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Partial glossectomy and floor of mouth (FOM) defect repair with biological dural graft: A case report

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ABSTRACT

INTRODUCTION: Oral carcinoma can cause significant defects that would necessitate a challenging reconstructive surgery. These techniques include biological or synthetic dressings, grafts, regional flaps, and free-vascularized flaps. Among these, the dural graft has demonstrated promising results in repairing the skull-base defects. Our aim is to report a new, innovative technique for partial glossectomy and floor of mouth defect repair using a biological dural graft dressing when primary repair was not feasible and the patient did not consent to dermal graft or flap interventions.

PRESENTATION OF CASE: This article reports the outcomes from a novel intervention of partial glossectomy repair using a biological dural dressing derived from bovine type-I collagen in a 57-year-old female patient with recurrent T1N1M0 squamous cell carcinoma of the left-sided tongue during the 12 month period of follow-up.

DISCUSSION: The best option for large tongue defects is a free flap, while for a moderate defect is a regional oral flap. The biological graft, as an acellular dermal graft has been well known to facilitate secondary healing in the tongue as an alternative to the split-thickness skin graft. In the current study, the dural dressing in tongue reconstruction was likewise shown to be an effective biological dressing; hence, the collagen membrane is biologically acceptable to the oral mucosa and an excellent wound graft material. However, it is absolutely contraindicated in bovine hypersensitive patients.

CONCLUSION: The biological dural graft dressing appears to be an effective method for tongue reconstruction, as it promotes adequate wound healing and it preserves function.

1. Introduction

Oral carcinoma can cause significant mucosal and bony defects that can necessitate a challenging reconstructive surgery. Oral and pharyngeal cancer is the sixth-most commonly occurring cancer internationally [1]. In the United States, cancers of the oral cavity account for nearly 2.3% of cancers; the survival rate is 60–80% for stages I and II, 40% for stage III, and 20% for stage IV [2]. The major risk factors for the development of cancers of the oral cavity are smoking and alcohol consumption, which when combined can exert a synergistic effect [3].

Primary surgical treatment is an effective modality in the treatment of T1–T2 oral tongue carcinoma, and a low rate of complications can normally be anticipated [4]. Selective neck dissection is usually required even for N0 neck, especially if microvascular access will be required for flap reconstruction [4].

Adjuvant treatment consists of postoperative radiotherapy (interstitial or percutaneous), either alone or combined with chemotherapy. Typical indications for adjuvant treatment include the presence of positive surgical margins when further surgery is not feasible, advanced neck disease, a tumor infiltration depth of greater than 5 mm, extracapsular tumor spread, and the infiltration of lymph vessels or nerves in the histology [4].

A reconstruction technique can be used to ensure adequate wound healing, the preservation of functions, and cosmetic appearance. These techniques include free vascularized flaps [5], local region flaps such as buccinator myomucosal flaps and skin grafts [6]. Furthermore, the biological graft has been well known to facilitate secondary healing in the tongue with the use of acellular dermal membrane graft (ADM) as alternative of split-thickness skin graft (STSG) [7]. The current study reports a novel clinical experience in the field of tongue reconstruction with the use of a different type of dermal dressing which is the dural graft.

Dural grafts are well known from their use in sinus, otologic, and skull-base surgeries. These grafts can be used to prevent cerebrospinal leak or as a septal reinforcement graft in epistaxis cases

Abbreviation: ADM, acellular dermal membrane graft; STSG, split thickness skin graft.

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arising from hereditary hemorrhagic telangiectasia. Several dural substitutes are currently commercially available [8]. Among these dural substitutes, only semisynthetic collagen matrix grafts appear promising; this is because they are thought to provide a matrix for ingrowth of, and subsequent replacement by, endogenous connective tissue, while continuously presenting a mechanical barrier [9].

Our aim is to report, a new innovative technique for partial glossectomy and floor of mouth defect repair using a biological dural graft dressing when primary repair was not feasible and the patient did not consent to dermal graft, regional or free vascular flap intervention.

2. Presentation of case

2.1. History

A 57-year-old female patient complained of a tongue lesion on the left lateral tongue lasting two months. The lesion first presented as a white patch and progressively increased in size and was associated with mild pain. The patient had no history of dysphagia or hoarseness. The patient had a 30 pack year smoking history.

2.2. Examination

On examination, the patient had a left lateral tongue lesion. It was approximately 1.4 × 2.7 cm in greatest dimension, and there was no detectable mass in the nasopharynx or larynx. The vocal cords were mobile bilaterally. No palpable neck mass was detected. The patient underwent biopsy of the left tongue lesion, which showed well-differentiated invasive squamous cell carcinoma.

A preoperative evaluation, a CT scan of the chest, neck, abdomen and pelvis showed a left lateral anterior tongue lesion 2.5 × 1.5 cm with multiple enlarged ipsilateral left neck lymph nodes (Level II, 1.5 cm and Level III, approximately 2 cm). MRI of the neck showed the same findings as CT. The fine needle aspiration of lymph nodes showed equivocal results with no definitive diagnosis. The clinical stage of the patient was T2N2bM0 squamous cell carcinoma of the tongue.

2.3. First procedure

The patient was admitted in January 2014 to undergo left partial glossectomy with primary closure and left selective neck dissection of levels I–IV.

2.3.1. Histopathology

Histopathological analysis revealed a well-differentiated invasive squamous cell carcinoma of the tongue. The tumor was 1.6 cm in size at its greatest diameter and was found to be in stage pT1. The tumor thickness was 0.7 cm, a focus of perineural invasion was present, no lymphovascular invasion was discovered, and all surgical margins were free. One of the 14 lymph nodes was positive for metastasis, which measured 1.3 cm. Definitive histopathological staging was T1N1M0.

The patient condition was discussed at the multidisciplinary head and neck tumor board after the initial procedure and because the permanent histopathology examinations revealed a perineural invasion with one ipislateral lymph node that is positive for malignancy, which measured 1.3 cm, the decision was made to initiate conventional fractionated radiotherapy of both the primary site of tongue and the neck with a total dose of 60 Gy in 30 fractions (2 Gy per fraction in 6 weeks treating 5 days per week), to be given 6 weeks after the first operation. This administration schedule was selected as the literature has reported that postoperative radiotherapy should be planned to be commenced 3–8 weeks after surgery [10].

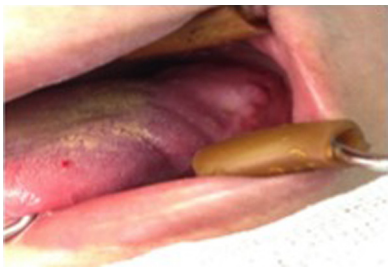

Fig. 1. Tongue lesion before the revision partial glossectomy and dural graft dressing.

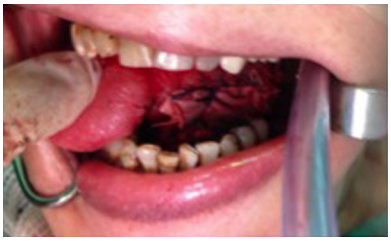

Fig. 2. Dural graft after revision partial glossectomy with dural graft dressing.

2.3.2. Follow-up

The patient developed difficulty in swallowing and speech that resolved after 10 days. After 6 weeks, the patient presented to the clinic complaining of tenderness and swelling at the site of the tongue excision. Examination revealed a nodular lesion that was measured as 1.8 in width and 3.4 cm in length with redness and tenderness (Fig. 1). The patient was scheduled for excisional biopsy of the nodule to exclude persistent tongue cancer cells, although the margins were free in the histopathology of first procedure. However, it exhibited neural invasion and positive lymph node, which are considered to be an intermediate risk for regional metastasis and poor prognosis [11].

2.4. Second procedure

On February 12, 2014, the patient underwent completion of the previously performed partial glossectomy using a frozen section that demonstrated scar and chronic stomatitis with a foreign body reaction, but no malignancy.

Following the revised excision, the defect was extended to the floor of mouth, 2.8 × 4.4 cm including the excision of the lesion with 1 cm around its borders to ensure that the margins were free of malignancy. An attempt at primary closure of the defect would have required the tongue to be tethered to the floor of the mouth; this could have increased the patient's difficulty in speech, mastication, and deglutition. Consequently, another treatment modality was considered. The promising results of the use of dural grafts in repairing defects at the skull base encouraged us to implement a dural graft in this case as biological dressing. We used DuraGen which contains Type I collagen that is derived from the bovine Achilles tendon. The dural dressing was 4.5 × 3 cm in size, and it was placed over the defect in the left tongue and the floor of mouth. The dressing was sutured and stabilized by interrupted vertical mattress sutures through the interdental papilla and floor of mouth using 3.0 VICRYL non-absorbable suture (Fig. 2).

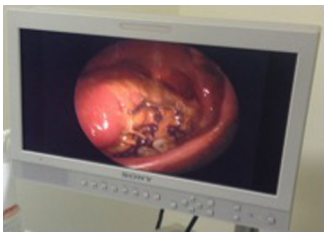

Fig. 3. Dural graft 1 week after revision partial glossectomy with dural graft dressing.

2.4.1. Follow-up

Following the procedure, the patient experienced mild difficulty in articulation and swallowing. One week after the procedure, the patient was able to swallow normally, but had experienced mild difficulty in the protrusion of the tongue (Fig. 3). After 3 weeks, the dural graft was removed and the granulation tissue demonstrated a normal healing process. At the end of 3 months, the patient returned to her normal articulation. At the end of the 12 month follow-up period, the tongue wound had healed completely with surface epithelisation across the entire wound, but associated with the usual side effect of stomatitis as a result of treatment with radiotherapy (Fig. 4).

3. Discussion

In most cases of oral tongue cancer, reconstruction is challenging. If primary closure is not possible, reconstruction is needed to facilitate the healing process and to obtain satisfactory swallowing and articulation functions [12,13]. These reconstruction methods include free-flap reconstruction in cases of large defects, while for moderate to mild defects, regional oral flap, free skin grafting, and biomaterial grafting are indicated [5]. There are various new techniques for reconstruction, including the use of biological dressing of fresh amniotic membrane graft [14] and the use of a polyglycolic acid sheet with a fibrin-glue spray [15].

The biological dural collagen dressing was used in this case because the tongue and floor of mouth defect was unable to be closed without causing tongue tethering. Additionally, the patient had not previously planned for and consented to a regional flap or autograft procedure. The dural dressing is not an alternative to standard reconstruction methods of regional flap, but it is one type of biological dressing that facilitates mucosal healing similar to that of the split-thickness skin graft [7]. The following describes the advantages and disadvantages of different modalities of reconstruction. Free flaps are the best option for large defects. However, the use of free flaps is associated with donor site morbidity, and requires complex surgery. We concluded that the optimal treatment for this patient with a moderate tongue defect, and a previous history of neck dissection is the buccinator musculomucosal regional flap. The advantages of the regional oral flap are that it replaces the tongue mucosa with the same type of mucosa, avoiding donor site morbidity, and achieving optimal functional and cosmetic results [6]. The split-thickness graft is also an effective method for moderate defect which can be harvested from any body surface such as the anterior upper thigh by using a powered dermatome set at 0.015 inch. thickness, it has the advantage of easy availability, simplicity of harvest, rapid healing of the graft in moist oral cavity and avoiding the risk of rejection. However, the split thickness result in keratinized graft in otherwise mucosal–lined cavity [7].

The use of biological dressing has the advantages of avoidance of the creation of a donor site with its associated pain and morbidity, reduced autologous skin graft thickness, and ability to be performed without requiring special surgical skills. However, some of these products have the disadvantage of cost and availability [16]. Chern et al. conducted a literature review of various biologic dressing used in acute surgical wounds. The study compared the utility, outcomes, and adverse effects among the different types of biological dressings that included the composite, dermal and epidermal grafts [16]. They found that the majority of studies of biological grafts in acute surgical wounds have been conducted on composite grafts such as Apligraf which is formed of the epidermal part of human neonatal foreskin keratinocytes and the dermal part of neonatal foreskin fibroblast with bovine type I collagen matrix, which seems to demonstrate favorable results of avoiding the creating a donor site, and ease of wound care. However, the major disadvantage of

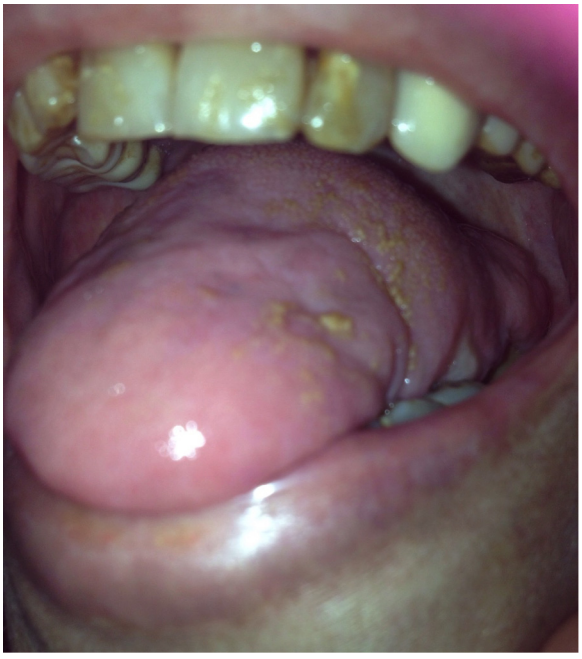

Fig. 4. Tongue 12 months after the revision partial glossectomy and dural graft dressing.

composite grafts is their short shelf life. The dermal grafts such as Integra are associated with numerous commercial products. One of them is DuraGen which has been used in the current study. This graft is formed from cross-linked bovine collagen and glycosaminoglycan, it coated on one side with a silicone membrane and it has shown promise in inhibiting wound contraction, scar formation and keloids. It has a role in the repair of defects where soft tissue bulk is needed for coverage, such as with large scalp defects after excision of cutaneous malignancy. However, it is associated with the risk of seroma and infection. An epidermal graft is an autologous pinch graft of epidermal keratinocytes that is used as a permanent wound coverage of a large area from a small amount of skin harvested but it is requires 3 weeks for graft cultivation [16]. The use of other biological graft dressings such as fresh amniotic membrane grafts, has the advantage of facilitating healing and being characterised by lower immunologicity [14], but fresh grafts are difficult to obtain on demand, as they become necessary. Although there are limited studies on the use of porcine xenograft, dermatologic surgeons widely use this product, which has the significant benefit of low cost and immediate availability [16].

The use of bovine dural graft is absolutely contraindicated in patients with a known history of hypersensitivity to bovine-derived materials. However, the possibility of allergic reaction to duraplasty material derived from bovine tissues is extremely low in patients without history of bovine allergy, as the dural substitutes are prepared in such a manner that they contain only chemically acellular collagen with no other animal protein [17]. However, the literature has documented only one case report of allergic reaction to dural graft derived from bovine tissue. In this case, the patient had a history of myelomeningocele and he developed an allergic reaction after the procedure of cord untethering with Durepair [18]. Furthermore, bovine dural graft is relatively contraindicated in the presence of surgical site infection, as two cases of wound infections have been reported in two studies consisting of 32 and 22 patients who underwent bovine pericardial duraplasty [19,20].

The criteria for the judgment of dural graft dressing usefulness are based on the Bessho and Murakami scale, which includes five categories; the hemostatic effect on the day after operation, the pain relief after one week, the granulation tissue formation at the third week, the surface epithelialization after one month of the surgery and the allergenicity to the material. These criteria were judged as good, fair or poor, which were assigned scores of 2, 1, and 0, respectively. Finally, usefulness of the material was graded as very useful (8–10 points), useful (5–7 points), or useless (0–4 points) [21]. In the current case the biological dural graft was found to be very useful receiving a total grade of 9 out of 10. This rating was earned as a result of the hemostasis on the day after operation being good (2 points), and the pain score after one week being fair (1 points). The formation of granulation tissue in the third week was good on the entire wound (2 points). The surface epithelialization, assessed at the end of one month, was good (2 points). Moreover, the patient had not developed any reactivity or allergenicity to the material (2 points).

Regarding the radiotherapy effect, Girod et al. reported that the radiation therapy had an adverse effect on both types of grafting (ADM and STSG), while the ADM group still demonstrated some improvement over the STSG group [7]. In our case, the patient developed usual acute side effects of radiotherapy, including stomatitis and xerostomia, but this did not compromise the achievement of complete healing during the period of the 12 month follow-up.

4. Conclusion

The use of a biological dural graft with partial glossectomy was an effective method for facilitating secondary healing in mild to moderate mucosal tongue defect, when primary repair was not feasible and the patient had not consented for dermal graft, regional or free vascular flap procedures. Moreover, the biological dural graft exhibited the advantages of easy availability, the ability to be performed without requiring special skills, and effectiveness in the prevention of postoperative scar formation and contraction of the tongue.

Conflicts of interest

None. No financial or funding support.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Ethical approval

Permission to conduct this study was granted by the Institutional Review Board of the Western region of Saudi Arabia under the principle of the Helsinki Declaration with reference number 304-14.

Disclaimers

None declared. All authors have approved the final article.

Authors' contributions

Khalid B. Al-Ghamdi: Revising the article critically for important intellectual content, final approval of the version to be submitted, performing the surgical procedure.

Zainab A. Bakhsh: The conception and design of the study, acquisition of data, analysis and interpretation of data, drafting of the article, final approval of the version to be submitted.

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