CASE REPORT

Coverage of denuded labial bone resulting from post space preparation with a free gingival autograft: lessons learnt

Sagar Sareen,¹ Anjani Kumar Pathak,² Divya Singhal,¹ Jaya Dixit,¹ Parth Purwar¹

¹Faculty of Dental Sciences, Department of Periodontology, King George's Medical University, Lucknow, Uttar Pradesh, India

²Department of Periodontics, CSMMU, Lucknow, Uttar Pradesh, India

Correspondence to

Dr Sagar Sareen, sagarsareen_32@yahoo.com

Accepted 31 July 2015

SUMMARY

Rehabilitation of endodontically treated teeth by post and core preparation is a common procedure in day to day dental practice. However, in some instances, post space preparation can produce excessive frictional heat leading to significant damage to the attachment apparatus of the tooth as well as to the overlying soft tissue. This report describes a case of mucosal dehiscence arising due to trauma induced by inadvertent post space preparation. The denuded mucosa was restored to its physiological position with the help of free gingival autograft obtained from the palatal donor site. The aesthetic results obtained were excellent and have been stable for a period of 2 years.

BACKGROUND

Thermal insults arising during endodontic post space preparation are of concern to the patient as the aesthetics as well as function of periodontal tissues are in jeopardy. During post space preparation, excessive frictional heat can be generated, which may lead to gingival necrosis, thus exposing the tooth root along with the labial cortical plate. Mucosal dehiscence is a serious yet infrequently reported complication of post space preparation procedure. Although connective tissue graft (CTG) is considered a gold standard mucogingival procedure for coverage of denuded root surface, excellent results were obtained by free gingival graft, which was used in the present case. The exposed root and bone surface were successfully covered using a free gingival autograft.

CASE PRESENTATION

An 18-year-old woman, working as a sales executive in a multinational company, was referred from a private dental practitioner to the out patient department of periodontology at King George's medical university, with an exposed root surface in the oral cavity leading to compromised aesthetics thus affecting her self-confidence and overall personality. On further elaboration, the proposer revealed that she suffered from trauma to her maxillary anterior teeth 4 months prior and consulted a private dental practitioner. After taking relevant history, pulp vitality tests were performed by him, which were found to be negative for the left maxillary central incisor. The private practitioner initiated root canal treatment (RCT) in relation to the left maxillary central incisor (tooth no-21). The clinical records and patient's history revealed that,

Figure 1 Preoperative photograph depicting mucosal dehiscence along with exposure of labial cortical bone on maxillary left central incisor.

after completion of RCT, she was scheduled for placement of post and crown preparation in tooth no-21 about 10 days earlier. In this visit, the post space preparation was carried out and proposer was discharged after receiving a temporary acrylic crown over the prepared core. Later, an emergency appointment was scheduled as the patient reported

Figure 2 Preoperative intraoral periapical radiograph showing fibre post and thin residual dentinal walls in relation to the concerned tooth.

CrossMark

To cite: Sareen S, Pathak AK, Singhal D, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2015-211427

Figure 3 Intraoral photograph showing connective tissue bed preparation apical and lateral to the defect.

of a constant burning sensation and mild discomfort in the maxillary anterior region. In this appointment, the proposer was prescribed a topical anaesthetic ointment for her symptoms and was reassured that the problem would subside over time. On the next follow-up visit 3 days later, a permanent all ceramic restoration was luted.

Seven days thereafter, the patient noticed that the soft tissue over the concerned tooth had started receding in an apical direction. Exceedingly concerned about her aesthetic appearance, she reported to the dental clinic immediately, where a mucosal dehiscence was noted and the patient was referred to our department. On her first visit to the department, a thorough intraoral examination was carried out, which revealed aberrant gingival recession along with denuded alveolar bone in relation to the maxillary left central incisor bearing an all ceramic crown. After taking an informed written consent from the patient, the crown was removed so as to carry out a detailed examination. The tooth was firm and was not tender on percussion. The soft tissue defect measured 4.5×4 mm from the prepared margins of the tooth and around 3 mm of labial cortical plate was visible in the oral cavity apicocoronally (figure 1). A preoperative intraoral periapical (IOPA) radiograph revealed an endodontically treated left central incisor with a fibre post inside the canal with relatively thin remaining dentinal walls (figure 2).

INVESTIGATIONS

Routine blood investigations were performed and were found to be within the reference range prior to the surgical intervention. IOPA radiographs were taken preoperatively and at follow-up visits, which revealed no abnormality in bone morphology.

DIFFERENTIAL DIAGNOSIS

The most common occurrences of mucosal and alveolar dehiscence have been reported in maxillary and mandibular incisors. The exact aetiology is still obscure but a review of the literature suggests it to be of multifactorial origin. Other factors that may play a role include decreased thickness of the alveolar housing, labioversion of the tooth in the dental arch, contour of the root apex, occlusal factors, orthodontic tooth movement, periodontal and endodontic pathology and aberrant frenal attachment. However, in the present case, the mucosal dehiscence had

Figure 4 Acquisition of free gingival graft from the left side of the palate.

occurred due to thermal trauma induced at the time of post space preparation.

TREATMENT

Addressing the patient's immediate aesthetic concerns, the mucosal dehiscence was corrected, using a free gingival autograft with the palate acting as donor site. Initially, the exposed root surface was carefully planed and any necrotic bone over the surface was trimmed using diamond finishing burs. The recipient site was prepared by incising at the existing mucogingival junction with a no-15 BP blade, thus making a 3–4 mm wide recipient connective tissue bed apical and lateral to the defect (figure 3). This was followed by the procurement of a free gingival graft of an appropriate size from the left side of the palate with the help of a template (figure 4). The blade was inserted along the desired thickness over one edge of the graft. The graft with adequate thickness of 1–1.5 mm was carefully separated. After removal of loose tissue tabs from the under surface, the graft was immediately placed on the prepared recipient bed directly over the denuded bone surface and anchored with the adjacent attached gingiva (figure 5). The graft was positioned firmly and all efforts were made to minimise the dead space at the recipient site. An adequate number of sutures were placed in order to secure a close adaptation of the graft with the prepared bed and the area was packed with a periodontal dressing. A modified Hawley's retainer was delivered to the patient postoperatively to allow the donor site a comfortable healing period.

OUTCOME AND FOLLOW-UP

The sutures and periodontal dressing were removed 10 days postoperatively and the patient was given restrictive plaque control instructions regarding the concerned area for the initial healing phase of 6 weeks. The ceramic crown was reformed

Figure 5 Stabilised graft over the denuded maxillary anterior area.

Figure 6 Clinical appearance of the grafted site 3 months postoperatively.

2 weeks after the surgery. Healing took place uneventfully and the patient was recalled for periodic evaluation (figure 6). The treatment was successful, as complete coverage of the defect was achieved and the results were shown to be stable 2 years postoperatively with an excellent aesthetic profile (figure 7).

DISCUSSION

We report successful management of a case of mucosal dehiscence arising due to thermal injury during post space preparation, with the help of free gingival graft placed directly over the denuded bone surface.

Intraradicular heat transfer and thermal injuries are clinical realities when post space preparation procedures are performed incorrectly. The increase in the external root temperature beyond 10°C produce irreversible injury to the attachment apparatus, along with dehydration effects on dentin, which often results in resorption.^{1 2} Erroneous use of peeso reamers for post space preparation resulting in sloughing of gingiva has also been previously reported.³ In some instances, the damage caused by pilot drills and ultra sonic post preparation devices has been so extensive that it ultimately lead to tooth loss.^{4 5} Ever increasing evidence suggests that endodontically routed iatrogenic injury can lead to serious deleterious effect on the periodontium emanating as fatty replacement of bone, cementum resorption and bony ankylosis.^{6 7} The other factors that may play a role in the occurrence of such defects are thin remaining dentinal walls of the affected tooth and limited use of water coolant as a counter-heating mechanism.

Going by the available evidence, although free CTG is concluded to be the gold standard treatment option for aesthetic root coverage,⁸ owing to the primary closure and better colour match of the grafted tissue, a free gingival autograft was used in

Figure 7 Clinical picture at 2 years recall visit revealing root coverage and excellent aesthetics.

the present case based on the clinician's experience and past scientific evidence, where it has been propitiously used over denuded bone surface with minimal aesthetic colour differences.⁹ In the present case, the graft was placed directly over bone and the amount of shrinkage observed was about 25% as opposed to 50% when the graft is placed over periosteum. The success of the graft depends on the survival of connective tissue. The graft is initially maintained by diffusion of fluid from the host bed, adjacent gingiva and alveolar mucosa.¹⁰ The fluid provides nutrition and hydration essential for graft survival. Revascularisation of the graft starts when the recipient bed capillaries proliferate and anastomose with the pre-existing vessels in the graft. The healing of an intermediate thickness graft is completed by 10.5 weeks, as seen microscopically.¹¹ Initially, at the time of transplantation, the graft is pale. The pallor changes to ischaemic grey until vascularisation begins and a pink colour appears.

Unfortunately, in spite of ample in vitro evidence investigating various endodontic devices and restorative procedures for the application of heat and the potential for noxious heat transmission to the surrounding apparatus,^{2 4 12} a dearth of literature exists for reports demonstrating such adverse events. Gluskin *et al*³ reported three similar cases of damage to the attachment apparatus of central incisors describing thermal injury from the intra-radicular use of ultrasonic devices for post removal. All the three cases were consequential to negligently overheating the post during removal causing severe destruction of soft tissue and bone, and eventually leading to tooth loss. The patients had to resort to multiple ridge augmentation procedures thereafter, owing to the compromised healing of extraction sockets emanating as grave aesthetic concerns. In a separate case by Walters and Rawal,⁵ a central incisor had to be extracted 15 weeks after thermal injury during post space preparation. Multiple nugatory attempts were made to salvage the tooth and the final decision of extraction was made owing to the physical agony of the patient suffering from severe headaches and an inflammatory reaction in the adjacent nasal cavity. None of the abovementioned cases^{3 5} received any surgical intervention as a measure for root coverage, which may have further deteriorated the prognosis of the involved tooth.

To the best of our knowledge, there is a scarcity of reports depicting the management of denuded labial bone resulting from thermal trauma. Jung *et al*¹³ successfully restored a mucosal defect arising due to thermal insult in maxillary incisors using a laterally positioned flap comprising of subepithelial CTG with a 4-month follow-up.

In our case, the result achieved with free gingival autograft was found to be stable for the follow-up duration of 2 years, along with accomplishment of positive restoration of the gingival architecture and excellent aesthetics. Alternative treatment modalities based on the available literature could have been the use of subepithelial CTG with a laterally displaced flap.¹³ However, other established options for recession coverage could be explored, such as lateral pedicle flap, free connective tissue autograft, subepithelial CTG with a coronally advanced flap and guided tissue regeneration, pertaining to the defect type and the amount of blood supply to the donor tissue, which is a prime requisite for a positive treatment outcome. The past evidence clearly suggests CTG to be significantly superior to GTR in terms of recession reduction (weighted mean difference: 0.43 mm, 95% CI 0.62 to 0.23), however, only limited data to comment on the usage of free gingival grafts and laterally positioned flaps exist.¹⁴

Owing to the adversity of these mishaps, it becomes prudent for clinicians to bear in-depth knowledge of the incidence, prevalence, preventive strategies and management of such

thermal irritations during dental procedures, irritations which may potentially affect the pulp and the periodontal tissues. However, at present, it is hardly possible to do so, based on their infrequently reported nature and the unavailability of universally accepted clinical protocols for post space preparation procedures without causing thermal damage to the adjacent periodontal tissues. Correspondingly, clinicians are prompted to report any adverse events that occur during the use of a device or material so as to contribute to enhance the literature with respect to topics such as the one under discussion.

CONCLUSION

In light of the results obtained in the present case, the free gingival autograft procedure can predictably restore the gingival architecture in mucosal dehiscence cases. However, larger studies with long-term follow-up are further needed to arrive at any confirmatory conclusions.

Patient perspective

The treatment has offered tangible benefits and has restored my confidence, which was earlier missing due to the unaesthetic appearance of my gums in the upper anterior tooth region. Besides the nominal postoperative issues for the selected treatment option, which I was informed of beforehand, I did not experience any other complication or adverse events.

Learning points

- Heat produced within the confines of the root canal can result in significant abuse of the circumscribing alveolar bone and attachment apparatus.
- Standardised clinical protocols for the post space preparation should be made available and used thereafter.
- Free gingival graft is a reliable modality in the treatment of an iatrogenic thermally induced mucosal dehiscence.

Contributors SS performed the periodontal plastic surgical procedure, and followed up and documented the present case.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Eriksson AR, Albrektsson T. Temperature threshold levels for heat-induced bone tissue injury: a vital-microscopic study in the rabbit. *J Prosthet Dent* 1983;50:101–7.
- 2 Saunders EM, Saunders WP. The heat generated on the external root surface during post space preparation. *Int Endod J* 1989;22:169–73.
- 3 Gluskin AH, Ruddle CJ, Zinman EJ. Thermal injury through intraradicular heat transfer using ultrasonic devices: Precautions and practical preventive strategies. *J Am Dent Assoc* 2005;136:1286–93.
- 4 Hussey DL, Biagioni PA, McCullagh JJ, et al. Thermographic assessment of heat generated on the root surface during post space preparation. *Int Endod J* 1997;30:187–90.
- 5 Walters JD, Rawal SY. Severe periodontal damage by an ultrasonic endodontic device: a case report. *Dent Traumatol* 2007;23:123–7.
- 6 Eriksson JH, Sundstrom F. Temperature rise during root canal preparation—a possible cause of damage to tooth and periodontal tissue. *Swed Dent J* 1984;8:217–23.
- 7 Saunders EM. In vivo findings associated with heat generation during thermo mechanical compaction of gutta-percha. Part 2—Histological response to temperature elevation on the external surface of the root. *Int Endod J* 1990;23:268–74.
- 8 Fu JH, Su CY, Wang HL. Esthetic soft tissue management for teeth and implants. *J Evid Based Dent Pract* 2012;(3 Suppl):129–42.
- 9 James WC, McFall WT Jr. Placement of free gingival grafts on denuded alveolar bone. Part I: clinical evaluations. *J Periodontol* 1978;49:283–90.
- 10 Gargiulo AW, Arrocha R. Histo-clinical evaluation of free gingival grafts. *J Periodontol* 1967;5:285–91.
- 11 Gordon HP, Sullivan HC, Atkins JH. Free autogenous gingival grafts. Part II. Supplemental findings: histology of the graft site. *Periodontics* 1968;6:130–3.
- 12 Weller RN, Koch KA. In vitro radicular temperatures produced by injectable thermoplasticized gutta-percha. *Int Endod J* 1995;28:86–90.
- 13 Jung UW, Kim CS, Choi SH, et al. Gingival coverage of iatrogenically denuded labial bone resulting from thermal trauma. *Int J Periodontics Restorative Dent* 2013;33:635–9.
- 14 Rocuzzo M, Bunino M, Needleman I, et al. Periodontal plastic surgery for treatment of localized gingival recessions: a systematic review. *J Clin Periodontol* 2002;29(Suppl 3):178–94.

Copyright 2015 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- Submit as many cases as you like
- Enjoy fast sympathetic peer review and rapid publication of accepted articles
- Access all the published articles
- Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow