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Case Report

Successful Treatment and a One Year Follow Up of a Periodontal Abscess Associated with Porcelain Laminate Veneers - A Case Report and SEM-EDS Analysis

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Abstract

A healthy periodontium lays a strong foundation for successful dental restorations but the periodontium's pathologic involvement can jeopardize even the well-made prosthesis.

This article details a case report of a 67-year female patient presenting with gingival swelling and pain in relation to maxillary right central incisor and restored with porcelain laminate veneers since five years. Clinical and radiographic presentation directed the diagnosis to a periodontal abscess. A 2 mm x 1.8 mm foreign body was recovered from the sulcus during localized scaling and root planning as a part of therapy. An SEM-EDS analysis of the foreign object was carried out suspecting it to be a remnant of dental cement. However, analysis showed it to be a polymer or plastic with localized calculus deposits indicating it to be probably a piece of interdental cleansing device of at least 2 - 3 weeks duration. The patient however had not given any specific history pertaining to a foreign object getting lodged in the sulcus. Definitive treatment involved scaling and root planing; irrigation with chlorhexidine and placing minocycline micro spherules localized chemotherapeutics in the deep pocket. One year post treatment periodontal evaluation showed probing depths and radiographic examination within normal limits indicating successful results.

Keywords: *Periodontal Abscess; Cement; SEM; Porcelain Veneers; Local Chemotherapeutics*

Introduction

Restoration of unaesthetic anterior teeth was previously achieved with full preparation crowns, but as demand for anterior esthetics and subsequently a need for a more conservative restoration increased, porcelain laminate veneers gained popularity [1]. Porcelain laminate veneers, an elective treatment more often than not, has become a predictable technique to improve aesthetics and perceived smile due to their biocompatibility, high aesthetic appeal and long-term success rate. Due to advancements in luting cements and a better understanding of successful tooth preparation for veneers, the indications for the same have expanded to include not only minor malposition like rotations, diastema, hypocalcifications, fractures, malformed teeth but also severe conditions like amelogenesis imperfecta and tetracycline staining [2,3]. The long-term success of these restorations is however dependent on a number of factors including but not limited to tooth preparation design, material characteristics of the ceramics and the adhesive luting system used [4].

A recent paper assessed the long-term gingival health of teeth restored with porcelain veneers and concluded that there is no difference in the probing depths between the restored and unrestored teeth in a period of seven to fourteen years but gingival index scores ranged from normal to moderate inflammation and recession was seen in 27% of the patients [5]. Satisfactory gingival response and excellent patient satisfaction were previously demonstrated by short-term studies with successful veneer survival rates in the upper nineties [6,7]. However, periodontal problems and adverse esthetic outcomes over time have been known to occur when a marginal gap exists between the veneer and the tooth due to polymerization shrinkage or dissolution of the luting cement.

The present case report describes the diagnosis and treatment of a periodontal abscess in relation to a tooth restored with porcelain veneer and SEM analysis of the likely culprit.

Case Report

Diagnosis: A 67-year-old woman was referred to department of Periodontics, University of Tennessee College of Dentistry with the chief complaint of a gingival swelling in relation to #8, producing moderate discomfort for about 3 days (Figure 1). Patient was a non-smoker with non-contributory medical history except for medication to control hypercholesterolemia and allergy to penicillin. Thorough clinical and radiographic exam was performed to assess oral health.

Figure 1: *Pre op view showing gingival swelling in relation to #8.*

Past dental history revealed porcelain laminate veneers placed about 5 years ago from #7 to 10. The patient had regular dental visits every six months and had no complaints until the point of referral. Clinical examination showed all probing within normal limits except the facial of #8 which had 7-8mm probing depths with bleeding on probing and slight suppuration (Figure 2). There was a diffuse fluctuant gingival swelling involving the entire attached gingiva on the facial surface of #8. The tooth was tender to percussion and palpation with continuous pain and discomfort of sudden onset. Radiograph showed no changes in the normal architecture (Figure 3). #7 to #10 were vital to electric pulp testing and endo testing. Since no changes were seen on radiograph in addition to the history of sudden onset swelling and deep probing depth; the teeth were assessed to be vital and endodontic involvement was ruled out. Though the patient did not give history of any foreign object or food particle being wedged in the sulcus, a tentative diagnosis of periodontal abscess was established based on the clinical and radiographic examination. Other conditions considered in differential diagnosis were gingival abscess, ruled out due deep periodontal pockets, peri-apical abscess, perio-endo lesion and endo –perio lesion ruled out due to presence of vital teeth without periapical radiolucency. Though there was no evidence of a crack clinically or radiographically, cracked tooth syndrome could be definitively ruled out only after favorable response to initial therapy.

Figure 2: *Deep probing depths on facial surface of #8.*

Figure 3: *Pre op radiograph showing normal architecture.*

Treatment: Irrigation, debridement and antibiotics are the mainstay for treatment of periodontal abscess. Local anesthesia was achieved with 1: 100000 lidocaine with epinephrine by local infiltration in the maxillary anterior area. Drainage was established with curettes in the deep pockets. A foreign object was subsequently removed from under the veneer margin, the immediate nature of which was unknown. Therefore, to discern the nature of the removed piece scanning electron microscopy (SEM) with microanalysis was available. A thorough scaling and root planning was done with ultrasonic and hand instruments. Irrigation of the abscessed pocket was done with 0.12% Chlorhexidine rinse (Figure 4). The patient was recalled after a week for a post op appointment and after eight weeks for a re-evaluation appointment. The patient was no longer symptomatic but deep probing depth was persistent. Since it was an isolated deep pocket it was decided to use minocycline microspheres, 1mg (Arestin) as an adjunct to scaling and root planning. It is a locally active broad-spectrum antibiotic placed directly in a deep periodontal pocket in concentrated dose. The patient was instructed not to touch

or floss the area for 10 days and avoid eating hard and crunchy food. The patient was recalled after 3 months for a further periodontal evaluation and maintenance. At this appointment all probing depths noted were within normal limits and there was no bleeding on probing (Figure 5). The patient continued her regular appointments with her general dentist and visited the periodontics department for yearly follow ups. The patient exhibits healthy periodontium with all probing depths within normal limits and no radiographic changes at the present *one year* post op appointment (Figure 6).

Figure 4: *Post treatment view after thorough SRP and removal of foreign object.*

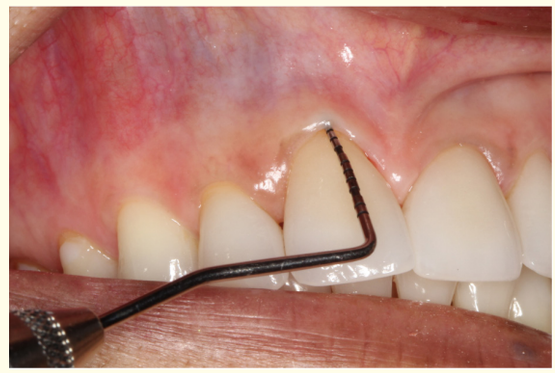

Figure 5: *Normal probing depths seen 3months after treatment with local chemotherapeutics.*

Figure 6: *1 year post op PA showing no radiographic changes.*

SEM analysis: Since it was not possible to determine the nature of the foreign object via patient's history, SEM with microanalysis using energy dispersive spectroscopy (EDS) was done. Samples were prepared by mounting the object on carbon adhesive tape with sample holder and then gold sputter coating. The object was determined to be 2 x 1.8 mm in size by 0.6 to 0.8 mm in height (Figure 7a). SEM revealed an irregular shaped semi-flat surface with small random surface debris (Figure 7b and 7c). EDS micro-analysis from both, map and point locations across the surface revealed high weight percentages of elements carbon, nitrogen and oxygen. Calcium and phosphorus were also present and intermingled throughout the surfaces with rare occasions having higher percentages in concentrated areas. Negligible amounts of metallic compounds like aluminum, magnesium, zinc and silicon were seen. Additionally, no amounts of radio-opacity marker elements were observed such as barium, strontium and other heavy metals (Figure 8a and 8b).

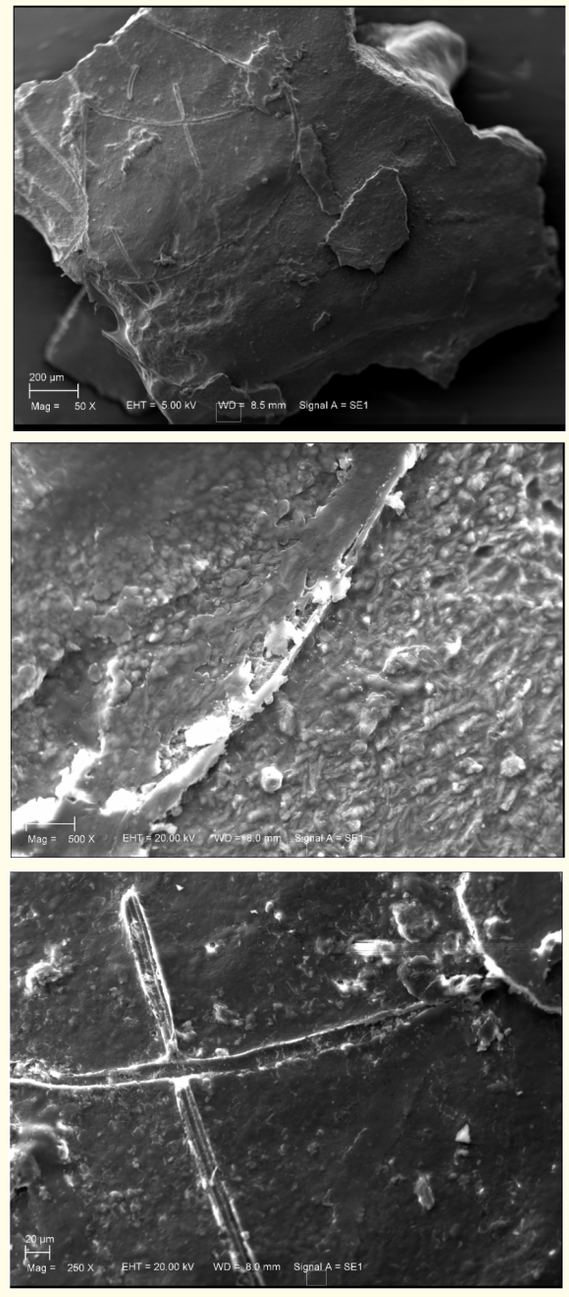

Figure 7a-7c: *Representative Scanning electron microscopy (SEM) micrographs of the recovered foreign object.*

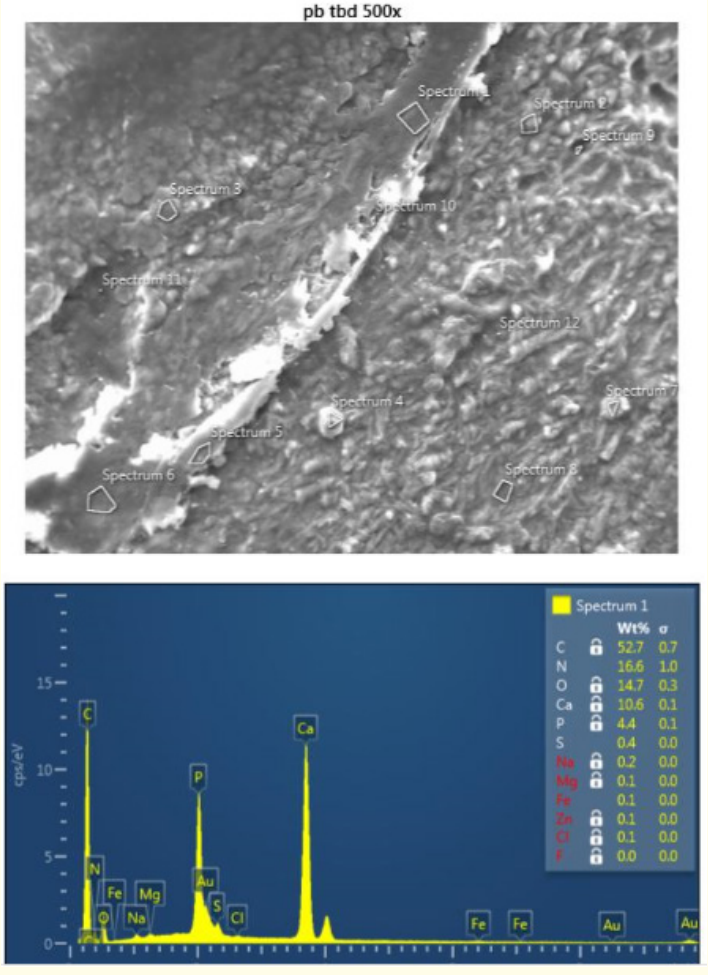

Figure 8a-8b: *Representative energy dispersive spectroscopy (EDS) showing high weight percentages of elements carbon, nitrogen and oxygen with calcium and phosphorus intermingled through the surface.*

Discussion

There exists an inseparable relationship between restorations placed and periodontal health. A wide number of restorative factors may adversely affect the periodontal health including margins of the restorations, contours, occlusion, materials, design factors of the restorations placed and procedures followed during the restorative treatment itself [8]. Margin integrity and excess cement are critical factors to maintain gingival health without inflammation when placing porcelain veneers.

Periodontal disease, characterized by sub gingival bacterial colonization, is a chronic inflammatory process resulting in loss of periodontal support around the teeth. According to the latest NHANES study, it is a fairly common condition affecting more than 42% of adult US population more than 30 years of age [9]. Periodontal abscess is however a relatively uncommon condition affecting 6-7% of all patients seen in the dental clinic and is usually known to be of acute onset, the diagnosis of which is based primarily on clinical presentation [10]. Signs of deep probing depth, gingival swelling, bleeding on probing, suppuration either spontaneous or on pressure application and symptoms ranging from mild discomfort to severe pain, swelling, tenderness of overlying gingiva in absence of radiographic changes and a vital tooth, suggest a periodontal abscess.

In the present case the veneer restorations were asymptomatic and esthetically and functionally acceptable, since 5 years before the development of periodontal abscess. Though excess cement acting as a foreign body has been a known cause of peri-implant disease and occurs few years after the placement of implants [11] micro leakage and failure to achieve a complete marginal seal through bonded ceramic restorations is a major cause of pulpal and periodontal inflammation in case of porcelain veneers [12]. Though the patient's history did not specifically suggest presence of a foreign object, it could not be ruled out, given the clinical appearance. Hence SEM and EDS analysis were performed when a foreign object was recovered from the sulcus.

Though the exact nature of the foreign object could not be definitely known, dental cements for veneers like resin based luting agents or glass ionomer based luting agents could be easily ruled out due to the absence of important metallic components. Very few areas of Calcium phosphate on the entire piece could possibly be attributed to formation of dental calculus. The foreign object itself has similar characteristics of a plastic or polymer base material, possibly a broken part of interdental cleansing device. Since the patient did not remember the piece being broken in the immediate past, and there were small areas of calculus present on the piece, it was present in the sulcus for at least 2 - 3 weeks, given the time required for initial biofilm to be mineralized. The engraved lines appearing on the sample are possible currete marks used do the SRP and remove the piece from the deep pocket (Figure 7c).

Local delivery of antibiotics was suggested as a treatment option for isolated deep probing depths where the risk to benefit ratio of systemic antibiotics is questioned. 1mg of minocycline, a broad spectrum tetracycline group of antibiotic, in 20 - 60 micron microspheres was inserted in the deep pocket with the help of a reusable syringe. It maintains its therapeutic benefits and concentration in the pocket for 14 days, conforming well to the depths of the pockets [13]. Minocycline microspheres as an adjunct to SRP have shown to reduce the red-complex bacteria by 6.49% as compared to 5.03% with SRP alone and probing depths by 1.38 mm compared to 1 mm by SRP alone [14]. A meta-analysis which analyzed the effects of SRP, surgical therapy and local antibiotics on deep probing and attachment levels concluded that when local antibiotic therapy is combined with SRP, probing depths and attachment levels show a consistent improvement [15].

Conclusion

As the diagnosis of periodontal abscess is empiric and based mainly on clinical signs and symptoms, a thorough case history, meticulous debridement with scaling and root planning and local chemotherapeutics can yield favorable results. Also, an appropriate restorative treatment is imperative for periodontal health and long-term success of the restoration.

Author's Contribution

All authors have contributed equally in making this manuscript a possibility. Dr. Bland, Dr. Cohen, Dr. Abhyankar and Dr. Kimmelman contributed to the clinical assessment and treatment of the patient. Brian Morrow performed the experiments and interpretation of the microanalysis data. All authors contributed to writing and proof-reading of the final manuscript before submission.

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Bibliography

1. M Peumans., *et al*. "Porcelain veneers: a review of the literature". *Journal of Dentistry* 28.3 (2000): 163-177.
2. Belser UC., *et al*. "Ceramic laminate veneers: continuous evolution of indications". *Journal of Esthetic Dentistry* 9.4 (1997): 197-207.
3. Burke FJ. "Survival Rates for Porcelain Laminate Veneers with Special Reference to the Effect of Preparation in Dentin: A Literature Review". *Journal of Esthetic and Restorative Dentistry* 24.4 (2012): 257-265.

4. D'Arcangelo C., *et al*. "Clinical evaluation on porcelain laminate veneers bonded with light-cured composite: results up to 7 years". *Clinical Oral Investigations* 16.4 (2012): 1071-1079.

5. R Arif., *et al*. "Gingival Health of Porcelain Laminate Veneered Teeth: A Retrospective Assessment". *Operative Dentistry* (2019).

6. Fradeani M., *et al*. "Porcelain laminate veneers: 6- to 12-year clinical evaluation--a retrospective study". *International Journal of Periodontics and Restorative Dentistry* 25.1 (2005): 9-17.

7. Aristidis GA and Dimitra B. "Five-year clinical performance of porcelain laminate veneers". *Quintessence International* 33.3 (2002): 185-189.

8. Vacaru R., *et al*. "Periodontal-Restorative Interrelationships". *Journal Oral Health and Dental Management in the Black Sea Countries* 3.5 (2003): 12-15.

9. Eke Paul I., *et al*. "Periodontitis in US Adults*". The Journal of the American Dental Association* 149.7 (2018): 576-588.e6.

10. Herrera D., *et al*. "The periodontal abscess: a review". *Journal of Clinical Periodontology* 27.6 (2000): 377-386.

11. Sequeira V., *et al*. "Prevention of Peri-Implantitis: A Narrative Review". *Journal of Dentistry and Oral Care Medicine* 4.1 (2018): 106.

12. Gabriela Ibarra., *et al*. "Microleakage of porcelain veneer restorations bonded to enamel and dentin with a new self-adhesive resin-based dental cement". *Dental Materials* 23.2 (2007): 218-225.

13. Krayer JW., *et al*. "Non-surgical chemotherapeutic treatment strategies for the management of periodontal diseases". *Dental Clinics of North America* 54.1 (2010): 13-33.

14. Goodson JM., *et al*. "Minocycline HCl Microspheres Reduce Red-Complex Bacteria in Periodontal Disease Therapy". *Journal of Periodontology* 78.8 (2007): 1568-1579.

15. Hung H and Douglass CW. "Meta-analysis of the effect of scaling and root planing, surgical treatment and antibiotic therapies on periodontal probing depth and attachment loss". *Journal of Clinical Periodontology* 29.11 (2002): 975-986.

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