CASE REPORT

A regenerative approach towards mucosal fenestration closure

Padma Gandhi,¹ Naveen Anumala,² Amarendra Reddy,² Rampalli Viswa Chandra²

¹Department of Conservative Dentistry & Endodontics, SVS Institute of Dental Sciences, Mahabubnagar, Andhra Pradesh, India

²Department of Periodontics, SVS Institute of Dental Sciences, Mahabubnagar, Andhra Pradesh, India

Correspondence to

Dr Naveen Anumala, naveen.anumala@gmail.com

SUMMARY

Mucosal fenestration is an opening or an interstice through the oral mucosa. A lesion which occurs with greater frequency than generally realised, its occurrence is attributed to a myriad of causes. Mucogingival procedures including connective tissue grafts, free gingival grafts and lateral pedicle grafts are generally considered to be the treatment of choice in the closure of a mucosal fenestration. More often, these procedures are performed in conjunction with other procedures such as periradicular surgery and with bone grafts. However, the concomitant use of gingival grafts and bone grafts in mucosal fenestrations secondary to infections in sites exhibiting severe bone loss is highly debatable. In this article, we report two cases of mucosal fenestrations secondary to trauma and their management by regenerative periodontal surgery with the placement of guided tissue regeneration membrane and bone graft. The final outcome was a complete closure of the fenestration in both the cases.

BACKGROUND

Mucosal fenestration is an opening or an interstice through the oral mucosa.¹ A lesion which occurs with greater frequency than generally realised,² its occurrence is attributed to a myriad of causes including heavy calculus deposits at the root apex in thin gingivae,³ endodontic infections, endodontic-periodontic lesions,¹ trauma to the tooth and anatomical anomalies such as cervical enamel projections,⁴ traumatic occlusion and mucogingival stress.⁵ They may also be caused iatrogenically because of orthodontic procedures¹ or secondary to laser therapy during depigmentation and gingivoplasty procedures.⁶

Figure 2 Intraoral periapical radiograph revealed 1×1 cm periapical radiolucency localised in the buccal plate with intact interdental bone.

The imperceptible nature of these lesions and the lack of acute symptoms generally contribute to decreased patient awareness, thus effectively preventing the patient to seek active treatment. These lesions can occur in clinically unexpected situations and may not be seen or evaluated on conventional dental radiographs.⁷ However, untreated mucosal fenestrations in a turbulent oral environment may become vulnerable to plaque and calculus accumulation, thus compromising the stability and existence of the tooth affected.^{4,6}

While some cases have been managed non-surgically with no treatment other than prophylaxis and meticulous oral hygiene instructions,⁸ mucogingival procedures including connective tissue grafts, free gingival grafts and lateral pedicle grafts are generally considered to be the treatment of choice in the closure of a mucosal fenestration.^{3,5,9} More often, these procedures are performed in conjunction with other procedures such as periradicular surgery and with bone grafts.^{5,9}

Figure 1 A small 4×4 mm fenestration in the alveolar mucosa just below the root apex in relation to 11.

Figure 3 After root canal therapy, apart from reduction in inflammation, there was no improvement in the overall condition.

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Figure 4 The periapical area was curretted to remove granulation tissue, the root was resected and a GIC filling was placed over the resected tooth apex.

While mucogingival surgery can be considered as a highly recommended procedure in the treatment of isolated mucosal fenestrations in infection-free sites with minimum bone loss, its use in mucosal fenestrations secondary to infections in sites exhibiting severe bone loss as in cases of fenestrations secondary to endodontic–periodontic lesions is not without its disadvantages. Prior to re-establishment of vascularisation, connective tissue grafts and free gingival grafts are solely dependent on diffusion from the host bed for their nutrition and survival.¹⁰ Placement of a bone graft in these situations may impede this process thus compromising the stability and survivability of the grafts.¹⁰ While vascularity may not be an issue in the case of pedicle grafts as the base of the pedicle itself is its primary source of nutrition; the outcome of a lateral pedicle graft depends primarily on the level of the interdental periodontal support.¹¹ Thus, this procedure may not be suitable in the treatment of fenestrations secondary to trauma or any other condition which might have led to the destruction of the interdental bone.

In this article, we report two cases of mucosal fenestrations caused by untreated periapical infections secondary to trauma and their management by regenerative periodontal surgery with the placement of guided tissue regeneration (GTR) membrane and bone graft.

CASE PRESENTATION

Case 1

A 24-year-old man with a history of trauma was referred to the department of periodontics with ‘itchy gum’ in the upper right central incisor region. The tooth was discoloured and a vitality

Figure 5 Placement of a bioactive bone graft into the residual bone defect.

Figure 6 Placement of a GTR membrane over the bone graft.

test revealed it to be non-vital. In the 5-year period after the trauma, the patient observed persistent suppuration from the apical region of the tooth through the gums. An examination revealed a small 4×4 mm fenestration in the alveolar mucosa just below the root apex in relation to 11 (figure 1). The lesion was non-tender but was covered with a layer of calculus and food debris. The tooth in question was probed but was found to be periodontally sound.

For reasons unknown, the patient did not seek active treatment and resorted to do so only when informed about the potential sequelae that the condition might cause. Initially, root canal therapy (RCT) was performed (figure 2) and the fenestration was meticulously debrided. The tooth surface was planed and the patient was put on a home-care regimen. Apart from reduction in inflammation, there was no improvement in the overall condition (figure 3) and hence the decision to perform a combined periodontal–periradicular surgery was taken.

Case 2

A 34-year-old patient suffered a traumatic episode leading to the avulsion of 11 and displacement of 12. The tooth was repositioned into its normal position, RCT was performed and the tooth was splinted to the adjoining teeth. Concomitantly, ulceration was observed in the periapical region, which developed into a fenestration in the alveolar mucosa 4 weeks after the traumatic episode (figure 10). The fenestration was about 3×4 mm in dimensions and was filled with oral debris. There was no suppuration and the tooth was not tender. The patients’ consent was obtained and a flap surgery with a bone graft was planned to close the fenestration.

Figure 7 Primary closure of the fenestration was achieved with 3-0 silk sutures.

Figure 8 Complete closure of the fenestration after one month.

INVESTIGATIONS

In the first case, an intraoral periapical (IOPA) radiograph revealed 1×1 cm periapical radiolucency localised in the buccal plate with intact interdental bone (figures 2 and 3). ‘Sounding’ the area under local anaesthesia confirmed the radiographic findings. In the second case, IOPA radiograph revealed periapical radiolucency (figure 11) with significant bone loss interdentally extending until the apex and buccally, which was confirmed by probing the affected site.

TREATMENT

Case 1

Under local anaesthesia, an incision was given in the fenestration area in a circular fashion to detach the mucosa from the underlying tissues. An Orban knife was used to create a pouch around the fenestration but no attempt was made to raise the flap from the gingival margin. The periapical area was curetted to remove granulation tissues, the root was resected and glass ionomer cement filling was placed over the resected tooth apex (figure 4). After haemostasis, a bioactive bone graft (Perioglass; Nova Bone Products, Alachua, Florida, USA; figure 5) was placed followed by a GTR membrane (Healiguide; Encoll, Fremont, California, USA; figure 6). Primary closure was achieved with 3-0 silk sutures (figure 7) and the patient was told to report after a week.

Case 2

The surgical procedure was performed 2 weeks after RCT (figure 12). Under local anaesthesia, crevicular incisions were given on the either side of 12 and flap was raised beyond the mucogingival line to gain access up to the root apex (figure 13).

Figure 9 Optimum apical healing was evident when the patient reported after 3 months.

Figure 10 Fenestration in the alveolar mucosa of 12.

The root surface was planed and degranulated interdentally and near the apex. The fenestration was sutured with 3-0 silk sutures at this time and a porous bone graft was placed in the interdental and the apical area (figure 14; Orthograft LD; Avanti Laboratories, Hyderabad, Andhra Pradesh, India). Root conditioning was performed with citric acid at pH 1 and the flap was closed with 3-0 silk sutures (figure 15).

OUTCOME AND FOLLOW-UP

In the first case, mild sloughing with membrane exposure was observed after a week but there was a complete closure of the fenestration with optimum apical healing when the patient reported after 3 months (figures 8 and 9). In the second patient, healing was uneventful and there was a complete closure of the fenestration within 20 days and complete radiographic fill after a period of 3 months (figures 16 and 17).

DISCUSSION

Fenestrations in the soft tissues of the periodontium are relatively uncommon lesions. In literature, this lesion has been described variously as ‘mucosal fenestration’,⁸ ‘gingival fenestration’² and as ‘apical fenestration’¹² purely on the basis of its location in the mucogingival complex. Interestingly, in the most accepted system of periodontal disease classification, it is unclear whether this lesion is considered as a non-plaque induced gingival lesion or as a mucogingival deformity around the teeth.¹³

Fenestrations may not always require surgical therapy and there have been reports on spontaneous fenestration closure after oral prophylaxis and oral hygiene instructions.^{8 9} However, even in cases where surgery is indicated, non-surgical

Figure 11 IOPA revealed periapical radiolucency with significant bone loss interdentally.

Figure 12 The surgical procedure was performed 2-weeks after root canal therapy.

therapy is still an important adjunct as it reduces inflammation, facilitates plaque control and aids in the proper attachment of flap to the denuded root surface, thus greatly aiding in fenestration closure.^{4 14} As the apical portion of the tooth is involved in the case of mucosal fenestration and persistence of root canal infection is the primary cause of inflamed periapical tissues, endodontic treatment is mandatory before attempting any surgical treatment.^{3 4 14}

Application of the principles of regenerative therapy in periapical surgery is not new and is a result of an extensive understanding of the molecular and cellular biology associated with regeneration of periapical tissues after non-surgical and RCTs. Regardless of the location of bone loss, a non-regenerative therapy will almost certainly result in a scar tissue formation with varying degrees of 'patchy' alveolar bone regeneration.¹⁴⁻¹⁶ When marked periapical or periodontal bony destruction are present, the predictability and function of a regenerative material may be an important additive to an overall surgical plan to improve prognosis.^{16 17}

The clinical status of patients with mucosal fenestration and the outcome of various treatment modalities has been infrequently reported.^{1 12} Various surgical procedures have been used for the closure of fenestration but by far, mucogingival surgery, either as a standalone procedure³ or in conjunction with bone grafts⁹ is being considered as a procedure of choice. However, the concomitant use of gingival grafts and bone grafts in mucosal fenestrations secondary to infections in sites exhibiting severe bone loss is highly debatable. Prior to

Figure 13 The flap was raised with the fenestration beyond the mucogingival line to gain access up to the root apex.

Figure 14 Pre-closure of the fenestration was closed with 3-0 silk sutures at this time and a porous bone graft was placed in the interdental and the apical area.

re-establishment of vascularisation, connective tissue grafts and free gingival grafts are solely dependent on diffusion from the host bed for their nutrition and survival.¹⁰ Placement of a bone graft in these situations may impede plasmatic circulation to the graft, thus compromising the stability and survivability of the grafts.¹⁰ While vascularity may not be an issue in the case of pedicle grafts as the base of the pedicle itself is its primary source of nutrition; the outcome of a lateral pedicle graft depends primarily on the level of the interdental periodontal support, the so-called 'peak effect'.¹¹ Thus this procedure may not be suitable in the treatment of fenestrations secondary to trauma or any other condition that might have lead to the destruction of the interdental bone.

Whether the lost bone is periapical or periodontal in location, regenerative periodontal therapy attempts to restore lost periodontal structures and functional attachment through the regeneration of cementum, periodontal ligament and alveolar bone and bone replacement grafts remain among the most widely used therapeutic strategies for the correction of periodontal osseous defects.^{15 16} Thus in fenestrations superimposed on sites with bone loss, it is quite logical to assume that bone fill should theoretically act as a nutritive base to facilitate healing of a mucosal/gingival fenestration. Thus while isolated fenestrations on the tooth surface secondary to trauma or anatomic factors are ideal situations for mucogingival surgery as the surrounding healthy bone contributes to the vascularity and stability of the graft, the same may not hold true in situations as seen in the cases reported potentially leading to the failure of the graft procedure.^{9 10 15} Thus, a regenerative procedure with a GTR and bone graft in the first case and with a bone graft alone in the second case was preferred over a mucogingival procedure

Figure 15 The flap was closed with 3-0 silk sutures.

Figure 16 Complete closure of the fenestration after 20 days.

in this case with the added advantage of not subjecting the patient to the trauma of a secondary surgical site for harvesting the graft.^{10 11} The two cases also represent different clinical situations; mucosal fenestration associated with periapical bone loss as in the first case and with periodontal bone loss as in the second case.

Primary wound closure is indispensable for a successful outcome of regeneration procedures.^{16 17} The alveolar mucosa being a mobile tissue is amenable to primary closure and in the above cases, the mucosa was closed primarily without using releasing incisions. It was closed with some tension in the case where both the bone graft and GTR was placed but complete mucosa-to-mucosa approximation was achieved in both the cases. Primary wound closure ensures stability of the blood clot, graft and membrane which are crucial for successful healing response.¹⁶ The authors believe that primary closure of the fenestration coupled with the placement of regenerative materials into the defect is an easier and less technically demanding procedure than mucogingival surgery.

To conclude, we have reported two cases of mucosal fenestration treated successfully with a regenerative periodontal procedure. In mucosal fenestrations, satisfactory outcomes can be obtained by applying the established periodontal surgical principles of thorough debridement, hard tissue management and obtaining primary tissue closure.

Figure 17 Complete radiographic fill after a period of 3 months was evident in the IOPA.

Learning points

- Fenestrations may not always require surgical therapy but as the apical portion of the tooth is involved in the case of mucosal fenestration, surgical treatment along with endodontics may be beneficial.
- A regenerative procedure with guided tissue regeneration/ bone graft is easier to perform than a mucogingival procedure with an added advantage of not subjecting the patient to the trauma of a secondary surgical site for harvesting the graft.
- Primary closure of the fenestration is a must when regenerative materials are being placed into the defect and because fenestrations are seen in the alveolar mucosa, the lesion can be closed primarily without using releasing incisions.

Contributors PG, AR and RV performed the therapies described in the report. NA is the primary author of the manuscript.

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