

Perio-Resto Interrelationship – A Literature Review

Amrutiya Mansi R¹, Deshpande Neeraj²

¹(PG, Department of Periodontics, K.M. Shah Dental College & Hospital / Sumandeep Vidyapeeth, At. & Po. Piparia, Ta. Waghodia, Dist. Vadodara, Gujarat, India)

²(Professor, Department of Periodontics, K.M. Shah Dental College & Hospital / Sumandeep Vidyapeeth, At. & Po. Piparia, Ta. Waghodia, Dist. Vadodara, Gujarat, India.)

Abstract: *The interrelationship between restorative dentistry and periodontics is very dynamic and inseparable. The establishment of periodontal health is a prerequisite for successful restorative procedures, because for a restoration to survive, the periodontium must be healthy so that the teeth are maintained properly in the dental arch. The adaptation of the margins, the proximal relationships and the surface smoothness has a critical biological impact on the periodontium. Therefore dental restorations play a significant role in maintaining periodontal health. This literature review addresses the interactions between periodontal tissues and restorative procedure.*

Keywords: *Interdisciplinary approach, Over hanging restorations, Periodontal health, Plaque accumulation.*

I. Introduction:

All restorative therapies generally require a healthy periodontium as a prerequisite for successful outcome hence forth periodontal tissues form the foundation for proper esthetics, function, and comfort of the dentition. The interplay between periodontics and restorative dentistry is present at many fronts, including location of restorative margins, margin adaptation, contours, occlusion and response of the gingival tissues to restorative preparations. Restorations must be critically managed in several areas so that they are in harmony with their surrounding periodontal tissues. To maintain or enhance the patients' esthetic appearance, the tooth-tissue interface must present a healthy natural appearance, with gingival tissues framing the restored teeth in a harmonious manner. The real art of dentistry is to co-ordinate and interface these perspectives and provide the best quality of care to the patient. To ensure long term gingival health, one of the most important parameter is managing the proper margin location of a restoration relative to the alveolar bone. Therefore a close attention should be paid to the restorative procedures such as margin placement, contours of restorations as well as occlusal forces. Overhanging restoration provides a favorable environment for plaque accumulation and harbors bacteria and causes periodontal destruction.

II. Perio-restorative inter-relationship:

Understanding the inter-relationship between restorative and periodontal diseases is crucial. Not only do restorative margins placed subgingivally risk invading the attachment apparatus, but also unwanted tissue response appear to result due to their subgingival location of the restorative margin, regardless of depth of sulcus penetration. Overhanging margins contribute to periodontal disease¹ by: (1) providing ideal locations for the accumulation of plaque and (2) changing the ecologic balance of the gingival sulcus area to one that favors the growth of disease associated organisms (gram-negative anaerobic species) at the expense of the healthy state organisms (gram-positive facultative species). The location of the gingival margin of a restoration is directly related to the periodontal health status. Removal of overhanging restorations allows a more effective plaque control, resulting in the disappearance of gingival inflammation and increase in the alveolar bone support.

Renggli & Regolati² (1972) demonstrated that gingivitis and plaque accumulation were more pronounced in interdental areas with well-adapted subgingival amalgam fillings compared to sound tooth structure. Subgingivally located margins are associated with more amounts of plaque, more severe gingivitis, and deeper pockets. Margins placed at the level of the gingiva induce less severe conditions and supragingival margins are associated with a degree of periodontal health similar to that seen with intact control surfaces.

Waerhaug³ (1956) stated that subgingival restorations are plaque-retentive areas that are inaccessible to scaling instruments. These retentive areas continue to accumulate plaque even in the presence of adequate supragingival plaque control. It has also been shown that even high-quality restorations, if placed subgingivally, would trigger an increased plaque accumulation, gingival inflammation, and a higher rate of gingival fluid flow. **Gilmore & Sheiham**⁴ (1971) illustrated interproximal radiographic bone loss adjacent to posterior teeth with overhanging restorations. **Jeffcoat and Howell**⁵ (1980) demonstrated a link to the severity of the overhang and the amount of periodontal destruction. Based upon radiographic evaluations of 100 teeth with overhangs and 100 without, they

reported greater bone loss around teeth with large overhangs. The severity of bone loss was directly proportional to the severity of the overhang. The size of the overhang was divided by the distance from cemento-enamel junction to cemento-enamel junction and multiplied by 100 to obtain the percentage of the interproximal space occupied by the overhang. Overhangs were designated as large if they occupied >51% of the interproximal space. Small and medium overhangs (<20% and 20–50% of the interproximal space, respectively) were not associated with bone loss.

III. Poorly Contoured Dental Restorations

Dental restorations (fillings) are ideally made to blend smoothly with the contours of the natural tooth being restored. Ideally, the margins should be tightly adapted against the tooth, providing a hermetic seal against bacterial invasion. If the restoration is built too large, or the margins overhang the edge of the tooth, food and bacterial plaque can accumulate along the margins, leading to inflammation of the soft tissues and tooth decay (caries). Plaque accumulation in such areas can produce a bad taste and halitosis (bad breath). The most common error in recreating the contours of the tooth in dental restorations is over contouring of the facial and lingual surfaces, generally in the gingival third. This over contouring results in an area that is inaccessible to oral hygiene procedures and is unable to control plaque accumulation. Consequently plaque accumulates and the gingival becomes inflamed. Over contoured restorations also prevent the self-cleaning mechanisms of the adjacent cheek, lips and tongue. Apparently, under-contouring is not nearly as damaging to the gingival as the over contouring. Evidence from studies^{4,5,6} demonstrates that over contouring is a significant factor in gingival inflammation whereas under-contouring has little if any effect on gingival health. Inadequate or improperly located proximal contacts and failure to reproduce the normal protective anatomy of the occlusal marginal ridges lead to food impaction. In some situations, establishing ideal tooth contours is complicated by poor visibility, decay that extends well below the gum level, restricted mouth opening of the patients, and other factors.

3.1. Clinical examination of the tooth/teeth with overhanging restoration

Restorations in themselves and especially those with overhanging margins have been shown to retain more plaque as compared to intact tooth surface. Overhanging tooth restoration can become a risk factor for periodontal breakdown due to production of environmental changes and disturbance between beneficial bacteria and periodontal pathogens. Common signs of overhanging restoration are difficult flossing and floss that catches or tears. Overhanging tooth restoration is examined clinically with a fine sharp sickle probe on the mesial distal buccal lingual surfaces of the involved tooth. Overhanging tooth restorations can be scored for the presence or absence of the overhang margins.^{6,7} Following scores can be used

Score 0 = unrestored surface

Score 1 = restoration within 1 mm. of the gingival margin or below, but without clinically detected overhang margin.

Score 2 = restoration within 1 mm. of gingival margin or below, but with clinically detected ledge indicative of overhanging margin.

Based upon the above mentioned score, teeth with overhanging restoration can be clinically diagnosed for overhanging restorations.

3.2. Clinical examination of the soft tissue around the overhanging restorations:

Overhangs have been strongly implicated as an etiologic factor in the progression of periodontal disease and alarmingly prevalent. In addition to promoting plaque accumulation, they change a nondestructive subgingival flora to a destructive one. There is good documentation that bleeding, gingivitis, and bone loss increase in tissue adjacent to overhanging dental restoration as compared to homologous teeth. Many investigators^{1,3,4,6,8} have reported upon the adverse effect of poor restorations on the health of the adjacent periodontal tissue. The relationship of overhanging dental restorations to periodontal disease has been studied by three methods.^{4,5,9,10} The most common method is to compare the periodontal status of teeth with overhanging dental restorations with homologous teeth without overhanging dental restorations.⁵ Another approach utilized extracted teeth to directly measure attachment on tooth surface with and without overhanging dental restorations.¹ The third method, intentionally placed overhanging dental restorations can be studied in humans for their effects on the subgingival microflora and periodontal tissue.

Before checking for gingival inflammation, presence or absence of supra and sub gingival plaque and calculus should be taken in to account. Gingival inflammation can be clinically examined by presence or absence of bleeding from a gingival margin by running a periodontal probe along the opening of the gingival crevice around the involved tooth (overhanged restored tooth). Probing pocket depth, should be measured from marginal gingiva to the base of the pocket around the involved tooth (overhanged restored tooth). Gingival recession should be measured from cemento-enamel junction to the marginal gingiva around the involved tooth

(overhanged restored tooth). Clinical attachment loss, from the cemento-enamel junction to the base of the pocket, around the involved tooth (overhanged restored tooth). These give the fair idea about the periodontal disease and its progression. After clinical examination, radiographic examination plays an important role as a confirmatory diagnosis for the overhanging restoration and its effect on the periodontium.

3.3. Radiographic examination:

Radiographic examination can be done by using intra oral peri apical radiographs or bitewing radiographs. Overhanging margins can be recorded on mesial or distal surface, and if the radiograph image showed a step or ledge extending beyond the normal smooth profile of the tooth, or a “beveled” appearance at the base of a proximal restoration, it was attributed to overhang margin present in a concavity on the surface of the tooth.⁶ Proximal surfaces can be scored from the radiographs as follows^{6,7}

Score 0 = unrestored surface.

Score 1 = restoration without visible overhanging margins.

Score 2 = restoration with visible overhanging margin in a tooth adjacent to another tooth.

These is to check for the presence or absence of the overhanging dental restoration. Furthermore a classification was given by *Kuonen et al* (2009)¹¹ which was used to semi-quantify the degree of the marginal overhangs of the fillings using the increments that are listed below.

Classification of various overhanging filling margins according to size

Category	Marginal overhang (mm)
A	0.01–0.19
B	0.19–0.39
C	0.45–0.84

IV. Treatment considerations:

4.1. Guidelines for Restorative Margin placement:

When determining where to place restorative margins relative to the periodontium, it is recommended that the patient’s existing sulcus depth to used as a guideline in assessing the biologic width requirement for the patient. The extension of any restorative margin into the gingival sulcus should be considered a compromise, but esthetic or retention demands often make it necessary.¹² Hence, supragingival margins are preferred over subgingival margins as they are considered a compromise. The marginal fit should be optimal because rough restorations or open margins lead to an accumulation of plaque and bacterial pathogens that are associated with inflammatory periodontal diseases. Intracrevicular margins are defined as those confined within the gingival crevice.¹³

The base of the sulcus can be viewed as the top of the attachment and therefore variations in attachment height are accounted for by assuring that the margin is placed in the sulcus and not in the attachment.¹⁴ The first step, in using sulcus depth as a guide in margin placement, is to manage gingival health. Once the tissue is healthy, the following three rules¹⁴ can be used to place intracrevicular margins.

Rule I

If the sulcus probes 1.5 mm or less, place the restoration margin 0.5 mm below the gingival tissue crest. This is especially important on the facial aspect and prevents a biologic width violation in a patient who is at high-risk in that regard.

Rule II

If the sulcus probes >1.5 mm, place the margin one half the depth of the sulcus below the tissue crest. This places the margin for enough below tissue so that it is still covered if the patient is at higher risk of recession.

Rule III

If a sulcus >2 mm is found, especially on the facial aspect of the tooth, then evaluate to see whether a gingivectomy could be performed to lengthen the teeth and create a 1.5 mm sulcus. Then the patient can be treated as mentioned in Rule-I.

Thus, overhangs not only increase plaque accumulation but also increase the specific periodontal pathogens in the plaque. Most overhanging restorations can be recontoured without replacing the restoration, and this should be considered a standard component of nonsurgical treatment.¹⁵ A variety of devices have been suggested for overhang removal, most based on clinical opinions. Spinks et al¹⁶ (1986) demonstrated that a motor-driven diamond tip is faster for removing overhangs and led to smoother restorations compared to sonic scalars and curettes, respectively.

4.2. Periodontal Considerations

It includes:

- Phase 1 therapy/initial therapy
- Periodontal surgery

4.2.1. Phase 1 Therapy

After phase I therapy, controlled periodontal inflammation, results in restorative procedures of a much higher quality than those carried out in an environment of gingival inflammation. The presence of an acute inflammatory response in the gingival, causes ulceration of epithelium that lines the gingival pocket and increase of vascularity and edema of the tissues immediately under this epithelium. Thus, in the gingival environment the important first order procedure should be plaque control, calculus removal and the removal of any inadequate dental restorations.

4.2.1. Periodontal Surgery

Periodontal surgery is performed after the completion of oral hygiene phase therapy if deemed necessary. In some patients, periodontal surgery like crown lengthening is necessary. In situations in which a tooth has a short clinical crown deemed inadequate for retention of a required restoration, it is necessary to increase the size of the clinical crown using crown lengthening procedures. These crown lengthening procedures enable the dentist, performing the restoration to develop an adequate area for retention without extending the margins deep into the periodontal tissues. These periodontal surgical procedures should be carried out with due regard for the restorative needs of the patient i.e. need to be modified because of the restorative or prosthetic needs of the patient.

V. Conclusion

Clinicians need to combine periodontal and restorative procedures in co-ordinated manner to optimize the best clinical outcome. All phases of clinical dentistry are intimately related to a common objective: The preservation and maintenance of the natural dentition in healthy state. For restorations to survive for long-term, the periodontium must remain healthy. For the periodontium to remain healthy, restorations must be critically managed in several areas so that they are in harmony with their surrounding periodontal tissues. Thus periodontal and restorative dentistry are interrelated for maintenance of healthy dentition. Indeed, a carefully constructed interdisciplinary approach, with accurate diagnosis and comprehensive treatment planning serves as corner stone in providing a holistic care to the patient.

Reference:

- [1.] R Vacaru, A Podariu, D Jumanca, A Galuscan, R Muntean. Periodontal-restorative interrelationships. OHDMBSC. 2003,3,12-5.
- [2.] Renggli H, Regolati B. Gingival inflammation and plaque accumulation by well- adapted subgingival and supragingival proximal restorations. Hel Odontol Acta. 1972,15,99-101.
- [3.] Waerhaug J. Effect of rough surfaces upon gingival tissue. Journal of Dental Research. 1956,35,323-5.
- [4.] Gilmore N, Sheiham, A. Overhanging dental restorations and periodontal disease. Journal of Periodontology. 1971,42,8-12.
- [5.] Jeffcoat MK, Howell TH. Alveolar bone destruction due to overhanging amalgam in periodontal disease. Journal of Periodontology. 1980,51,599-602.
- [6.] Pack ARC, Coxhead LJ, McDonald BW. The prevalence of overhanging margins in posterior amalgam restorations and periodontal consequences. Journal of Clinical Periodontology. 1990,17,145-52.
- [7.] Ibraheem AF, Al-Safi KA. Prevalence of overhang margins in posterior amalgam restorations and alveolar bone resorption. Journal of College of Dentistry. 2005,17,11-3.
- [8.] Roderiques HJ, Stroham JD, Newman HN. Effect on gingival health of removing overhanging margins of interproximal subgingival amalgam restorations. Journal of Clinical Periodontology. 1980,7,457-62.
- [9.] Gorozo I, Newman HN, Strahan JD. Amalgam restoration, plaque removal and periodontal health. Journal of Clinical Periodontology. 1979,6,93-105.
- [10.] Hakkarainen H, Ainamo J. Influence of overhanging posterior restoration on alveolar bone height in adults. Journal of Clinical Periodontology. 1980,7,114-20.
- [11.] Kuonena P, Huynh-Baa G, Krummena VS, Stossela EM, Rothlisbergera B, Salvi GE et al. Restoration Margins in Young Adolescents: A Clinical and Radiographic Study of Swiss Army Recruits. J Oral Health and Preventive Dentistry. 2009,7,377-82.
- [12.] Valderhaug J, Heloe LA. Oral hygiene in a group of supervised patients with fixed prosthesis. Journal of Periodontology. 1977,48,221-4.
- [13.] Maynard GJ, Wilson RD. Physiologic dimensions of the periodontium fundamental to successful restorative dentistry. Journal of Periodontology. 1979,50,107.
- [14.] Sood S, Gupta S. Periodontal-Restorative Interactions: A Review. Indian Journal of Clinical Practice. 2013,23,707-13.
- [15.] Padbury Jr A, Eber R, Wang H-L. Interactions between the gingiva and the margins of restorations. Journal of Clinical Periodontology. 2003,30,379-85.
- [16.] Spinks GC, Carson RE, Hancock EB, Pelleu GB. An SEM study of overhang removal methods. Journal of Periodontology. 1986,57,632-6.