

Adequacy of the Zetaplasty Technique for Closing Extensive Oroantral Communication

Ronaldo Celio Mariano, Geraldo Alves Villela Junior,
Pedro Henrique Moraes de Menezes, Sabrina Ferreira

Faculty of Dentistry, Federal University of Alfenas (UNIFAL-MG), Alfenas, Minas Gerais, Brazil

Received August 8, 2024; Accepted May 19, 2025.

Key words: Maxillary sinus – Surgery oral – Oral surgical procedures – Oral fistula

Abstract: A buccosinus fistula consists of a permanent communication between the oral cavity and the sinus. For the treatment of this complication, three modalities can be highlighted: sliding of the vestibular flap, palatal flap, or graft of cheek adipose tissue. Each of these treatment forms has disadvantages, which led to the development of the zetaplasty technique. Patient C.M., a 57-years-old male, sought the Surgery Clinic of the Federal University of Alfenas for the treatment of a broad buccosinus communication. After anesthesia, a perilesional incision followed by an extended incision anteriorly to expose the alveolar ridge for regularization. Additional relief incisions were executed to mobilize the vestibular and palatal flaps. The proposed technique aims to obtain relief incisions in the vestibular and palatal areas from the freshened wound margins, allowing the sliding of the flaps in the zetaplasty technique. There has been no need for surgical re-intervention up to the present moment.

Mailing Address: Geraldo Alves Villela Junior, MSc., Faculty of Dentistry, Federal University of Alfenas (UNIFAL-MG), St. Gabriel Monteiro da Silva, 700 – Centro, Alfenas (MG), 37130-001, Minas Gerais, Brazil; Phone: 55 35 988 685 583; e-mail: geraldo.junior@unifal-mg.edu.br

<https://doi.org/10.14712/23362936.2025.19>

© 2025 The Authors. This is an open-access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>).

Introduction

The continuities between the maxillary sinus and the oral cavity are defined as the rupture of the bone lamina interposed between the dental roots and the maxillary cavity, concomitantly with the perforation of the surrounding sinus membrane. According to the characteristics of the opening site, communicating processes are classified in the literature as perforations of the maxillary sinus (recent and simple opening of the antrum, with bloody tissue on the margins of the lesion and favourable prognosis) or oroantral communications (also proposed as a fistula oroantral) (Rey Santamaría et al., 2006; Khandelwal and Hajira, 2017).

Bucosinusal communications are processes of doubtful prognosis. They are conditions in which the margins of the lesion are already epithelized by a mucous tissue generated during the healing process from the proliferation of tissues adjacent to the lesion. This process takes about three weeks, and thereafter there is no spontaneous regression of the case (Gonty, 1995).

The main etiology for oroantral communications are accidents related to the extraction of upper premolars and molars (Khandelwal and Hajira, 2017). Risk factors for the appearance of oroantral communications are the presence of divergent roots in the vicinity of edentulous spaces requiring extraction, pneumatization of the maxillary sinus, destruction of the sinus floor by periapical lesions, inadequate handling of instruments and large cystic lesions (Peterson et al., 2000).

Research demonstrates a greater involvement of males from the third decade of life, the age at which extractions of missing teeth usually begin (Freitas et al., 2003; Person et al., 2005; Park et al., 2019; Bereczki-Temistocle et al., 2022). On the other hand, Marzola (2005) reports a higher incidence in the 16–30 age group in his bibliographic review.

Gregori and Campos (2004) points out as important factors the deficiency of the surgical planning of extractions, mainly when there is pneumatization in the antrum, osteolytic pathological processes, roots with laceration, ankylosis, hypercementosis, manual inability, anatomical position occupied by unerupted teeth, maxillofacial trauma – facial, intraosseous cysts and infectious complications of molar extractions.

As systemic pathologies, the etiological factors are: bisphosphonates therapy (Esen and Akkulah, 2021) and tuberculosis (Ries Centeno, 1991; Rey Santamaría, 2006). Finally, osteoporosis and osteopenia can also be indicated, although there are no publications directly correlating these two processes with the continuities. Correlated articles point to evidence that obviously requires further studies for confirmation.

Furthermore, the fact that osteoporosis is diagnosed in a part of the skeleton does not mean that it is present in all other bones (Esen and Akkulah, 2021).

If the oroantral communication is smaller than 2 mm in diameter, the most indicated treatment is clot stabilization and preservation at the extraction site. Additional soft tissue flap lifting is not required. Sutures are made to reposition the soft tissues and gauze is kept for 1 to 2 hours over the suture. The communication must be diagnosed and treated immediately to ensure better prognosis, avoid maxillary sinusitis and if the communication is equal to or greater than 3 mm in diameter, a surgical procedure must be performed to close the communication (Khandelwal and Hajira, 2017).

Case report

Patient C.M., male, 57-years-old, Caucasian, rural farmer, with a history of uncontrolled arterial hypertension, was referred for evaluation and treatment of oroantral communication established two months ago, after extraction of five right posterior upper teeth. According to the patient, some of these teeth were mobile and others quite destroyed. The extractions were performed by a dentist at a municipal public service office without radiographs. The patient had been using amoxicillin and nimesulid since the day of dental extractions and had been smoking cigarettes since the age of 18, with an average consumption of 10 cigarettes per day.

On clinical examination, an extensive epithelialized oroantral communication is observed (Figure 1).

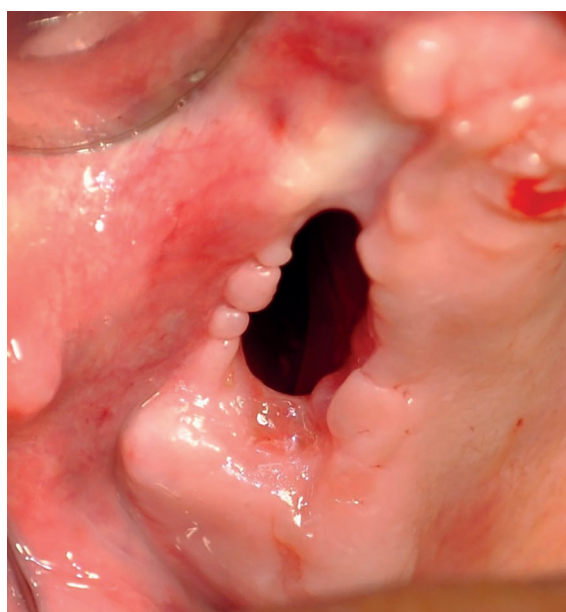


Figure 1: Clinical aspect of extensive oroantral fistula.

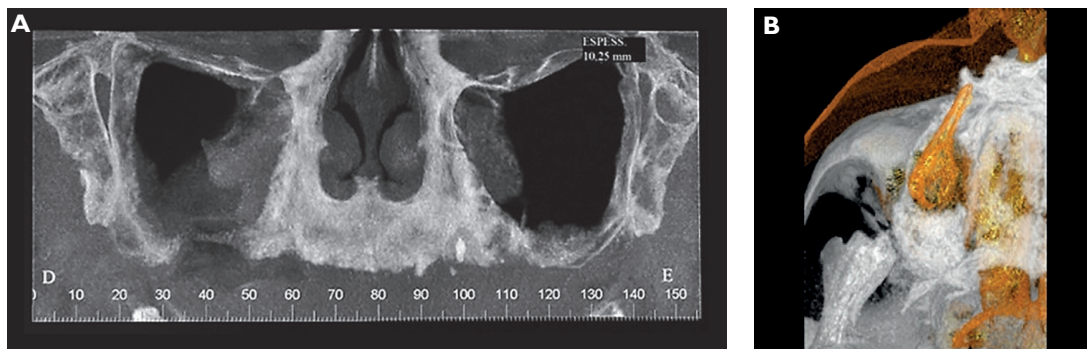


Figure 2: A) Panoramic view of the jaws. Observe the oroantral communication on the right side. B) Axial section of the right maxilla. Note extensive oroantral communication.

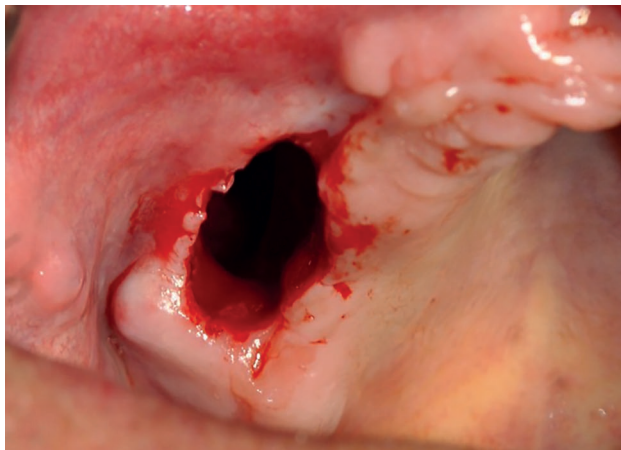


Figure 3: Elliptical incision for sharpening the edge of the wound (removal of oroantral fistula epithelium).

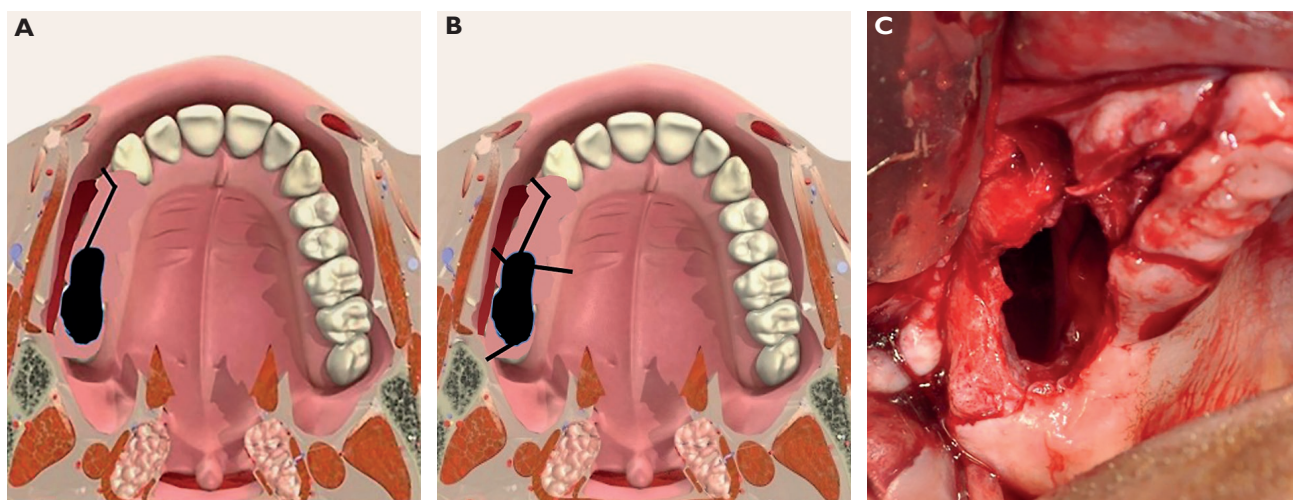


Figure 4: A) Schematic drawing of the linear anterior incision starting from the wound margin. B) Buccal and palatal relief incisions for mobilization of flaps in schematic drawing. C) Clinical aspect of buccal and palatal incisions.

The internal epithelium of the communication was slightly reddish. There were no reports of pus taste. The upper alveolar ridge has contour irregularities, as well as the lower alveolar ridge. The tomographic exam allows observing extensive oroantral bone continuity between the mouth and sinus (Figure 2).

Under local anesthesia (3% prilocaine with 0.03 IU/ml felypressin + 2% lidocaine) and intraoperative clinical monitoring, surgical access began with an elliptical incision to debride the edge of the wound (Figure 3). From the incision extended to the anterior, it was possible to regularize the alveolar ridge

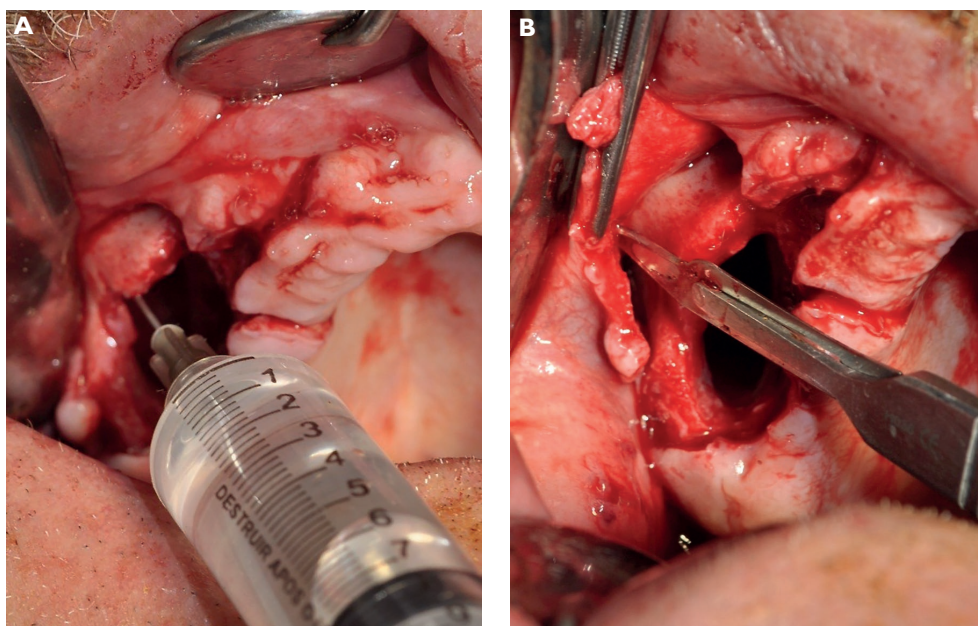


Figure 5: A) Irrigation with 0.5% metronidazole solution. B) Internal incision in the periosteum in the buccal flap.

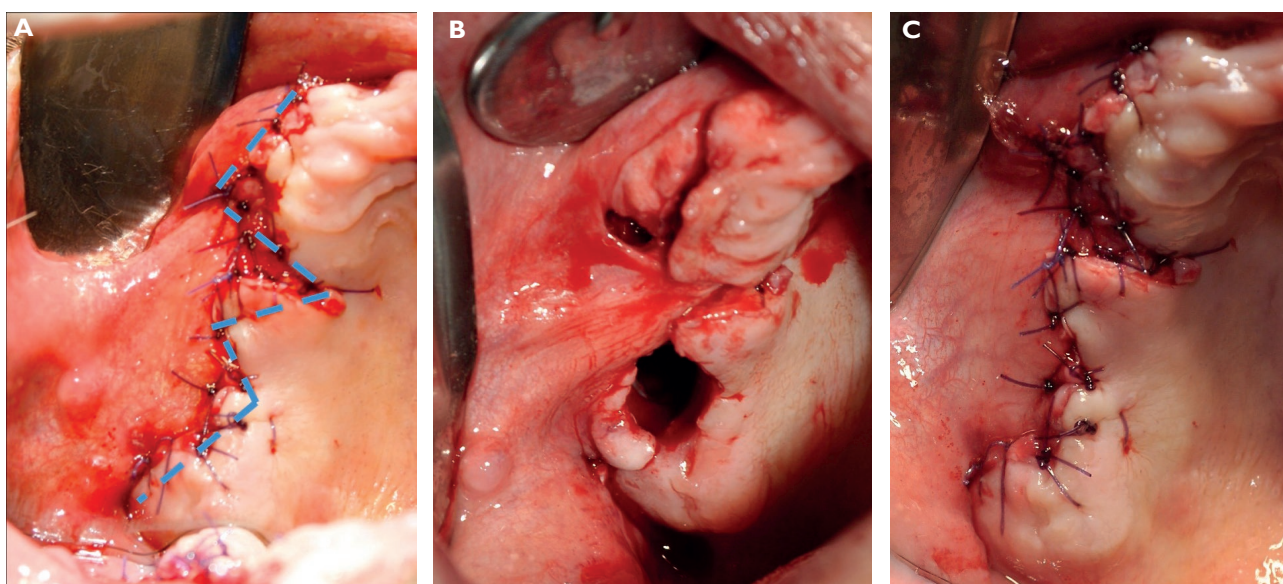


Figure 6: A) First stitch of suture shifting the buccal flap to the palate. B) Alternating buccal and palatal sutures for wound closure. C) Sliding of the flaps following the concept of the zeta-plasty technique.

in this area with an alveolotomy and bone files. Thus, in addition to the anterior extension of the incision (Figure 4A), other relief incisions were made to mobilize the buccal and palatine flaps (Figure 4B). The technique aims to obtain, from the debrided wound margins, relief incisions in the vestibular and palatal areas to enable flap sliding (Figure 4C), following the concept of the zeta-plasty technique.

Before starting the closure of the wound, in order to reduce the risk of infection, irrigation with 0.5% metronidazole was performed (Figure 5A).

As the vestibular flap was tight for the beginning of wound closure, internal incisions in the periosteum

were made (Figure 5B). The first suture aimed to slide the vestibular flap towards the palate (Figure 6A). To achieve this, poliglecaprone 3-0 suture was used. This suture is absorbable and maintains its tensile strength for a long period (around 15 to 20 days). Then, alternating sutures of V and P flaps were performed until complete closure of the wound, as shown in Figure 6B and C.

The first follow-up for clinical observation occurred at 7 days. There were no complaints of pain or signs of infection. After 2 weeks (Figure 7A), the suture was removed. Clinical and radiographic follow-up was performed at 3 months and 1 year (Figure 7B).

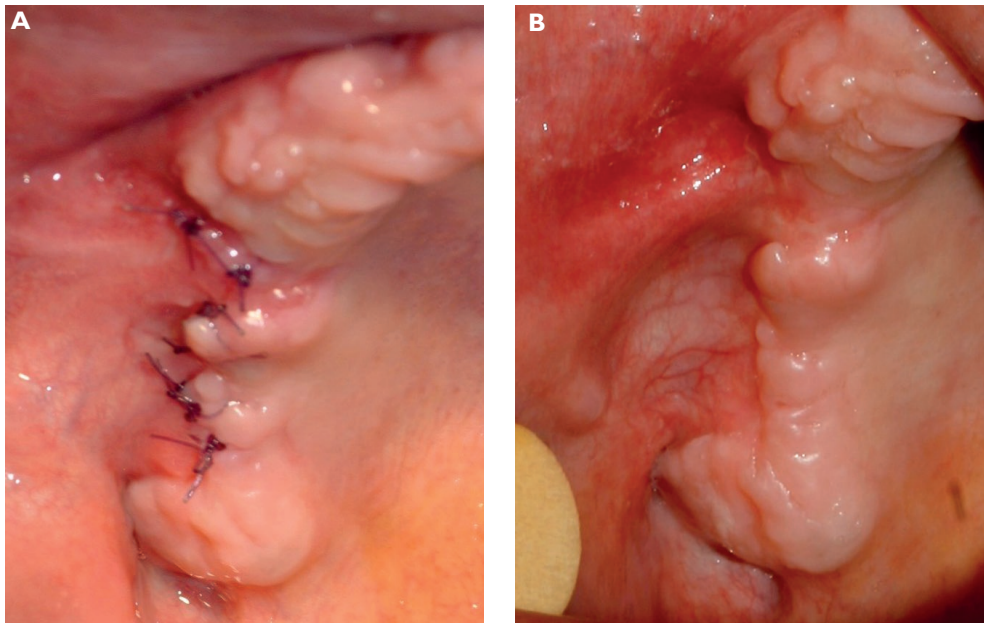


Figure 7: A) 14-day clinical follow-up. B) 1-year clinical follow-up.

Radiographic analysis shows no shadows and there are no complaints from the patient.

Discussion

The most frequent cause related to the establishment of oroantral perforation and consequent fistula formation is due to the deficiency (or even lack) of planning in the extraction of posterior-superior teeth, mainly upper molars (Gregori and Campos, 2004; Person et al., 2005; Galletti et al., 2016). This was demonstrated in the present clinical case, since not even radiographic analysis was performed to plan the extractions. Adequate planning, considering the pneumatization of the maxillary sinus or the close contact with the roots of the teeth to be extracted, leads the good professional to perform primary closure of the wound in the face of sinus perforations detected during the extraction session.

The best treatment for oroantral communication is to prevent it from occurring by performing a good planning and careful observation of the case, both radiographically and clinically. Radiographic analysis allows visualization of the existence of pneumatized maxillary sinus, divergent or dilacerated roots to determine the risk of perforating or fracturing the maxillary sinus floor during tooth extraction. If perforation occurs, the type of treatment to be performed will depend on the size of the communication, the presence of preoperative infectious processes such as sinusitis, periodontal disease or periapical lesions, and the presence of

dental fragments or other foreign bodies introduced into the maxillary sinus (Peterson et al., 2000).

Several authors propose surgical techniques to close the oroantral communication, however, these techniques do not always have satisfactory results (Hanazawa et al., 1995). Among the options of sliding flaps for the case in question, the buccal sliding flap may be the most common and simple procedure, but this type of treatment can cause loss of depth of the buccal sulcus and decrease in attached gingiva (Graziani, 1995; Peterson et al., 2000; Konate et al., 2021). The palatal sliding flap has the advantage of a greater thickness and irrigation, providing a flap with sufficient size and mobility. However, it causes discomfort and pain in the region of exposed bone tissue, in addition to increasing the risk of infection (Kwon et al., 2020).

The pedicled buccal fat pad graft is not a new technique, as mentioned by Tideman et al. (1986), and was another treatment option for the case due to the size of the fistula being larger than 3 mm. The buccal fat pad has easy surgical access and considerable mobility, allowing for its traction and positioning over the fistula. The process of epithelialization is evident in the oral cavity on the seventh postoperative day and is complete in the 3rd or 4th week through a process of metaplasia. This process occurs similarly in the membrane of the maxillary sinus (Mannelli et al., 2019).

In the case in question, considering the size of the communication, we observed that the amount required for the use of the pedicled buccal fat pad graft could cause some facial asymmetry and post-operative complications related to excessive edema

and bleeding. We opted for the simultaneous manipulation of the vestibular and palatal flaps, slid using the zetaplasty technique described here.

Zetaplasty is recommended in frenectomies and cheiloplasties. The zetaplasty technique used here for the closure of the oroantral communication was an adaptation of the principles of flap sliding to optimize the closure of a wound without requiring extensive tissue dissection.

The fact that the patient is a smoker worsens the prognosis of the proposed treatment because smoking is a risk factor for oral surgeries, which can lead to complications related to poor wound healing (Bereczki-Temistocle et al., 2022). As smoking is a significant extrinsic factor that affects both the rate and quality of wound healing, increasing the risk of postoperative wound complications such as infection, dehiscence, and necrosis (Ahn et al., 2008), the authors sought an appropriate technique for closing the buccal sinus communication. Wounds need adequate blood supply to receive the various nutrients, chemicals, and cells required in the complex wound healing process, especially in the closure of buccal sinus communications. Smoking leads to hypoxia as a result of reduced blood flow to the skin and decreased oxygen-hemoglobin concentration due to competitive binding of carbon monoxide with heme molecules in red blood cells (Campanile et al., 1998). The technique employed in this case report, using small pedicled flaps, vestibular and palatal, for complete closure of the fistula, provided lower risks of tissue dehiscence and necrosis, especially in patients like this. Clinical and radiographic observation allowed for the observation of a good resolution of the presented case.

Conclusion

Therefore, the presented case showed that there was a high possibility that the communication was caused by the absence of adequate planning and improper maneuvers during tooth extraction. The choice of surgical treatment modality was based on the extent of the communication. It is believed that the sliding flap technique by zetaplasty presented in this study was effective in resolving the case, as to date, there has been no need for surgical reintervention.

References

- Ahn, C., Mulligan, P., Salcido, R. (2008) Smoking: The bane of wound healing. Biomedical interventions and social influences. *Adv. Skin Wound Care* **21**, 227–236.
- Bereczki-Temistocle, D. L., Gurzu, S., Jung, I., Cosarca, A., Beresescu, G., Golu, V., Petrovan, C., Ormenisan, A. (2022) Selecting the best surgical treatment methods in oro-antral communications. *Int. J. Environ. Res. Public Health* **19**(21), 14543.
- Campanile, G., Hautman, G., Lotti, T. (1998) Cigarette smoking, wound healing, and face-lift. *Clin. Dermatol.* **16**, 575–578.
- Esen, A., Akkulah, S. (2021) Management of large oroantral fistulas caused by medication-related osteonecrosis with the combined sequestrectomy, buccal fat pad flap and platelet-rich fibrin. *J. Maxillofac. Oral Surg.* **20**, 76–82.
- Freitas, T., Farias, J. G., Mendonça, R. G., Alves, M. F., Ramos, R. P. Jr., Cândia, A. V. (2003) Fístulas oroantrais: Diagnóstico e propostas de tratamento. *Rev. Bras. Otorrinolaringol.* **69**, 838–844.
- Galletti, C., Cammaroto, G., Galletti, F., Camps-Font, O., Gay-Escoda, C., Bara-Casaus, J. J. (2016) Dental implants after the use of Bichat's buccal fat pad for the sealing of oro-antral communications. A case report and literature review. *J. Clin. Exp. Dent.* **8**, 645–649.
- Gonty, A. A. (1995) Application of the interseptal alveolotomy for closing the oroantral fistula – Discussion. *J. Oral Maxillofac. Surg.* **53**, 1396.
- Graziani, M. (1995) *Cirurgia Bucocomaxilofacial*, 8th Edition. Guanabara Koogan, Rio de Janeiro.
- Gregori, C., Campos, A. C. (2004) *Cirurgia Buco-dento-alveolar*, 2nd Edition. Sarvier, São Paulo.
- Hanazawa, Y., Itoh, K., Mabashi, T., Sato, K. (1995) Closure of oroantral communications using a pedicled buccal fat pad graft. *J. Oral Maxillofac. Surg.* **53**, 771–775.
- Khandelwal, P., Hajira, N. (2017) Management of oro-antral communication and fistula: Various surgical options. *World J. Plast. Surg.* **6**, 3–8.
- Konate, M., Sarfi, D., El Bouhairi, M., Benyahya, I. (2021) Management of oroantral fistulae and communications: Our recommendations for routine practice. *Case Rep. Dent.* **2021**, 7592253.
- Kwon, M. S., Lee, B. S., Choi, B. J., Lee, J. W., Ohe, J. Y., Jung, J. H., Hwang, B. Y., Kwon, Y. D. (2020) Closure of oroantral fistula: A review of local flap techniques. *J. Korean Assoc. Oral Maxillofac. Surg.* **46**(1), 58–65.
- Mannelli, G., Arcuri, F., Comini, L. V., Valente, D., Spinelli, G. (2019) Buccal fat pad: Report of 24 cases and literature review of 1,635 cases of oral defect reconstruction. *ORL J. Otorhinolaryngol. Relat. Spec.* **81**, 24–35.
- Marzola, C. (2005) *Fundamentos de Cirurgia Buco-maxilo-facial: Tratamento Medicamentoso e Cirúrgico das Comunicações Buco Sinusais*. Ed. Independente, Bauri.
- Park, J., Chun, B. D., Kim, U. K., Choi, N. R., Choi, H. S., Hwang, D. S. (2019) Versatility of the pedicled buccal fat pad flap for the management of oroantral fistula: A retrospective study of 25 cases. *Maxillofac. Plast. Reconstr. Surg.* **41**(1), 50.
- Person, O. C., Nishimoto, E. S., Hamasaki, S. F., Guelere, P., Dell'Aringa, A. R. (2005) Corpo estranho em seio maxilar como causa de halitose. *Rev. Arq. Med. ABC* **30**, 54–57.
- Peterson, J. L., Ellis, E., Hupp, R. J., Tucker, R. M. (2000) *Cirurgia Oral e Maxilofacial Contemporânea*, 3rd Edition. Elsevier, Rio de Janeiro.
- Rey Santamaría, M. D., Valmaseda Castellón, E., Berini Aytés, L., Gay Escoda, C. (2006) Incidencia de comunicación bucosinusal tras la extracción de 389 terceros molares superiores. *Med. Oral Patol. Oral Cir. Bucal* **11**(4), 334–338.
- Ries Centeno, G. A. (1991) *Cirurgia Bucal*. El Ateneo, Buenos Aires.
- Tideman, H., Bosanquet, A., Scott, J. (1986) Use of the buccal fat pad as a pedicled graft. *J. Oral Maxillofac. Surg.* **44**, 435–440.