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Verrucous Carcinoma of the Buccal Mucosa: Resection and Reconstruction Using Amniotic Membrane - A Case Series of Three Patients with Favorable Aesthetic and Functional Outcomes

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Abstract: ***Background: Verrucous carcinoma (VC) of the oral cavity is a low-grade, well-differentiated variant of squamous cell carcinoma with distinct exophytic, warty morphology. It predominantly affects the buccal mucosa, often arising in patients with a long-standing history of tobacco and areca nut chewing. Despite its locally aggressive behavior, VC carries a favorable prognosis when managed with adequate surgical excision. Reconstruction of the resultant intraoral defect, particularly in elderly patients, poses a significant challenge; the ideal reconstructive material should be readily available, biocompatible, and promote mucosal healing with minimal morbidity. Methods and Patients: We present a case series of three patients (age range 54-72 years) with biopsy-confirmed verrucous lesions of the buccal mucosa. All three underwent wide local excision under general anesthesia followed by reconstruction using a combination of the pedicled buccal fat pad (BFP) and human amniotic membrane (HAM). Functional outcomes (mouth-opening, mastication, speech) and aesthetic outcomes (contour symmetry, scar visibility) were assessed at one week, one month, and three months post-operatively. Results: All three patients demonstrated uncomplicated wound healing, satisfactory restoration of buccal contour, and preserved oral function at follow-up. No recurrence was observed within the follow-up period. The BFP provided well-vascularized soft-tissue volume replacement, while the HAM acted as a biologic scaffold promoting re-epithelialization and minimizing scar contracture. Conclusion: Wide local excision followed by dual-layer reconstruction with BFP and HAM is a safe, effective, and reproducible technique for managing moderate-sized verrucous lesions of the buccal mucosa, offering excellent aesthetic and functional outcomes.***

Keywords: Verrucous carcinoma, buccal mucosa, wide local excision, buccal fat pad, amniotic membrane, oral reconstruction, tobacco, areca nut, oral potentially malignant disorder.

1. Introduction

Verrucous carcinoma of the oral cavity was first described by Ackermann in 1948 and is now recognised as a distinct clinicopathological entity among oral squamous cell carcinomas. It accounts for approximately 2–12% of all oral carcinomas and carries a characteristically indolent but locally destructive clinical course. The buccal mucosa is the single most common site, accounting for over 60% of cases in South and Southeast Asian populations where tobacco and areca nut (betel nut) chewing habits are prevalent [1].

Clinically, VC presents as a slow-growing, white or grey, exophytic, cauliflower-like or warty growth with a broad base. Unlike conventional squamous cell carcinoma, lymph node metastasis is exceptional, yet inadequate local excision leads to predictable recurrence. Surgical wide local excision with tumour-free margins remains the mainstay of treatment, while the role of radiotherapy remains controversial owing to reports of anaplastic transformation following irradiation [2].

Reconstruction of intraoral buccal defects poses unique challenges: the buccal mucosa is a functional surface critical to mastication, swallowing, and speech. Donor-site morbidity, patient age, comorbidities, and defect size must guide the choice of reconstructive modality. The pedicled buccal fat pad (BFP), described by Egyedi in 1977 and popularized by Tideman et al. in 1986, offers an accessible, well-vascularized, and reliable option for defects up to 5 cm in the posterior buccal mucosa [3,4]. Human amniotic membrane (HAM) is a collagen-rich, immunologically inert biologic scaffold with documented anti-inflammatory, anti-fibrotic, and pro-epithelialization properties that make it an excellent adjunct for intraoral wound coverage [5,6].

The combination of BFP and HAM for reconstruction after VC excision has been reported in isolated cases but a systematic case series directly demonstrating the aesthetic and functional outcomes of this dual-layer approach is lacking in the current literature. We present three patients treated at our institution to illustrate the versatility and reproducibility of this technique.

2. Patients and Methods

Three patients presenting to the Department of Oral and Maxillofacial Surgery with verrucous lesions of the buccal mucosa were included in this series. Diagnosis was confirmed by chairside toludine blue test and incisional biopsy in all cases. Systemic fitness was assessed by pre-operative hematological investigations, chest radiograph, electrocardiogram, and two-dimensional echocardiography. Medical fitness was obtained prior to operative intervention. All procedures were performed under general anesthesia with Naso-tracheal intubation. All patients provided written informed consent. Patient identifiers have been masked to preserve confidentiality.

2.1 Surgical Technique

A standardized operative protocol was followed across all three cases:

- Pre-operative lesion demarcation: The margins of the lesion were identified and marked with a surgical marker, ensuring a minimum 1 cm clearance from the clinical edge.
- Wide local excision: Excision was performed using a No. 15 Bard-Parker blade. Dissecting scissors, skin hooks, and monopolar/bipolar electrocautery were used for hemostasis and dissection. The specimen was submitted for formal histopathological assessment of margins.
- Extraction of associated teeth: Teeth within the zone of excision and those with peri-lesional involvement were extracted in the same sitting.
- Buccal fat pad harvesting: The BFP was accessed through an incision in the buccal mucosa posterior to the parotid duct. The fat was gently teased out with mosquito forceps and advanced to cover the defect without tension. It was secured with interrupted 3-0 Vicryl sutures.
- Amniotic membrane application: A single sheet of decellularized HAM was trimmed to match the defect dimensions and sutured over the BFP with 4-0 Vicryl in two cases with the basement-membrane surface facing the raw wound bed. An additional layer of collagen membrane was used to reinforce coverage in one case without buccal fat pad. (fig 1)

Figure 1: Amniotic membrane

- Wound closure: Remaining mucosal edges were closed primarily wherever tension-free apposition was feasible.

3. Case Reports

Case 1

History and Examination

A 72-year-old female patient presented with a gradually enlarging white patch over the left buccal mucosa associated with burning sensation and dull aching pain of 5 months' duration. The pain was aggravated on eating and subsided spontaneously. The patient reported a prolonged history of betel nut and tobacco chewing (5–6 times per day) for approximately 40 years, which she had discontinued 3 weeks prior to presentation. General physical examination was unremarkable; the patient was conscious, oriented, and systemically stable. No cervical lymphadenopathy was detected.

Intraoral examination revealed a solitary white, non-scrapable, exophytic lesion over the left buccal mucosa (fig 2) measuring approximately 35 mm. The lesion had a verrucous, irregular surface with indurated margins. Toluidine blue staining was positive, raising clinical suspicion of dysplasia.

Investigations

Routine haematological parameters, chest radiograph, ECG, and 2D echocardiogram were within normal limits. An orthopantomograph was obtained to assess adjacent dental structures. Incisional biopsy confirmed verrucous leukoplakia with epithelial dysplasia. Staging according to the Evren et al. classification placed the lesion at Stage III.

Figure 2: White, non-scrapable, exophytic lesion over the left buccal mucosa

Treatment and Outcome

Wide local excision of the lesion (fig 3) was performed under general anaesthesia with appropriate safety margins. Teeth involved at site of lesion were extracted. The resultant defect was reconstructed using HAM supplemented with a collagen membrane secured with interrupted 4-0 Vicryl sutures. Post-operative recovery was uneventful. At 1-week follow-up, the membrane was well-integrated with no evidence of dehiscence, infection, or excessive inflammatory response. The patient demonstrated satisfactory mouth opening and reported significant reduction in discomfort. Oral hygiene instructions and dietary modification counselling were provided.

Figure 3: Wide local excision of the lesion

Figure 4: Bilaminar reconstruction using amniotic membrane and collagen sheet

Figure 5: 1 Week Follow up

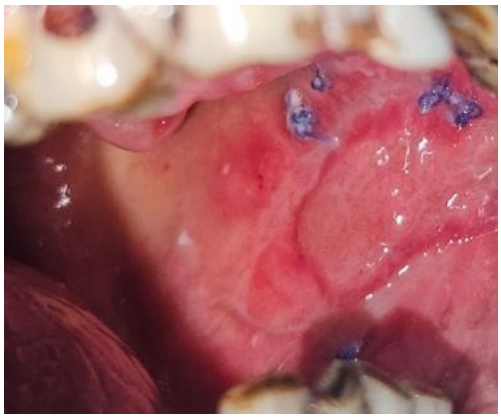

Figure 6: 2- week Follow up

Case 2

History and Examination

A 58-year-old hypertensive male presented with a progressively enlarging growth over the right buccal mucosa of 3 months' duration, associated with burning sensation, mild pain, and slight difficulty in chewing. The growth was insidious in onset and had increased from a small papule to its current size of approximately 3 × 2.5 cm. The patient had a significant history of gutka chewing (3–5 packets/day for 30 years) and tobacco quid chewing (twice daily for 3 years). He was on anti-hypertensive medication and was otherwise systemically stable.

Intraoral examination revealed a solitary whitish, ulcero-proliferative lesion over the right buccal mucosa measuring 3 × 2.5 cm with an irregular outline, everted and raised edges, a granulation-tissue-covered floor, and indurated base on palpation. The surrounding mucosa was erythematous. The lesion extended antero-posteriorly from the 46 to 48 region and supero-inferiorly from the cervical margin of 46–48 to the depth of the buccal vestibule. No regional lymphadenopathy was detected.

Investigations

Routine blood investigations, chest radiograph, ECG, and 2D echocardiography were performed and general medical fitness obtained. Contrast-enhanced computed tomography (CECT) of the neck was performed to delineate the lesion extent and assess for nodal disease. Incisional biopsy (performed at the referring institution) confirmed the diagnosis of verrucous hyperplasia/verrucous carcinoma.

Figure 7: Cauliflower like lesion over the left buccal mucosa

Treatment and Outcome

Wide local excision was performed under general anaesthesia. The lesion was excised with adequate clearance margins. Teeth 41 through 48, within the zone of excision and peri-lesionally involved, were extracted in the same operative sitting. The resultant posterior buccal defect was reconstructed using a pedicled BFP advanced from the buccinator space and secured in position. HAM was placed over the BFP as a second-layer biologic dressing to facilitate epithelialisation and prevent contraction. Post-operatively, the patient was managed with analgesics, antibiotics, and chlorhexidine mouthwash. Follow-up at 1 week demonstrated excellent graft take, intact BFP vascularity, and minimal oedema. At 1 month, near-complete re-epithelialisation was noted. At 3 months, the patient had restored masticatory function with satisfactory oral aperture and no evidence of local recurrence.

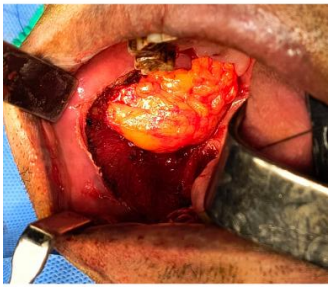

Figure 8: Buccal fat pad

Figure 9: Secured amniotic membrane

Figure 10: 1 Week Follow up

Case 3

History and Examination

A 54-year-old diabetic male presented with a white, slowly growing exophytic lesion over the left buccal mucosa and commissure region, accompanied by burning sensation and progressive reduction in mouth opening over a period of 4 months. The patient reported no history of dysphagia, dysphonia, or constitutional symptoms. He had a 25-year history of tobacco chewing and pan masala consumption (4–6 times daily). Diabetes mellitus was diagnosed 3 years prior to presentation and was controlled on oral hypoglycaemics (HbA1c 7.2%). Pre-operative optimisation of glycaemic control was achieved with the endocrinology team.

Intraoral examination demonstrated a solitary, white, warty, exophytic growth over the left buccal mucosa extending toward the commissure, measuring approximately 2.8 × 2.2 cm. The lesion had a cauliflower-like surface texture with a broad, indurated base. Fibrous banding was palpable in the adjacent buccal mucosa consistent with concomitant oral submucous fibrosis. Inter-incisal distance on maximum mouth opening was 28 mm. No cervical lymphadenopathy was present.

Investigations

Haematological workup including fasting blood sugar, HbA1c, complete blood count, and coagulation profile were within acceptable ranges post-optimisation. Panoramic radiograph showed peri-apical pathology associated with teeth 34 and 35. Incisional biopsy confirmed a diagnosis of well-differentiated verrucous carcinoma without invasive transformation.

Treatment and Outcome

Wide local excision under general anaesthesia achieved microscopically clear resection margins. Teeth 34, 35, and 36 were extracted due to direct involvement in the excision perimeter. The surgical defect was reconstructed in a dual-layer manner: the BFP was mobilised from the ipsilateral buccal space and draped over the exposed wound without tension; HAM was fixed over the BFP surface, providing a smooth, moist biological barrier. Collagen sutures were used throughout. Post-operative recovery was satisfactory despite the patient's diabetic status. Fasting blood sugar was monitored twice daily during hospitalisation. Wound inspection at 1 week revealed intact membrane coverage with early granulation tissue beneath the amniotic layer. At 4-week review, re-epithelialisation was substantially complete and mouth opening had improved to 36 mm — an 8 mm gain compared to pre-operative baseline. At 3-month follow-up, masticatory efficiency and speech were fully preserved with aesthetically pleasing contour of the buccal mucosa and no recurrence.

Figure 11: Secured Amniotic membrane over buccal fat pad

4. Summary of Cases

Parameter	Case 1	Case 2	Case 3
Age / Sex	72 years / Female	58 years / Male	54 years / Male
Site	Left buccal mucosa	Right buccal mucosa	Left buccal mucosa + commissure
Duration of symptoms	5 months	3 months	4 months
Lesion size	35 mm	3 × 2.5 cm	2.8 × 2.2 cm
Habit	Betel nut + tobacco (40 yrs)	Gutka (30 yrs) + tobacco quid (3 yrs)	Tobacco + pan masala (25 yrs)
Diagnosis	Verrucous leukoplakia, Stage III	Verrucous hyperplasia/carcinoma	Verrucous carcinoma (well-differentiated)
Teeth extracted	None	41 – 48	34, 35, 36
Reconstruction	HAM + collagen membrane	BFP + HAM	BFP + HAM
Complications	None	None	None (diabetic patient)
Follow-up outcome	Good healing, reduced pain	Full re-epithelialisation, good function	Mouth opening improved 28→36 mm; no recurrence

5. Discussion

Verrucous carcinoma represents a clinically important subset of oral cancer in which timely surgical intervention, guided by sound oncological principles, can yield excellent long-term outcomes. The present series confirms that wide local excision with tumour-free margins is achievable in moderate-sized buccal VC while simultaneously achieving functional and aesthetic reconstruction through the combined use of BFP and HAM.

5.1 Aetiological Considerations

All three patients in this series shared a consistent background of chronic smokeless tobacco exposure, consistent with the established aetiology of oral VC in South Asian populations. The carcinogenic potential of tobacco-specific nitrosamines and arecoline- the principal alkaloid in areca nut- is well-documented and is compounded by the synergistic effect of combining these two agents [7]. Cessation counselling and

long-term surveillance are integral to the management plan for each of these patients.

5.2 Role of the Buccal Fat Pad

The BFP is an encapsulated adipose structure within the masticator space, intimately related to the buccinator muscle. Its reliable blood supply from the facial, transverse facial, and buccal arteries, and its proximity to intraoral defects make it the first-line reconstructive option for posterior and mid-buccal defects up to approximately 5 × 5 cm [3,4]. In the present series, the BFP provided immediate, vascularised bulk replacement that maintained the three-dimensional contour of the cheek and prevented the skin-dimpling contracture often seen with split-skin grafts. Importantly, the technique does not preclude future surveillance and is associated with low donor-site morbidity — a critical advantage in patients with comorbidities such as hypertension (Case 2) and diabetes mellitus (Case 3).

5.3 Role of Human Amniotic Membrane

HAM has emerged as a versatile biologic dressing in oral and maxillofacial surgery. Its unique composition- a thick basement membrane, an intermediate compact layer, and a spongy stromal layer- provides a structural scaffold that guides epithelial cell migration and proliferation [5]. Published evidence supports its anti-inflammatory properties (attributed to interleukin-1 receptor antagonist and interleukin-10 content), anti-fibrotic activity (inhibition of TGF-β signalling), and analgesic effect through reduction of nociceptive peptides at the wound bed [6]. In Case 1, HAM alone- complemented by a collagen membrane- facilitated mucosal re-epithelialisation over a non-adipose wound surface; in Cases 2 and 3, it served as a second-layer dressing over the BFP, accelerating surface healing and reducing the risk of post-operative fibrous contracture that may otherwise compromise mouth opening.

5.4 Functional and Aesthetic Outcomes

The functional priority in buccal reconstruction is preservation of adequate oral aperture, mastication, and speech. In the present series, all three patients achieved mouth-opening measurements within the functional range (>35 mm) at 3-month follow-up. Notably, Case 3- who presented with pre-existing submucous fibrosis and restricted opening of 28 mm- demonstrated an objective improvement to 36 mm following reconstruction, underscoring the anti-fibrotic advantage of HAM. Masticatory efficiency was reported as adequate by all three patients. Regarding aesthetic outcomes, the BFP provided natural buccal fullness avoiding the hollowed appearance associated with mucosal-only closures. Patients and attendants consistently commented on the unremarkable external facial appearance in the immediate post-operative period.

5.5 Comparison with Alternative Techniques

Nasolabial flaps, temporalis fascia flaps, and free flaps such as the radial forearm free flap offer reliable reconstructive options for larger or composite buccal defects. However, these techniques are associated with external donor-site scarring, prolonged operative time, and anaesthetic risk-considerations that are particularly relevant in the elderly or medically compromised patient cohort represented in this series [8]. For small to moderate defects in the posterior buccal mucosa, BFP + HAM reconstruction represents a single-field, low-morbidity solution that does not preclude future free-flap reconstruction if required for recurrence or second primary tumours.

Split-thickness skin grafts (SSG) have historically been used for intraoral defects but are associated with higher rates of contracture, colour mismatch, and keratinization- all undesirable in a moist mucosal environment [9]. Collagen membranes and artificial dermis are viable adjuncts but lack the biological activity of HAM. The present series therefore supports the growing body of evidence favouring HAM as the preferred biologic membrane in the oral cavity.

6. Conclusion

This case series demonstrates that wide local excision followed by dual-layer reconstruction using a pedicled buccal fat pad and human amniotic membrane is an effective, safe, and reproducible technique for verrucous lesions of the buccal mucosa. The procedure is well-tolerated across a range of patient profiles — including the elderly and those with systemic comorbidities — and consistently delivers favourable functional and aesthetic outcomes. The combined use of BFP and HAM leverages the complementary properties of each material: the BFP restores structural volume while the HAM promotes biological wound healing and minimises contracture. These results support wider adoption of this reconstructive approach in the management of moderate-sized buccal mucosal defects following oncological resection.

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