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(Citation)
Journal of Oral and Maxillofacial Surgery, Medicine, and Pathology,30(6):492-495

(Issue Date)
2018-11

(Resource Type)
journal article

(Version)
Accepted Manuscript

(URL)
https://hdl.handle.net/20.500.14094/90005415

Case Report

Facial artery musculomucosal flap to close an oroantral fistula

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Abstract

Oroantral fistulas (OAF), which develop as a result of maxillary sinus infection caused by oroantral communication, are sometimes intractable. We present a case of closure with a facial artery musculomucosal flap (FAMM flap) for intractable OAF. A 73-year-old man presenting with an OAF and rhinorrhea was referred to our department. Twenty-eight years earlier, he had undergone bilateral radical surgery for maxillary sinusitis, and six years earlier, he underwent extraction of his right maxillary first and second molars. Six months after the dental extractions, he developed maxillary sinusitis secondary to oroantral communication. Four years after the dental extractions, he underwent endoscopic sinus surgery with closure of the OAF with a rotational pedicled palatal flap, but the OAF recurred. To treat the OAF recurrence, we used a FAMM flap. His postoperative course was good, with no OAF recurrence 6 years after surgery. FAMM flaps are useful to close intractable OAFs.

Keywords: oroantral fistula; facial artery musculomucosal flap; maxillary sinusitis; palatal flap; hinge flap

1. Introduction

Oroantral communication (OAC) occurs primarily after extraction of the maxillary molars because of the close anatomical relationship between the root apices of the molar teeth and the sinus floor. Although the reported incidence is relatively low (5%), OAC is frequently encountered because of the large number of dental extractions that are performed [1]. Most OACs heal spontaneously when the defect size is < 5 mm [2]. The presence of epithelium arising from the oral and/or from the maxillary sinus mucosa inhibits spontaneous healing, and food and saliva contamination causes bacterial infection, impaired healing, and chronic sinusitis, unusually resulting in oroantral fistula (OAF). When an OAF is wider than 5 mm and persists for more than 3 weeks, additional surgical intervention is required [3, 4].

Surgical techniques used to close OAFs include simple vestibular mucosal flaps, buccal advanced flaps, buccal fat pad flaps, rotational pedicled palatal flaps, and nasolabial flaps [3-5]. The facial artery musculomucosal (FAMM) flap introduced by Pribaz et al. [6] has been used to close defects in the oronasal mucosa. We present a case in which a FAMM flap was useful to close an intractable OAF.

2. Case report

Time course of disease development

A 73-year-old man presenting with an OAF and rhinorrhea was referred to our department. The time course of disease development is described below.

- Twenty-eight years earlier (he was 45 years old), he had undergone bilateral radical surgery for maxillary sinusitis.
- Six years earlier (67 years old), he underwent extraction of his right maxillary first and second molars; however, six months after the dental extractions, he suffered maxillary sinusitis secondary to OAF.

- Two years after developing OAF (69 years old), he underwent closure of the OAF in a previous hospital (the details of the surgery were unknown).
- Two years after the closure (71 years old), OAF recurred, and he underwent endoscopic sequestrectomy of the right maxilla with widowing of the inferior nasal meatus with simultaneous OAF closure with a rotational pedicled palatal flap at the immediately previous department; however, OAF recurred a second time.
- One year and 6 months after the second OAF repair (73 years old), computed tomographic images revealed postoperative changes indicating a Caldwell-Luc procedure, a residual sequestrum in the right maxillary sinus, a nasoantral window, and a large defect in the inferior wall of the right maxillary sinus (Fig. 1). We planned debridement with closure of the recurrent OAF with a FAMM flap.

Surgical procedure

Under general anesthesia, we began by removing the sequestrum in the maxillary sinus through the oral cavity. The maxillary sinus was then lavaged thoroughly through the OAF and the nasoantral window (Fig. 2A). Next, the mucosa around the fistula was incised and inverted as a hinge flap. The defect in the mucous membrane of the inferior wall of the maxillary sinus was closed by suturing this hinge flap (Fig. 2B). The superiorly-based FAMM flap was then designed (Fig. 2C). The flap was based on the facial artery and oriented obliquely extending from the retromolar trigone to the upper gingivolabial sulcus, and anteriorly from Stensen's duct papillae. The flap pivot point was located close to the edge of the intraoral raw surfaces (Fig. 2C). An incision was made through the mucosa and under the buccinator muscle to reach the facial artery and accompanying vein, which were ligated, followed by dissection at the distal side of the flap. The flap was then rotated to cover the defect in the oral mucosa and sutured (Fig. 2D and E). Schema of the surgical technique is

shown in Figure 3. The donor defect was closed primarily in two layers: muscle and mucosa. One day after the surgery, oral liquid diet was started followed by soft diet three days after the surgery. The patient experienced no postoperative complications such as surgical site infection, hematoma formation, and wound dehiscence, and the OAF closed completely. Figure 2F shows the postoperative findings 1 year after the surgery. Six years after the surgery, we saw no recurrence of the OAF, mouth opening difficulty, or denture instability.

3. Discussion

OAFs originate from OACs previously closed with various flaps. OAFs with large bony and mucosal defects in the maxillary sinus must be closed with extensible flaps with stable blood supply. The FAMM flap has been commonly used to close palatal clefts and fistulae, and recently, to reconstruct intraoral defects (e.g. alveolus, tongue, lip, and floor of the mouth) after oncological resection [7-10]. We used the FAMM flap to close an intractable OAF that could not be sufficiently treated with a palatal flap.

A previous anatomical study revealed that the termination of the facial artery is commonly the dorsal nasal artery, followed by the coronal labial artery. The inferior and superior coronal labial arteries are constant and the most important collaterals [11]. The presence of tooth elements, especially molars, limits the use of a FAMM flap because of the possibility of flap pedicle injuries postoperatively; therefore, dentulous patients must be made aware that they will have to wear a bite block during the healing period [12]. In contrast, in edentulous patients, FAMM flaps are optimal because of the wide arch of rotation, which allows the reconstruction of large, posterior, and scarring defects [12,13]. Berania et al. [8] commented that the anterior limit of the flap should be located 10 mm posterior to the labial commissure, the posterior limit anterior to Stensen's duct papillae, and the width of the base of the flap at least 15 mm to ensure adequate venous drainage. Ayad et al. [14] commented

that the FAMM flap is preferable for small- to medium-sized defects following oral cancer ablation because in their study, partial flap failures were more frequent when the flaps were used for large defects following T3–T4 cancer ablation. The FAMM flap can be harvested both superiorly or inferiorly [15]. Pribaz et al. [16] used the superiorly based FAMM flap for upper lip defects and the inferiorly based flap for almost lower lip ones. The superiorly based FAMM flap is suitable for the closure of maxillary defects. The pivot point of the superior FAMM flap is in the vicinity of the maxillary tuberosity or in the gingivolabial sulcus [7]. We designed the pivot point of the flap in the vicinity of the intraoral raw surfaces, as shown in Figure 3.

Few reports discuss the usefulness of FAMM flaps to close OAFs following dental extraction. In a report by Dupoirieux et al. [11], two patients underwent OAF closure with a superiorly-based FAMM flap to repair defects in the upper vestibule caused by tooth extraction. The sizes of the flaps for the defects caused by the tooth extractions were 15–20 × 40 mm, and another four flaps to close defects caused by cyst, gunshot, and traffic accident were 10–20 × 25–70 mm [11]. Only the longest flap of 15 × 70 mm failed, as complete necrosis [11]. In another report by Shetty et al. [17], an anterior fistula following dental cyst excision, which measured 1.2 cm^2, was successfully closed with a superiorly-based FAMM flap. In contrast, our patient had intractable OAF with chronic infection following dental extraction that was previously closed with a palatal flap, unsuccessfully. There appear to be two major causes of the failure of the primary surgery with a palatal flap in our patient: (1) the residual infection within the maxillary sinus with sequestrum, as shown in Figure 1, might have disturbed wound healing; and (2) excessive tension on the margin of the palatal flap may have resulted in irregular blood flow leading to wound dehiscence. In the second surgery with the FAMM flap, we debrided first, to control infection within the maxillary sinus. The hinge flap was raised and closed on the side of the maxillary sinus, followed by covering the

raw surfaces in the oral cavity with the FAMM flap. A buccal fat pad flap was as an alternative to the FAMM flap, but a buccal fat pad in this patient could have been affected by the postoperative changes from the Caldwell-Luc procedure. The reasons we selected a FAMM flap in the second surgery were its reliable blood supply and the wide arch of rotation.

In conclusion, essential to treating the refractory OAF in our patient were using sufficient debridement and a two-layer repair (i.e., closing the maxillary sinus floor with a hinge flap and covering oral cavity raw surfaces with a flap with a reliable blood supply and a wide rotation arch, which are provided by the FAMM flap).

Funding

None.

Conflict of interests

None declared.

Ethical approval

Not required.

Acknowledgements

We thank Jane Charbonneau, DVM, from Edanz Group (www.edanzediting.com/ac) for editing a draft of this manuscript.

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Figure captions

Fig. 1. Preoperative coronal computed tomographic images (A). Arrow indicates the nasoantral window. Arrowhead indicates the large oroantral fistula. The residual sequestrum is evident.

Fig. 2. Intraoperative findings during FAMM flap surgery (A–E) showing communication between the oroantral fistula and the nasal cavity (A). The mucosa of the maxillary sinus is inverted as a hinge flap and closed (B). Markings for the facial artery musculomucosal (FAMM) flap (C). The FAMM flap is raised (D). The intraoral raw surfaces are covered with the FAMM flap. The donor site is closed primarily (E). Postoperative findings 1 year after surgery (F).

Fig. 3. Schema of raising the hinge flap (A), the superiorly based FAMM flap design, and transfer to the intraoral raw surfaces (B).

Figure
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Figure 1.

Figure
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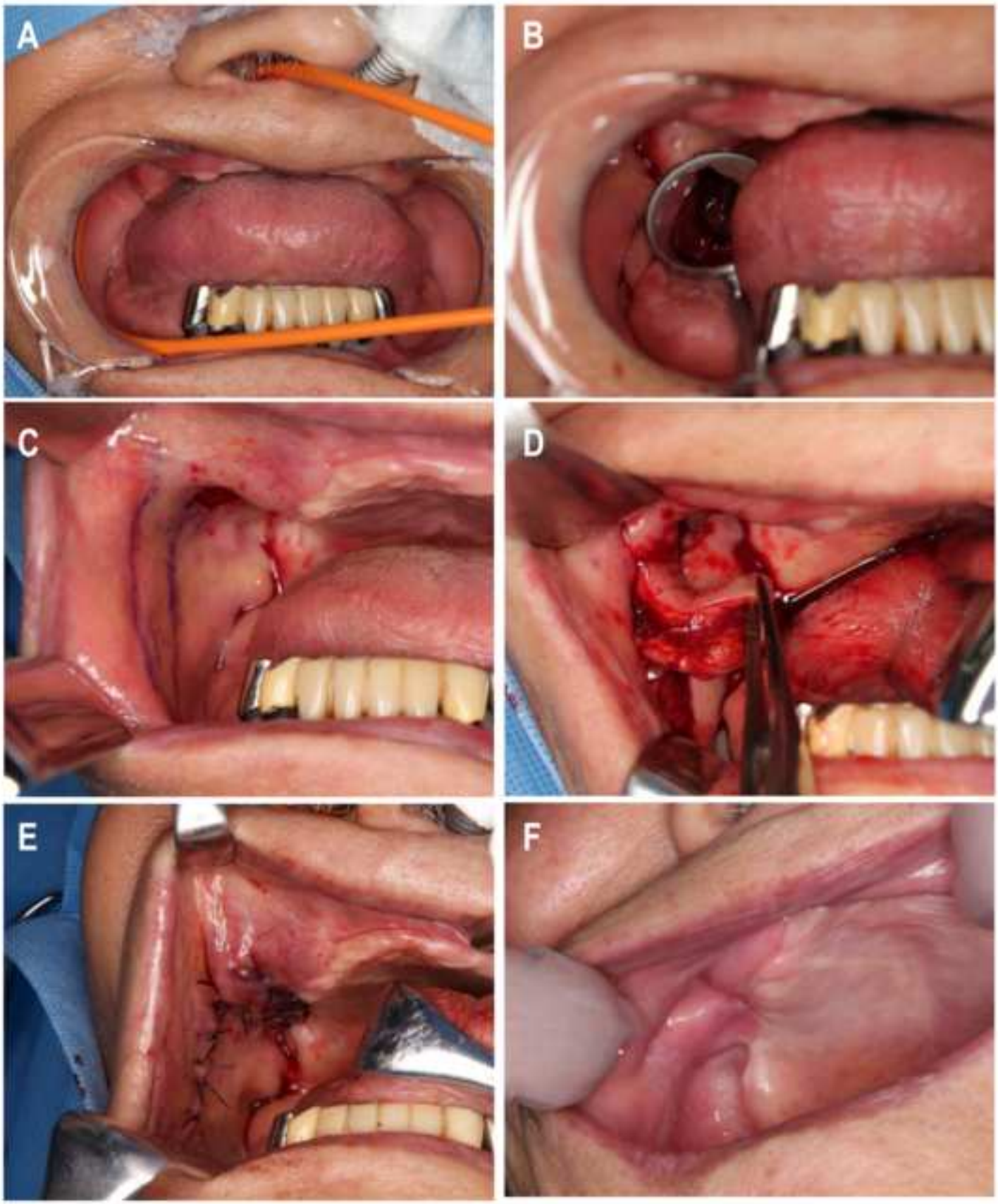

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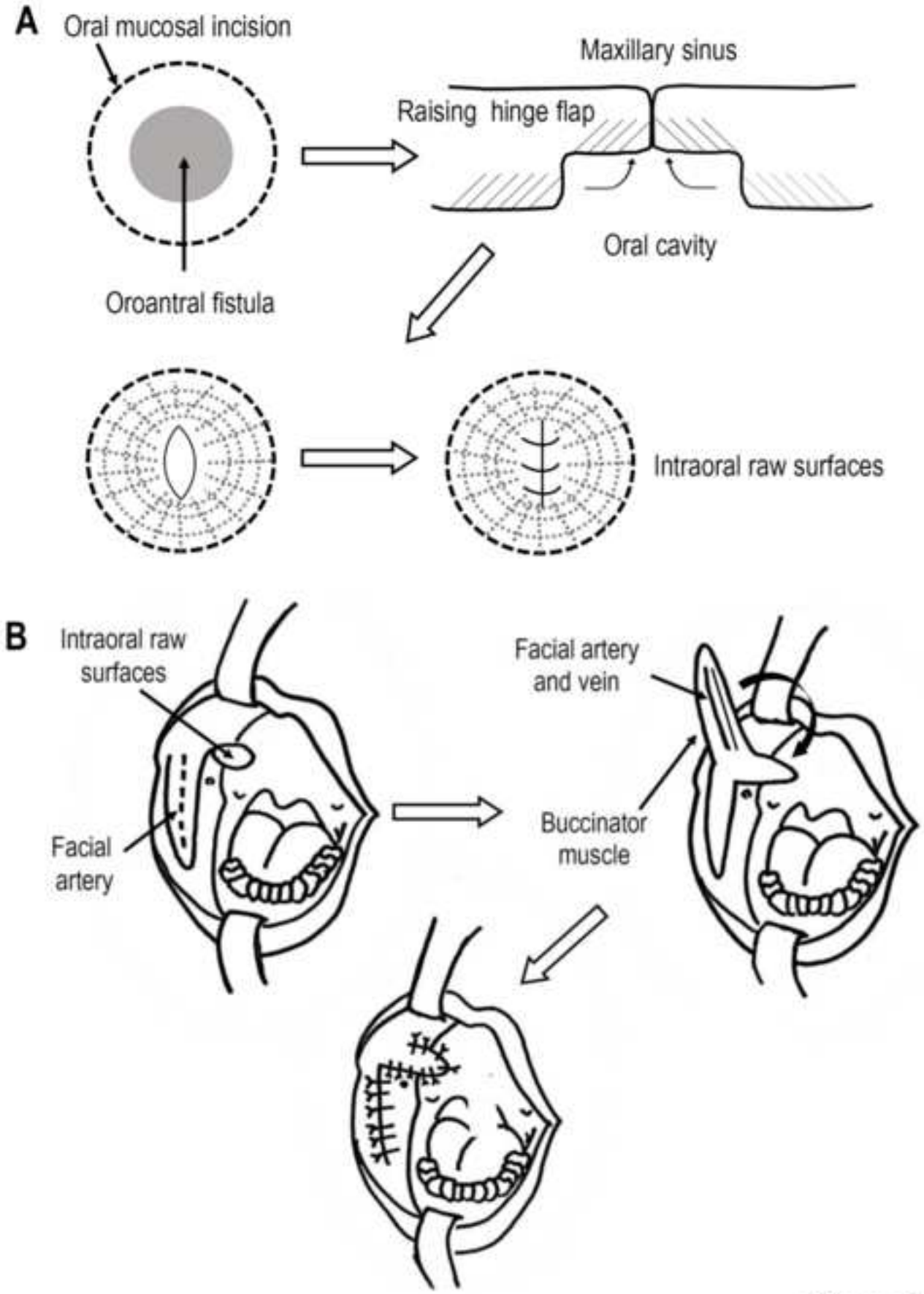

Figure 3.