla; followed by several aesthetic surgical reconstructions including thigh skin graft in the perioral region. There were no favorable clinical conditions for carrying out further surgical procedures, however, facial defect remained extensive, affecting the overall harmony of the face in addition to the orbital absence. In the planning of the patient's first oculofacial prosthesis, a substantial impairment of facial structures was identified, with marked volumetric deficiency, such as zygomatic, preauricular and cheek deficiency, asymmetry, scars, distortions, hyperkinesis, and volumetric deficiency (Fig. 5A). Firstly, to treat hyperkinesis 30U of BTX-A (Dysport) were injected as follows: 6U in the left zygomaticus major and 6U into the left levator labii superioris and 3U into the left fibers of the orbicularis oris muscle. On the right side, 6U were injected into the depressor anguli oris, 6U into the mentalis muscle and 3U into the depressor labii inferioris (Fig. 5F). In 1 session, a bolus of 3.75 ml CaHA (rennova diamond) was injected supraperiosteally below the right zygomatic region. In subsequentially 3 consultation, a total volume of 9.75 ml of HA (rennova ultradeep) was retro injected into the preauricular region, mandibular angle and cheek and 3.6 ml injected into the temporal area, all in the right side. On the right upper lip region, 2 ml of HA (rennova ultradeep) was injected (Fig. 5D). There was an episode of chronic infection related to the application of fillers noted approximately 7 days after the HA injection, at the peri orbicular region, over a soft tissue graft area, with the presence of purulent discharge drainage (Fig. 5E). Purulent exudation was successfully drained, and the patient treated with oral antibiotic therapy (Clindamycin 4× daily), oral steroidal anti-inflammatory drugs (prednisolone), and heat compressing, starting from the following week to filler injection and completely solved up to 21 days.

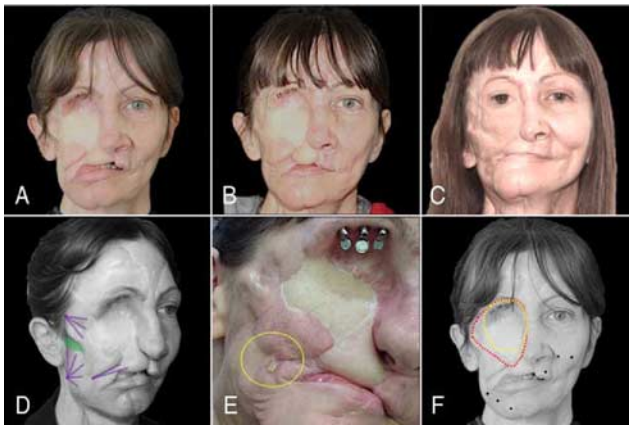

FIGURE. 5. Patient DV.A. (A) Initial photograph before treatment, revealing substantial impairment of facial with marked volumetric deficiency on the zygomatic, temporal, periorbital, preauricular and cheek regions, as well as atrophic scarring, hyperkinesia, and asymmetries. (B) Intermediate photograph taken after adjuvant procedures completion, presenting less distortion due to facial contour and asymmetry improvements. (C) After rehabilitation with injectable cosmetic adjuncts methods and prosthesis positioned according to final prosthetic planning. (D) Overlapped graphic Illustration on initial photograph with HA application sites indicated by the purple lines and CaHA application pointed out in green. (E) Purulent discharge drainage at the peri orbicular area due to an episode of chronic infection related to the application of fillers 7 days before. (F) Overlapped graphic illustration on initial photograph with TBX-A application sites indicated by black dots. The initial and final prosthetic planning are outlined in yellow and red dotted lines, respectively. CaHA, calcium hydroxyapatite; HA, hyaluronic acid.

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RESULTS

Three patients received BTX-A and fillers application, 1 patient received filler injections and 1 patient received BTX-A solely. Analysis of the records and photos enable comparison in between initial and final prosthesis planning and overall facial modifications produced by the application of BTX-A, HA, and CaHA. Changes perceived are described on the Supplementary Digital Content, Table 1, http://links.lww.com/SCS/D599 and on Figures 1 to 5, including illustrations overlapped.

Botulinum toxin type A injection attenuated asymmetries and distortions caused by muscle disorders during facial movements and at rest. Fillers reduced surgical depression, softened atrophic scars, and improved facial contour. Initial and final prosthetic planning outlines were demonstrated on Figures 1F to 5F. Only in patient 5 the initial and final prosthetic planning outline is similar (Fig. 4C).

DISCUSSION

Facial rehabilitation planning must be individualized since it depends on several aspects including patient specific conditions as the biological tissue, remaining or previously grafted, and clinical condition. Manipulation of remaining tissues after cancer therapy is challenging due to reduced healing capacity and increased risk of complications. Previous irradiation harms the local vascularization and may induce late and irreversible soft tissue damage predisposing to infection, wounds, and necrosis.[25] In the present study, small necrosis and infection related to fillers injection were observed in 2 of the previously irradiated patients (2 and 5). With patient 2, the risk of necrosis[26,27] was immediately noticed after a single injection of 0.3 ml HA (rennova ultradeep) at temporal region on a graft, previously irradiated site and adequately managed with hyaluronidase with no consequences. The use of HA is indicated in areas of higher risk (scars, grafts, irradiated tissue, thin skin) as HA can be effectively dissolved within hours by hyaluronidase; therefore, embolisms, nodules, or overfilled areas could be treated by hyaluronidase.[18,28,29]

In patient 5, peri orbicular subcutaneous infection probably related to compression of poorly vascularized graft tissues, on previously irradiated sites, was observed 7 days after the procedure, but it was adequately managed with oral antibiotics and drainage of purulent exudation.[19,29] Filler injection for volume replacement in graft areas with firm adherence of the skin to the bone, scars, thin subcutaneous tissue is limited due to high risk of complications. Even small volumes of fillers frequently applied on healthy tissues with reactions, on irradiation sites, would better distribute in multiple steps to improve tissue resiliency and procedure safety.[18,29] Local anesthesia should not contain vasoactive drugs such as epinephrine to avoid local circulatory insufficiency.[30] To reduce de risks in the orbital region, HA, and CaHA should be applied in the supra periosteous plane in bolus and injected in superficial subdermal planes.[28]

Injection of autologous fat technique has been described for sequela treatment in head and neck cancer patients.[11,12,25] Many aspects have a significant impact on the overall outcome and there is no consensus for optimal donor site, fat harvesting ang processing.[25] Adverse effects as fat graft resorption (up to 50%).[11,25] Fibrosis, pseudocyst formation and calcification are described. Fat necrosis is a rare complication but also mentioned.[11] Controversy remains regarding it use due to concern related to the possible stimulation of recurrence.[11] Most of injection of autologous fat techniques are carried out in on single moment, not allowing tissue conditioning and is also performed by a multidisciplinary team under general anesthesia and hospitalization elevating the procedure cost ratio and morbity.[11,12]

The mixture or concomitant use of HA and CaHA maintained constant volume once HA loading compensates for early loss of CaHA load.[28] Calcium hydroxyapatite may have a more prolonged effect, lifting tissues more efficiently and providing better volume replacement than HA due to its high viscosity and elasticity.[14,28] Calcium hydroxyapatite, besides volume increase, provides long-term neocollagenesis.[24,28] Combination of CaHA and HA demonstrate good results in improving facial contour and symmetry, dissembling atrophic scars, reducing surgical depressions, and can be seen as a good alternative, to simulate/predict results or tissue conditioning, as it may be applied in several steps, before more invasive treatments, with permanent fillers or fat grafting. One patient on this study (5) underwent HA lip filling for asymmetry decrease and reconstruction of perioral structures. The authors agree that the HA is a better filling option for lip tissues for its translucency, predictability, lower viscosity, and elasticity coefficients when compared to CaHA, providing natural contours as well.[20,31,32]

For filler injection, a blunt microcannula (22G × 5 cm) was used preceded by subincision, using the same microcannula, to create space for HA to be deposited more homogeneously and in larger quantities. The rupture of fibrous beams with vigorous movement performed on the subdermal plane with a blunt instrument produces less trauma and bleeding. The use of blunt tip differs from the literature, which described subincision as puncture of the skin surface and insertion of a tri-faceted hypodermic needle but presented similar results. It aimed to make subcuticular cuts and splits of subcutaneous fibrous beams to release the traction they employ on the skin.[14] Filler injections were preceded by aspiration testing, which reduces the possibility of intravascular injection.[25]

Botulinum toxin has gained popularity since its introduction for treatment of a considerable variety of movement disorders, including asymmetries due to long-term facial paralysis.[32,34] Its action blocks the release of acetylcholine by the cholinergic nerve endplates, resulting in temporary inactivity of the affected muscles,[33] BTX-A injections take about 1 week to reach maximum clinical effect.[34] In cancer patients, muscle groups are often removed or damaged during surgical ablation,[1] and the muscle activity absence or decrease on the affected side can result in progressive contralateral hyperkinesia, which often leads to asymmetries as well. In this study, asymmetries were treated with BTX-A according to widely described parameters for facial paralysis.[32–34] In 4 patients (patients 1–5), BTX-A application was injected for treatment of progressive contralateral hyperkinesia. Botulinum toxin type A was also used to reduce the activity of the lower lip depressor and lower angle muscles to improve lip symmetry at rest and during facial movements. In all cases, symmetry improvement was evident, both at rest and in function, promoting aesthetics refinement and favoring prosthesis adaptation, especially during facial mimics.

Application of BTX-A on the remaining biological soft tissues, decreased dyskinesias and asymmetries at rest and of the facial mimicry, promoting better prostheses adaptation. The use of HA, and CaHA fillers reduced scars, surgical depressions, and facial contour deficiencies with a beneficial impact on prostheses size and thickness. The adjuncts cosmetic methods concomitantly applied to oculofacial prostheses had a positive impact on the overall facial rehabilitation of the patients presented on this study, however it should be individually planned by an experienced team, since it depends

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on several aspects including specific conditions of each patient as biological tissue and clinical condition. Overall improvements seem to be more evident in minor asymmetries and irregularities. In addition, during patient selection, it is essential to discuss realistic expectations, the need for maintenance reapplications, alternative options, as well as risks and adverse effects. Another aspect that requires attention is the risk of cancer recurrence, which may demand further surgical procedures that may affect the outcome of the planned side treatment.

Although the durability of TBX-A, HA, and CaHA durability is limited, causing it to be repeated over time for clinical effect maintenance[15,34] has the advantage that they would not permanently jeopardize patients' cancer treatment sequence and patient follow-up.[20,23] In the context of facial rehabilitation, including reconstructive plastic surgery, facial implants and prosthesis manufacture the cost of injectable cosmetic adjuncts are proportionally small not presenting a significant increase in the total rehabilitation cost. Moreover, the cosmetic adjuncts can be performed under local anesthesia without hospitalization, presenting a good cost ratio benefit. The study follow-up was at a minimum of 12 months after the last-performed procedure, and no further interventions or corrections were required during this period. The timeframe for reinjections of BTX-A is estimated in 6 months and fillers up to 18 months.[18,19] Within limitations of the present study, which are the small number of patients and the short time for follow-up further studies should be carried out to confirm the beneficial outcomes and provide information on durability and late adverse reactions.

This study is the first to present the use of BTX-A, HA, and CaHA as complements to oculofacial prostheses manufacture in oncologic patients. Application of BTX-A, HA, and CaHA, before prosthesis reconstruction represents an additional resource to improve overall results, that may express an increase in the satisfaction and quality of life[5] of oncologic patients with oculofacial prostheses.

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Rehabilitation of Atrophic Maxilla With Immediate Loading of Extrasinus Zygomatic Implant

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Abstract: The aim of this case series was to evaluate the long-term success rate of immediate occlusal loading of extrasinus zygomatic dental implants after a 3-year follow-up. The sample consisted of 31 patients (mean age of 64 years) with atrophic maxillae rehabilitated with 1 to 4 extrasinus zygomatic implants, placed unilaterally or bilaterally. All the patients received complete implant-supported dental prostheses with immediate loading by associating zygomatic implants with conventional implants. None of the procedures were associated with bone grafts. During the 3-year period of follow-up in the present study, all the patients attended clinical sessions and underwent radiographic exams every 6 months. In total 55 zygomatic and 69 conventional implants were placed, where 1 zygomatic and 2 conventional implants were lost, representing success rates of 98.18% and 97.20%, respectively. None of the studied patients had signs of sinusitis or changes in the maxillary sinuses. All the patients showed occlusal contact on natural antagonist teeth or implant-supported dental prostheses. Therefore, it was concluded that the use of exteriorized zygomatic implants with immediate loading represented a feasible option with high success rates for the treatment of atrophic maxilla.

Key Words: Case series, edentulous atrophic maxilla, extrasinus, zygoma implants

Rehabilitation of atrophic maxillae poses a challenge to the implant dentist. The treatment by means of horizontal bone grafts have been described in the literature, with high success rates[1–4] however, apart from producing greater morbidity, they also demand a longer waiting time for bone repair. Moreover, they make it unfeasible to insert implants with immediate loading in the first surgical stage.[2] Whereas the options for rehabilitation based on anchorage of implants in remaining bone such as the lateral wall of the nasal fossa, canine, pterygoid, and zygomatic pillars, have shown equally high success rates, and are a therapeutic option.[5]

Anchorage in the canine pillar is the most used and has been established in the literature through the "All-on-4" concept.[6] Nevertheless, in some cases, bone remodeling in the posterior region of the maxilla has been shown to be so severe that it promotes extensions into the anterior maxillary sinus, making it impossible to anchor implants in the region of the canine pillar, as recommended in the original angled implant technique.[7] When faced with these situations, the alternative for rehabilitation include transsinus implants,[8,9] pterygoid implants and zygomatic implants.[10]

The original technique implemented for zygomatic fixations recommended the insertion of implants through the interior of maxillary sinus from the remaining alveolar ridge, so that an apical anchorage of the zygomatic bone could be achieved.[11] However, despite being an innovative technique and with considerable success rates, some disadvantages have been observed, such as the need for preservation and elevation of the sinus membrane. A consequence of the extremely palatalized approach is the position of the implant platform, which in most cases will cause discomfort for the patient. Another factor to be considered in this option is the biomechanics of the whole set of the prosthetic reconstruction that may be overloaded due to the creation of a vestibular cantilever. Also, as the implant is located within the maxillary sinus from the remaining edge, it is more susceptible to sinusitis and buccal sinus communications.[12,13]

The technique to improve and avoid complications resulting from the initial technique was proposed by Stella and Warner in 2000.[14] They proposed a technique for installing zygomatic implants, which the antrostomy and lifting of the sinus membrane were not necessary, they recommend a lateral slot outside of wall of the maxillary sinus, avoiding or minimizing the contact of the implant with the sinus's membrane. Through this technique, the implant platform was

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