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Iatrogenic acid-induced gingival recession during crown cementation: A case report

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Abstract

Accidental contact of various chemicals in dentistry may cause damage to the gingiva. A male patient presented for a full mouth rehabilitation with ceramic crowns. The patient underwent the steps of ceramic crown preparation uneventfully. At the time of crown delivery, cotton rolls were placed in several vestibular areas for isolation. They were regularly changed during different steps of etching and cementation process, which included the use of Multilink Primer B (Ivoclar Vivadent™). On removal of the cotton roll in the area of upper right canine, the gingival tissues appeared blanched and grayish white. The cotton roll was found to have absorbed some etching material in it. As the patient was asymptomatic, he was dismissed. Two weeks later, the patient presented with inflammation and

gingival recession in the same area. Initially, he was treated palliatively, and subsequently, he received a connective tissue graft on the upper right canine. This case report showed that acid etching material used during the prosthodontic cementation may have caused a gingival recession, which was successfully treated with tunnel flap and connective tissue graft. Optimal isolation of the operative field should be performed to avoid this problem.

Introduction

Iatrogenic oral soft tissue trauma may be related to physical, chemical or thermal agents.¹

There are several reports indicating that widely used chemical agents, such as aspirin, hydrogen peroxide, silver nitrate, phenol, formocresol and sodium hypochlorite,^{2,3} can harm the integrity of the soft tissues in the oral cavity.

Clinical presentation of chemical injuries include burns, ulcerations, tissue necrosis and gingival recessions.^{2,3} Their clinical manifestations might differ according to the composition, concentration, pH of the substance, the quantity applied, the manner and duration of tissue contact, and the extent of penetration into tissue.⁴ These oral mucosal changes can vary from diffuse erosive lesions, ranging from simple mucosal sloughing to complete mucosal involvement with extension into the submucosa.⁵

This article presents and discusses the case of an iatrogenic chemical injury of the gingiva due to contact with the self-etching primer and its management.

Case report

A 76-year-old Caucasian male presented with a desire for a comprehensive reconstruction. His medical history included coronary heart disease, by-pass surgery 8 years ago, arrhythmia, hypertension, high cholesterol, chronic obstructive pulmonary disease, gastro-oesophageal reflux disease, rheumatoid arthritis, neuropathy on right foot and benign prostatic hyperplasia. He was a past smoker, drank alcohol socially and was allergic to latex. His medications included chewable aspirin 81mg, spironolactone, warfarin, digoxin, metoprolol succinate, atorvastatin, alfalfa, mometasone-formoterol, pantoprazole, gabapentin and tamsulosin.

Clinical examination revealed multiple lesions including cupping of occlusal surface, incisal grooving with dentin exposure, short clinical crowns and raised amalgam restorations that were consistent with tooth damage from acid erosion. No evidence of parafunctional habit was found. History of gastroesophageal reflux disease was identified as a potential source of acid erosion (Fig. 1). Periodontally, he was diagnosed with incipient gingivitis.⁶ After carefully reviewing possible treatment options, a full mouth rehabilitation was planned to restore a premolar occlusion and patient provided written consent for all subsequent treatment.



Fig. 1 Tooth structure loss due to acid erosion

Patient underwent the various steps of crown preparation uneventfully. The finish lines were placed at equigingival level and a single cord technique without any chemical agents (Ultrapak #1, Ultradent™) was used to retract the gingiva prior to the final impression. Digital impressions were made using an intraoral scanner (Trios3, 3shape). CAD/CAM-generated ceramic restorations were fabricated using lithium disilicate glass ceramic blocks (IPS e.max CAD, Ivoclar Vivadent™). After try-in, the ceramic restorations were etched using 9% hydrofluoric acid (Porcelain etch, Ultradent™) and treated with silane (Monobond Plus, Ivoclar Vivadent™) outside the mouth. The tooth surfaces were treated with the self-etching primer (Multilink primer A and B, Ivoclar Vivadent™) which contains phosphoric acid acrylate and 2-hydroxyethyl methacrylate (HEMA), and a dual-cure resin cement (Multilink automix, Ivoclar Vivadent™) was used for cementation of crowns. Cotton rolls were placed in vestibular areas for isolation of teeth during the cementation process. After cementation of the crown on maxillary right canine (#13), the patient felt instant discomfort when removing the cotton roll that was used for isolation of the upper right quadrant. The cotton roll had dislodged from the vestibule onto the gingiva. The buccal gingiva of the upper right canine appeared blanched and grayish white and based on its characteristic odor, some etching material was found on the cotton roll. The patient did not report lingering pain or other symptoms and was dismissed.

The patient presented 2 weeks after crown delivery for evaluation of oral hygiene. At this time, a 2-mm deep recession was evident on buccal aspect of the upper right canine. The gingival margin was erythematous and hemorrhagic, and a diffuse white lesion was present apical to it (Fig. 2). The patient stated that this area was painful for a week after crown delivery but felt better afterwards. A periodontal consultation was completed and a diagnosis of recession along with chemical trauma was assigned to the lesion. Based on the clinical presentation of the white lesion and the previous dental procedures in the area, it was supported that one of the cotton rolls that was used for isolation of the area was accidentally contaminated with the etchant Multilink Primer B and remained on the gingiva and oral mucosa of the area for an extended period of time. The patient was advised not to brush the area and only rinse the area with chlorhexidine gluconate 0.12% twice a day.



Fig. 2 Erythematous gingival margin with diffuse white area at 2 weeks

After 1 week, the patient presented for a follow-up visit. The recession was 3 mm deep and the surrounding gingival tissues appeared less erythematous (Fig. 3). The white lesion had decreased in size and color intensity. However, a whitish hue of the gingiva and mucosa was still present. The patient was asymptomatic and was advised to use a soft postsurgical toothbrush with the roll technique and chlorhexidine solution for one more week.



Fig. 3 Three-mm deep recession with reduced erythema at 3 weeks

Six weeks following crown delivery, the patient presented again for a follow-up. The recession had remained 3 mm deep and the gingival characteristics of the area were within normal limits. The patient reported no symptoms and exhibited adequate plaque control. To correct the recession, a connective tissue graft with a coronally advanced flap at site #6 was treatment planned.

After medical consultation, mucogingival surgery was performed 3 months following crown delivery. The recession depth and surrounding gingival tissue characteristics had not changed since the last follow-up (Fig. 4). After adequate anesthesia, a 12 × 4 × 1.5 mm connective tissue graft was harvested from the right palate and a full-split thickness tunnel was prepared at the recipient site. The graft was placed under the tunnel and the flap was coronally advanced until it rested 1 mm coronal to the crown margin. The flap and graft were stabilized at their final position using 6-0 polypropylene sling sutures. Hemostasis was achieved in donor and recipient site and patient was dismissed after postoperative instructions were given.



Fig. 4 Three months following crown placement

Healing was uneventful and the patient presented for postoperative appointments at 2 weeks and 4 months (Fig. 5). Tissues were within normal limits and residual recession was 0.5 mm from the crown margin. This corresponded to a 2.5 mm and 83% of root coverage. At 9 months, the gingival margin had migrated coronally, exhibiting creeping attachment and additional root coverage (Fig. 6). Radiographically, the interproximal bone levels were similar to prior to restoration. The patient and his dentists were satisfied with the result.



Fig. 5 Four months postoperative



Fig. 6 Nine months postoperative with creeping attachment

Discussion

Oral mucosal damage due to chemicals is often the result of an unintentional therapeutic error by clinicians during dental procedures as a wide variety of dental agents can cause mucosal harm.² To the best of our knowledge, this is the first case report that describes phosphoric acid- and HEMA-induced gingival necrosis following crown cementation, and its management.

In this case, during the first weeks following crown cementation, the gingival tissues appeared erythematous close to the gingival margin, and white apically. A fast-developing gingival recession was

also evident. Differential diagnosis included physical and/or chemical trauma. Rawal et al. emphasized on the similarity in clinical appearance among traumatic lesions and pointed out that a detailed and accurate history is often critical to the practitioner in the diagnosis of possible or probable traumatic injury.⁷

After a review of the prosthodontic procedures that were completed at the crown cementation appointment, it was concluded that the lesion is an iatrogenic chemical injury caused by a contaminated cotton roll with Multilink Primer B.⁸ This primer contains phosphoric acid acrylate 25%-50% and 2-hydroxyethyl methacrylate, 25%-50%. Both agents are toxic to gingival tissue and gingival fibroblasts.^{4, 9, 10} Blomlof et al.⁴ performed an animal study on the possible immediate necrotizing effects on periodontal tissues of etching agents operating either at low or neutral pH. Phosphoric and citric acids, both of which operate at low pH, exerted immediate (within 20 s) necrotizing effects on both mucosal flaps and periodontal tissues. The penetration depth increased with time up to one-fourth of the circumference of the root after 3 min.

Szczepanska et al. reported from the neutral comet assay that HEMA induced DNA double strand breaks, induced apoptosis and perturbed the cell cycle. Therefore, methacrylic acid, a product of HEMA degradation, may be involved in its cytotoxic and genotoxic action.⁹ Di Nisio et al.¹⁰ investigated the inflammatory response in human gingival fibroblasts (HGF) treated with a relatively low HEMA concentration by studying reactive oxygen species (ROS) production, cyclooxygenase-2 and tumor necrosis factor-alpha gene expression, and prostaglandin E2 (PGE₂) release. They concluded that HEMA induced an inflammatory response in HGFs modulated by ROS production, as well as by the increase in TNF-a and COX-2 gene expression and by PGE₂ release.

Three months after crown cementation, when the recession depth had stabilized and the gingival tissues appeared within normal limits, a subepithelial connective tissue graft was performed for treatment of recession. A tunneling technique was used and 83% root coverage was achieved. This outcome for the correction of a chemically induced recession is consistent with the 82.75% mean root coverage for treatment of recession in non-traumatized tissues, as published in a systematic review investigating outcomes of the tunneling technique.¹¹ In a case report by Akman et al,⁵ a subepithelial connective tissue graft achieved root coverage and an increase in keratinized tissue, after chemically induced gingival and bone necrosis during an operative procedure.

In our case, creeping attachment was evident 9 months following the procedure. This coronal gingival migration following the use of subepithelial connective tissue graft has been previously documented in the literature.^{12, 13} Additional creeping attachment may occur up to 2 years after the graft procedure with a tunnel flap,¹³ resulting in further gingival approximation or coverage of the apical margin of the crown. This case report is the first to describe creeping attachment at a site that had suffered a chemical injury, indicating that such sites may respond similarly to non-traumatized tissues. Therefore, a subepithelial connective tissue graft can be used for the correction of chemically induced recession.

Conclusions

This case report showed that acid etching material used during the prosthodontic cementation may have caused a gingival recession, which was successfully treated with tunnel flap and connective tissue graft. Optimal isolation of the operative field should be performed to avoid this problem.

Author contributions

VK: supervised periodontal management of the case, drafted, edited and revised the manuscript; HA: supervised the prosthodontic management and procedures of the case, drafted, edited and revised the manuscript; SYR: drafted, edited and revised the manuscript.

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Conflict of interest

The authors have no conflict of interest. All authors reviewed the manuscript prior to submission.

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