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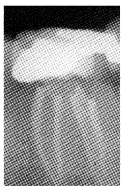

CASE REPORT

The management of mucosal fenestration: a report of two cases

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Abstract

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Aim To report on the management of two patients with mucosal fenestration of root apices.

Summary Two cases of mucosal fenestration of root apices were treated by a combination of nonsurgical root canal treatment and surgery. Root-end resection was performed to bring the root apices within the alveolus before root-end filling and packing of the bony defects with demineralized freeze-dried bone allograft. The areas were then covered with connective tissue grafts taken from the hard palate before repositioning the mucogingival flap. At 1 year follow-up, the mucosal fenestrations were completely healed by soft tissue graft coverage, and radiographs revealed bony healing.

Key learning points

- Connective tissue grafts can be used to manage mucosal fenestration.
- Periradicular surgery and connective tissue grafts can be used in combination.

Keywords: connective tissue graft, mucosal fenestration, periradicular surgery, root-end SuperEBA filling.

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Introduction

Mucosal fenestration describes the situation where the apex of a tooth is exposed to the oral environment following breakdown of the overlying bone and alveolar mucosa. Mucosal fenestration may be attributed to imbrications or malpositioning of teeth, deficiencies of, or thin alveolar cortex, prominent morphology of the root apex, or severe periradicular inflammation with bone destruction. Several studies have indicated that mucosal fenestration is most commonly seen in the mandibular or maxillary anterior

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region, especially on the labial aspect because of tooth angulation placing root apices in a labial position (Rawlinson 1984, Lin 1989, Tseng *et al.* 1995, Yang 1996, Ju *et al.* 2004).

Several case reports have proposed treatment options. These include root canal treatment and root-end resection (Lehman *et al.* 1979, Dawes & Barnes 1983, Yang 1996, Ju *et al.* 2004), blind root surface instrumentation and mouth rinsing with chlorhexidine (Lin 1989), full thickness mucogingival flap with primary (Tseng *et al.* 1995) or secondary healing (Rawlinson 1984), full thickness mucogingival flaps with guided tissue regeneration and bone grafting (Tseng *et al.* 1995), and pedicle flap operations (Lehman *et al.* 1979, Ju *et al.* 2004).

The connective tissue graft, also known as subepithelial connective tissue graft or a free connective tissue graft, was first described by Langer & Calagna (1980) and is widely used for root coverage (Langer & Langer 1985, Zabalequi *et al.* 1999, Cordiolo *et al.* 2001) and ridge augmentation (Seibert & Louis 1996, Maurer & Leone 2001). The technique is widely employed in periodontal plastic surgery and is usually associated with long-term success (Langer & Calagna 1980, Becker & Becker 1993, Cordiolo *et al.* 2001, Maurer & Leone 2001).

This article reports two cases with apical fenestration associated with apical periodontitis and mucosal breakdown. The hard and soft tissue defects were treated successfully by a combination of periradicular surgery and connective tissue grafting.

Case reports

Case one

A 30-year-old male was referred to the dental department of Taichung Veterans General Hospital, Taiwan, by a general dental practitioner for treatment of an abscess related to tooth 12 (FDI). Symptoms had occurred approximately 2 weeks earlier with mild pain and purulent exudation through the overlying mucosa. On intraoral examination, the root apex was visible and radiographic examination revealed extensive periradicular bone destruction and an immature root-end (Fig. 1). In addition, a radiopacity consistent with an invagination was noted inside the pulp chamber of tooth 12, which responded negatively to thermal pulp testing. Periodontal probing depths were within normal limits. The diagnosis was dens invaginatus with necrotic pulp and asymptomatic apical periodontitis with labial mucosal fenestration.

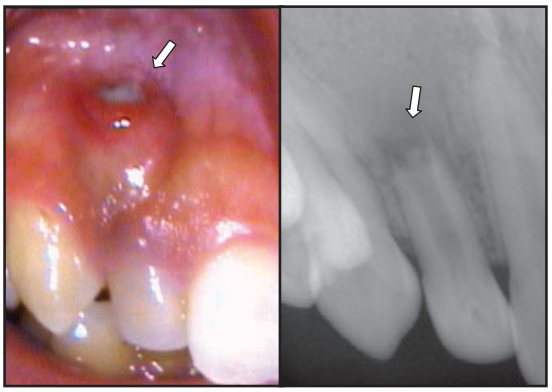

Figure 1 Mucosal fenestration at the apical area of tooth 12 (arrow). Radiographs revealed a periradicular lesion and immature root end. There was evidence coronally of dens invaginatus.

Nonsurgical root canal debridement was performed before surgical intervention. Under local anaesthesia with 2% lidocaine (Scandonest 2%; Septodont, Kuala Lumpur, Malaysia), a sulcular incision was made and a full thickness mucogingival flap was raised with two vertical incisions, one at the mesial line angle of tooth 11 and one at the distal line angle of tooth 13. Following debridement of the wound, approximately 7.0 mm of the labial cortical plate overlying tooth 12 was found to have been destroyed. After root planing, apical curettage were performed. Approximately 3.0 mm of root-end was resected with a fissure bur to position the root-tip within the alveolus. Ultrasonic root-end preparation was performed with a KiS-5D diamond-coated ultrasonic tip (Spartan, Fenton, MO, USA). The root-end cavity was filled with Super-EBA cement (Bosworth, Skokie, IL, USA) (Fig. 2). The area of soft tissue surrounding the fenestration was then excised. The area of the soft tissue defect was measured approximately 6 mm^2 in size. Demineralized freeze-dried bone allograft (DFDBA)(Pacific Coast, Los Angeles, CA, USA) was then placed in the bony defect and covered with a connective tissue graft approximately 8 mm × 10 mm in size taken from the inner side of alveolar mucosa on the hard palate using a full thickness flap technique. The donor site was immediately covered with the haemostatic Gelfoam (Johnson & Johnson, Gargrave, Skipton, UK) and sutured with 4-0 vicryl (Johnson & Johnson Intl, Edinburgh, UK). This graft was carefully trimmed and covered the whole defect. The surgical flap was repositioned and sutured with 4-0 vicryl (Fig. 3). A periodontal dressing (COEPACK; GC America, Alsip, IL, USA) was placed and 0.12% chlorhexidine mouthrinse (Scodyl, Taipei, Taiwan) was prescribed to be used three times daily for 2 weeks. The sutures were removed 2 weeks post-operatively when mild inflammation and some debris was observed on the junction of the tissue graft and mucosa. Careful debridement and irrigation with diluted betadine (Taiwan Veterans Pharmaceutical Co. Tainan, Taiwan, ROC) was performed. Three months after surgery,

Figure 2 Root end resection and retrograde filling with Super-EBA cement.

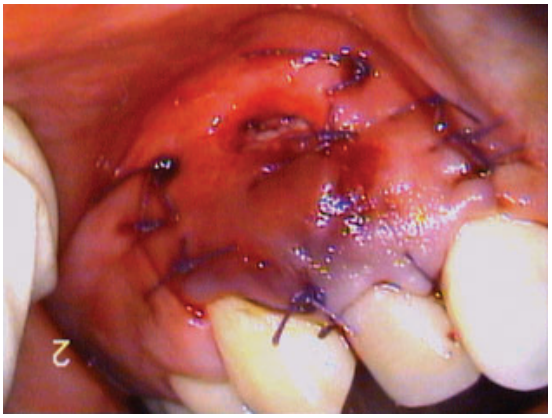

Figure 3 Flap repositioned and sutured with 4-0 vicryl.

the surgical site appeared healed. The connective tissue covered the previously fenestrated defect and no clinical symptoms or signs were present. At the 6 month (Fig. 4) and 1 year follow-ups, the soft tissue remained intact, and radiographs provided evidence of bony healing.

Case two

A 30-year-old male visited the dental department of Taichung Veterans General hospital, Taiwan, requesting treatment of the exposed root-tip of tooth 14. The dental history revealed that the tooth had received root canal treatment and a post-retained crown from a general dental practitioner 15 years previously. Two years before presentation, nonsurgical root canal retreatment had been undertaken to treat recurrent apical periodontitis with apical abscess and the tooth had been re-restored with a post-retained crown. On examination, it was found that the root apex of tooth 14 was visible and there was percussion pain. Mild gingival swelling with palpation pain was observed. The margins of the new crown appeared satisfactory and there were no significant periodontal probing depths. Radiographic examination revealed a radiolucent lesion at the apex of tooth 14 (Fig. 5). The diagnosis was chronic apical periodontitis because of failed root canal treatment, and a labial mucosal fenestration was also diagnosed. Since the tooth had

Figure 4 Six month follow-up. Soft tissues healing was well advanced with complete coverage of the fenestration. Radiography demonstrated satisfactory bony healing.

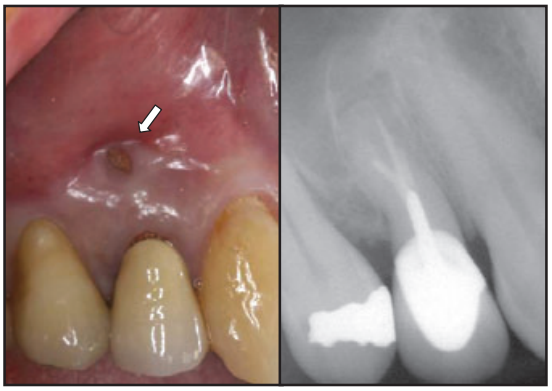

Figure 5 Mucosal fenestration of the buccal root of tooth 14 (arrow). Radiography confirmed apical periodontitis.

received two episodes of nonsurgical treatment, and because of the unlikelihood of the defect closing to cover the root-tip, the patient preferred surgical treatment. Antibiotics (Amoxicillin 500 mg every 6 hours for 5 days) were prescribed to manage the presenting infection.

The surgical procedure was performed as described in case one. After infected tissue debridement, almost all the labial wall of the root of tooth 14 was devoid of alveolar bone (Fig. 6). Only 1.0 mm of labial alveolar bone covered the root cervically and the root was largely outside its alveolar housing. Root-end resection was performed as previously. A narrow isthmus between two canals was found and the Super-EBA root-end filling cement was placed. A connective tissue graft from the palatal mucosa of the right maxilla was used to cover the soft tissue defect (Fig. 6). The flap was then repositioned and sutured as before.

Two weeks after surgery, the wound had healed uneventfully. At 3 months follow-up, a small depression was evident on the soft tissue graft. However, the defect was totally covered by the tissue graft with no root exposure. At the 6 month and 1 year follow-ups, the radiographs demonstrated periapical bony healing and intact soft tissues (Fig. 7).

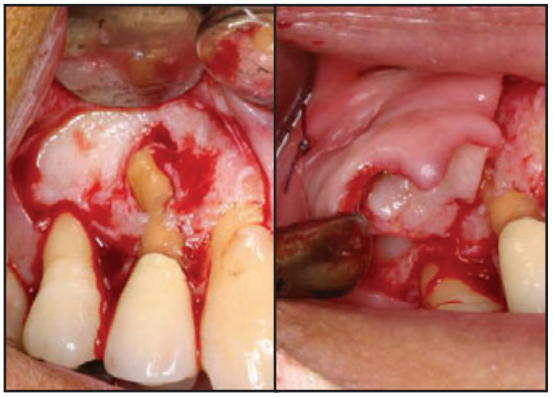

Figure 6 After complete debridement, fenestration of the buccal cortex and minimal labial bone coverage was noted. Placement of the connective tissue graft is demonstrated.

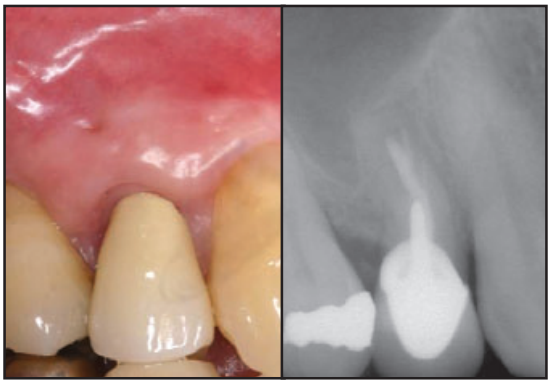

Figure 7 Six month follow-up. The defect was totally covered with soft tissue and the radiograph demonstrated bony healing.

Discussion

Fenestration of the root apex is a relatively uncommon complication of pulpal-periradicular disease (Lehman *et al.* 1979, Dawes & Barnes 1983, Lin 1989, Tseng *et al.* 1995, Yang 1996, Ju *et al.* 2004). The probable aetiological factors in the cases reported were extreme buccal inclination of root tips with very thin or nonexistent buccal cortical plate, combining with chronic periradicular inflammation. Mucosal breakdown and exposure of the root tip to the oral cavity leaves the root-tip vulnerable to plaque accumulation and calculus formation. These events make spontaneous soft-tissue coverage of the exposed root-tip improbable.

Case two in this report accepted nonsurgical root canal retreatment of tooth 14 on two occasions and a new post-retained crown had been fabricated approximately 2 years previously, but chronic apical periodontitis persisted. The persistent disease was suspected to be associated with a complicated root canal system. A narrow isthmus between two canals was found in the root canal system and this was confirmed during the procedure. In an effort to correct the mucosal bony defect and thoroughly disinfect the root canal system, a surgical endodontic treatment, including root-end preparation and filling was combined with a periodontal plastic reconstruction procedure.

The causative factors in Case one were probably the same as those described in Case two. Incomplete root canal cleaning and shaping with bacterial infection was almost certainly the reason of treatment failure. Root canal variation is one of the factors that might compromise canal disinfection, and this tooth presented a dens invaginatus (dens in dente) (Oehlers 1957).

Because of the external inflammatory root resorption and canal complexity, it was difficult to achieve an adequate root canal debridement and filling by a nonsurgical approach. Therefore, a combined approach with surgical endodontic treatment and connective tissue graft was performed. This combined procedure might unexpectedly cause some degree of aesthetic compromise. In Case one, it was not possible to match the keratinized colour of the palatal subepithelial connective tissue with the recipient site in alveolar mucosa. If the bony or mucosal defect is small, a better-coloured local pedicle soft tissue may be sufficient to cover the defect, and primary closure may be indicated to prevent the aesthetic risk. On the other hand, large bony or mucosal defects will have only minimal buccal bone plate support and insufficient blood supply for tissue repair or regeneration. Fortunately, the defect in Case one was located in a nonaesthetic region. A subepithelial connective tissue graft procedure was able to provide a stable treatment outcome.

Guided tissue regeneration (GTR) is well established for the regeneration of supporting periodontal tissue in those teeth with periodontal disease. Many studies have reported the success of this procedure not only in animals but also in humans (Nyman *et al.* 1982, Gottlow *et al.* 1986, Becker & Becker 1993, Gottlow 1993). Some studies have also demonstrated favourable outcomes with bone grafts alone (Melloning & Captain 1984, Anderegg *et al.* 1991, Flemming *et al.* 1998) or in combination with GTR (McClain & Schallhorn 1993, Trejo *et al.* 2000, Panlantonio 2002). However, the application of GTR procedures in periradicular surgery is a compromise. When the apical pathosis communicates with the alveolar crest, GTR treatment is considered to be beneficial (Rankow & Krasner 1996, Von Arx & Cohran 2001, Dietrich *et al.* 2003). Controversially, some reports suggest that GTR is not always successful if apical pathosis is isolated and there is no communication with the marginal alveolar bone (Maguire *et al.* 1998, Santamaria *et al.* 1998, Douthitt *et al.* 2001). In the cases reported here, GTR was not recommended because it would delay connective tissue graft healing. Meanwhile, DFDBA was placed in Case one, but was not used in Case two because a sinus floor perforation was found during the surgical procedure. Loss of graft material into the sinus may have serious consequence (Skoglund *et al.* 1983, Ardekian *et al.* 2006). Postoperatively, radiographic evaluation showed periradicular bone healing in both cases. The application of GTR and bone graft materials may be useful adjuncts in endodontic surgery but further research is needed.

Successful management of periapical mucosal fenestration requires correct diagnosis and treatment procedures including adequate debridement of the root canal and reconstruction of bony and mucosal defects. These two case reports demonstrate the potential of periradicular surgery combined with subepithelial connective tissue graft procedures in the management of periapical mucosal fenestration. Further research is needed to demonstrate the long-term outcome and histological evaluation of this combined procedure.

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