

Periodontal-restorative interrelationships

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Summary

Dental restorations and periodontal health are inseparably interrelated. The adaptation of the margins, the contours of the restoration, the proximal relationships and the surface smoothness have a critical biological impact on the gingiva and the supporting periodontal tissues. Dental restorations therefore play a significant role in maintaining periodontal health.

Key words: plaque accumulation, overhanging margins, over contoured margins, ridge-lap bridges.

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Dental restorations and periodontal health are inseparably interrelated. The adaptation of the margins, the contours of the restoration, the proximal relationships, and the surface smoothness have a critical biological impact on the gingiva and the supporting periodontal tissues. Dental restorations therefore play a significant role in maintaining periodontal health. Faults in dental restorations and prostheses are common causes of gingival inflammation and periodontal destruction. Seven characteristics of restorations and partial dentures are important from a periodontal point of view:

- margins of restorations;
- contours;
- occlusion;
- materials;
- bridge design;
- design of Removable Partial Dentures;
- procedures of Restorative Dentistry themselves.

They all play a role in the etiology of periodontal lesions.

1. Margins of restorations

Overhanging margins contribute to periodontal disease 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 frequency of overhanging margins of proximal restorations varies in different studies from 16.5% to 75%. A highly significant statistical relationship was found between marginal defects and reduced bone height. Removal of overhangings allows a more effective control of plaque, resulting in the disappearance of gingival inflammation and increasing of the alveolar bone support.

The location of the gingival margin of a restoration is directly related to the periodontal health status. Subgingivally located margins are associated with 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.

Numerous studies have shown a positive correlation between subgingival margins and gingival inflammation. 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.

Roughness in the subgingival area is considered to be the major cause of plaque buildup and the subsequent inflammatory response. The subgingival zone is made up of the crown and the margins of the restoration, the luting material and the prepared tooth surface. Several sources of the roughness have been described: strips and scratches in the surface of carefully

polished acrylic resin, porcelain or gold restoration; separation of the cervical crown margin and the cervical margin of the finishing line by the luting material, exposing the rough surface of the prepared tooth; dissolution and disintegration of the luting material causing crater formation between the preparation and the restoration and inadequate marginal fit of the restoration.

The undersurface of pontics in fixed bridges should barely touch the mucosa. When the contact is excessive it prevents cleaning. Plaque accumulates, causing inflammation and even pseudopocket formation.

2. *Contours*

The most common error in recreating the contours of the tooth in dental restorations is overcontouring of the facial and lingual surfaces, generally in the gingival third.

This overcontouring results in an area in which oral hygiene procedures are unable to control plaque. Consequently plaque accumulates and the gingiva becomes inflamed. Overcontouring crowns and restorations also prevent the self-cleaning mechanisms of the adjacent cheek, lips and tongue.

Apparently, undercontouring is not nearly as damaging to the gingiva as the overcontouring. Evidence from studies demonstrates that overcontouring is a significant factor in gingival inflammation whereas undercontouring 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. Failure to re-establish adequate interproximal embrasures fosters the accumulations of irritants.

3. *Occlusion*

Restorations that do not conform to the occlusion patterns of mouth cause occlusal disharmonies that may be injurious to the supporting periodontal tissues. The insertion of the "high filling" or the insertion of a prosthetic replacement that creates excessive forces on abutment and antagonist teeth can produce periodontal injury around teeth with a previously healthy periodontium.

The occlusal surface of pontics should be in harmony with the functional pattern of the entire

dentition. Abnormal occlusal relationships jeopardize the opposing teeth and the remainder of the dentition as well as the periodontium of the abutment teeth.

4. *Materials*

In general, restorative materials are not themselves injurious to the periodontal tissues. One exception to this may be self-curing acrylics. The surface of restorations should be as smooth as possible to limit plaque accumulation.

Resins are highly polishable, but have deficiencies in strength, porosity and wear.

Successful tissue response to any composite material depends on many variables. Surface smoothness, an important variable, can be altered significantly if the restoration is incorrectly finished. The type of the composite material, the proximity of the restoration to the soft tissue also influence success, whether light curing was complete and whether air bubbles were incorporated during placement. Soft tissue inflammatory response to resin may not show up initially, because the restoration that initially had smooth surfaces may become rough as air bubbles, incorporated during mixing, become exposed.

Organic compounds found in the toothpaste, plaque and soft drinks can soften any composite material or resin cement, resulting in surface roughness and plaque retention.

Laboratory-made porcelain restorations offer a more biocompatible alternative to direct bonded restorations, being both aesthetically and marginally superior.

Glass ceramics and porcelain veneers offer a clear advantage over any other type of restorative materials in the maintenance of gingival health. Their fine marginal fit results in a thin cement line, which lessens gingival irritation. In addition, the nonporous surface of glass ceramics or porcelain does not allow bacteria to adhere significantly, thus reducing inflammation.

There are clinical situations in which the full crown is indicated prior to restoration. It fulfills requirements that can be met in no other type of restoration.

However, even when ideally constructed in relation to the gingival sulcus, the full-crown introduces the risk of gingival inflammation.

Crowns substitute a foreign substance (e.g. gold, resin or porcelain) for the natural tooth

wall of the gingival sulcus. The materials themselves are not irritating but plaque can accumulate on these surfaces, which can result in gingival inflammation.

The junction between the crown and the tooth also presents a problem. Even with a perfect marginal fit, an extremely thin cement line that attracts plaque is unavoidable.

The exact relationship between the degree of surface roughness and plaque accumulation is yet undetermined. There is evidence that the amount of plaque that accumulates in patients with relatively poor oral hygiene is not affected to a significant degree by minor changes in root surface configuration. In patients with rough dental restorations, however, the surface configuration may play an important role in plaque accumulation. Therefore, all restorative materials placed in the gingival environment should have the highest possible degree of polish.

5. Bridge design

A bridge should be designed to minimize accumulation of dental plaque and food debris and to maximize access for cleansing by the patient and also provide embrasures for the passage of food.

The health of the tissues around fixed prostheses depends primarily on the patient's oral hygiene; the materials with which bridges are constructed appear to make little difference and bridge design is important only to the extent that enables the patient to keep the area clean.

Ridge-lap pontics, which straddle the ridge and have a concave tissue-facing surface, constitute the least desirable design and should be avoided. They make plaque control impossible for the patient and inevitably result in the inflammation of the contact tissue.

The bridge design with the least effect on the periodontium is the sanitary or hygienic pontic. It is often necessary to use a design other than the hygienic bridge for aesthetic reasons.

The ovate bridge is the most hygienic type with the best patient acceptance. Prior to wide spread use of the ovate bridge, the modified ridge lap design was considered the most aesthetic.

Another problem that can occur is if during cementation the restoration is not seated as close as possible to the tooth preparation. A minimal cement line at the margin reduces plaque formation.

It is extremely important also, that all excess cement be removed from the sulcus after cementation. Retained cement particles can cause gingival inflammation.

6. Design of Removable Partial Dentures

Several investigations have shown that after the insertion of partial dentures, there is an increase in mobility of the abutment teeth, gingival inflammation, and periodontal pocket formation. This is because partial dentures favor the accumulation of plaque, particularly if they cover the gingival tissue. Partial dentures that are worn night and day induce more plaque formation than those worn only during the day. These observations emphasize the need for careful and personalized oral hygiene instruction, to avoid harmful effects of partial dentures on the remaining teeth.

The presence of removable partial dentures induces not only quantitative changes in dental plaque, but also qualitative changes, promoting the development of spirilla and spirochetes.

7. Restorative Dentistry Procedures

When using elastic impression materials, it is often necessary to retract the gingiva to gain access to the gingival finish line of the preparation. The most commonly used method for gingival retraction is the use of retraction cords. They are impregnated with agents such as 8% zinc chloride, 10% tannic acid and 10% aluminum sulfate, 8% racemic epinephrine – which cause local ischemia that may be injurious to the gingiva.

Improper placement and removal of retraction cords can result in tissue tearing and inflammation. There have been reports of periodontal abscesses associated with impression material and/or retraction cord left in the gingival environment after taking impressions. That is why immediately after an impression is taken, it should be carefully checked out for pieces that may have been torn from it and left in the gingival environment. The gingival sulcus should also be inspected carefully for residual impression material.

Improperly constructed "interim" restorations may cause periodontal inflammation and gingival recession. The requirements for fit, pol-

ish and contour in the interim restoration should be the same as for the final restoration. The marginal integrity of interim restorations should be technically as good as possible and their surface should be highly polished, so that plaque accumulation is minimized. The contour of these restorations should also be compatible with the gingival tissue.

The use of rubber dam clamps, copper bands, matrix bands, and discs in such a manner as to lac-

erate the gingiva results in varying degrees of inflammation. Although for the most part such transient injuries undergo repair, they are needless sources of discomfort to the patient. Injudicious tooth separation and excessively vigorous condensing of gold foil restorations are sources of injury to the supporting tissue of the periodontium that may be attended by acute symptoms such as pain and sensitivity to percussion.

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