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Review Article

Perio-Prostho Interrelationship

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ABSTRACT:
Periodontal health is a pre-requisite for successful prosthetic or restorative treatment. The relationship between periodontal health and restorative treatment is very important. For restorations to remain successful for long term, the periodontium must remain healthy and free from all kind of inflammation. For periodontal tissues to remain healthy, restorations need to be evaluated for a number of factors. This review will focus on all such factors which are important for comprehensive periodontal treatment.

Keywords: Periodontal health, prosthetic or restorative treatment, Pontic design, Margins of restorations

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INTRODUCTION

To achieve the long-term therapeutic targets of comfort, good function, treatment predictability, longevity and ease of restorative and maintenance care, active periodontal infection must be treated and controlled before the initiation of restorative, esthetic and implant dentistry. This has led to the emergence of a very important aspect of dentistry i.e. the interdisciplinary approach. In this various specialties of dentistry work hand in hand to provide a complete dental care.

Of all the disciplines within modern dentistry, periodontics and prosthodontics have the strongest and the most intimate connections as healthy periodontium will increase the longevity of prosthesis.

RATIONALE / BACKGROUND

Periodontal treatment must be completed to remove all the factors which can initiate or aggravate the inflammatory response of tissues before starting the prosthetic treatment because non inflamed tissues are less likely to change or shrink during the sub gingival restorative treatment. Prosthesis constructed on healthy periodontal tissues is more conducive to gingival health and pose less long term complications. For prosthetic restorations and appliances, periodontal health plays a crucial role in their success whereas defective restorations can lead to the initiation and progression of periodontal diseases.

All active periodontal disease should be controlled before starting the prosthetic part of the treatment. Active periodontal disease means spontaneous or bleeding on probing, suppuration or pus discharge, deep periodontal pockets, furcation involvements, tooth mobility or any signs of inflammation in soft tissues i.e. color, contour, consistency, surface texture, size and position of the gingiva. The inflamed periodontium causes change in appearance of the soft tissues surrounding prosthesis and thus can negatively effect the esthetic outlook. If the prosthesis is placed without periodontal intervention, the disease activity will continue leading to persistent inflammation, alveolar bone loss, tooth mobility and poor prognosis which might result in tooth loss.

Apart from controlling active periodontal disease, the Perio-prosthetic interrelationship also aims at maintaining the soft and hard tissue sites for better prosthetic replacements e.g. crown lengthening to keep sub gingival margins of the restoration, ridge augmentation for implant placement and papilla reconstruction i.e. all such procedures where intact and healthy periodontium will lead to better prosthetic outcome[1].

Supportive periodontal treatment for patients with prosthesis is very crucial, can avoid further progression of disease in patients already treated for periodontitis.

Inappropriate prosthetic treatment planning can lead to periodontal inflammation, gingival recession, and associated negative outcomes.

ANATOMY OF THE TISSUES

The dentogingival complex (DGC) is a critical anatomical and functional unit that secures the gingiva to the tooth and protects the underlying tissues from bacterial invasion and mechanical damage. The integrity of the dentogingival complex depends on having an intact epithelial covering, with junctional epithelium forming a seal in the gingival sulcus. If this unit is not intact, periodontium is at an increased risk of developing periodontal diseases. This seal is at a higher risk of getting broken during sub gingival restorations and can lead to inflammatory response in surrounding tissues thus making the pre-prosthetic periodontal surgery an important procedure to be followed for long term success of prosthesis and restorations.

Becker & Becker (1984) in his previous studies showed that sites with treatment but without maintenance had a 2 times higher tooth loss than the sites with regular maintenance after periodontal treatment[2,3].

PROSTHO-PERIO INTERRELATIONSHIP

1. Biological Width:

The attachment of the junctional epithelium to the tooth is reinforced by the gingival fibers, which brace the marginal gingiva against the tooth surface. This is the reason why junctional epithelium and the gingival fibers are considered a functional unit called as Dentogingival unit. The dimensions of dento-gingival complex called as “Biologic Width” is present around the natural teeth in a protective cuff- like barrier which has the tendency to self-restore and adapt dynamically.

Iconic study on cadavers by Gargiulo et al 1961[4] found that the connective tissue attachment occupies 1.07mm space above the crest of the alveolar bone whereas junctional epithelium occupies 0.97mm of space above the connective tissue attachment. The combination of these 2 measurements constitutes the Biologic Width.

The reasons for the violation include an attempt to access sound tooth structure, increased preparation length, previous restorations, existing caries, resorption defects, traumatic injury, iatrogenic insults, and improper identification of sulcus depth[5, 6].

Clinically, this is very important, as violation of this width can lead to 2 types of reactions in the tissue surrounding the prosthesis or restoration:

1. There can occur bone loss of an unpredictable nature as the body will attempt to create the same space between the restoration margin and the crest of the alveolar bone which has been encroached upon.
2. In second scenario, bone level may remain unchanged, but unreasonable periodontal inflammation starts and persists around the margins.

In both the cases, the treatment protocol will remain the same, the biological width has to be maintained either by raising a flap and recontouring the bone (Crown Lengthening procedure) to create the space for Biological Width or by orthodontically extruding the tooth.

Crown lengthening is a surgical procedure aimed at the removal of periodontal tissue to increase the clinical crown height.[7]

2. Use of retraction cord and effect on periodontium:

The periodontal tissues are manipulated both mechanically and chemically while making an impression for the future prosthesis. This manipulation and its effects on tissues are enhanced manifold if the surrounding tissues are inflamed. Even on the healthy periodontal tissues, excessive manipulation while impression taking can damage the dentogingival seal.

Ruel and coworkers reported that gingival displacement methods like retraction cords may cause 0.1-0.2 mm gingival recession and the destruction of the junctional epithelium that took 8 days to heal[8]. Chemical agents as well as the mechanical force of retraction cords could trigger temporary gingival recession and gingival inflammation[9]. It has been shown that the different time intervals of the chemical retraction agent placement could cause different degree of tissue inflammation changes in the beginning[10]. Hence, the proper manipulation, different gingival retraction techniques such as materials and time-control are the key factors to avoid permanent tissue damage while impression-taking process is made[11].

Minimal force should be used to place the cord so as not to penetrate the sub epithelial connective tissue. Most importantly, moisten the cord prior to removal to avoid tripping over the sulcus epithelium. There is direct relationship between the time that retraction cord is in the sulcus and the potential for adverse gingival responses such as recession. It has been suggested that total cord retraction time ideally should not exceed 15 to 20 minutes. Too large a retraction cord or too many cords can cause excessive trauma[12].

3. Contour of the Crown:

Restoration contour is one of the most important aspect of prosthetic-perio interrelationship as the prosthesis contour can effect maintenance of the periodontium. Prosthetic overhangs can lead to plaque accumulation or can make the plaque removal difficult leading to gingival inflammation and thus worsening the periodontal status. Ideal contour will provide better oral hygiene access; will have an adequate fullness of the gingival form and a pleasing

visual tooth contour. Over contouring and gingival inflammation are proved to be associated, whereas undercontouring produces no adverse periodontal effect. The most frequent cause of overcontoured restorations is inadequate tooth preparations by the dentist which forces the technician to produce a bulky restoration to provide room for the restorative material. In areas of the mouth where esthetic considerations are not critical, a flatter contour is always acceptable[12].

Here an important thing is that just to avoid overcontouring, excessive grinding of the tooth material should be avoided.

4. Location of restrorative margin:

Location of restorative margins depend on the extent of caries, root caries, esthetics, retention and resistance form of the restoration. Three types of restorative margins are there:

Supragingival margins

Equigingival margins

Subgingival margins

Out of these, the supragingival margins are the most beneficial type when considering the health of the periodontium because they are easy to clean whereas the other two margins i.e. the subgingival and equigingival favours the plaque accumulation as it is practically not possible to clean beneath the gingival surface. Apart from these, while placing subgingival margins there are higher chances of violating the biological width. The biological width follows the osseous scallop. Therefore, the inappropriate use of a more horizontal tooth preparation margin as opposed to a scalloped margin on anterior teeth will often violate the biological width in the interproximal area. Thus, it is important to know the total dentogingival complex measurement when preparing a tooth[13].

The effect of the location of an artificial crown margin on plaque accumulation and gingival health were well documented by Flores-de-Jacoby et al[14]. While placing subgingival margins, there is limited access to polish those margins underneath the gingiva and so are more chances of plaque accumulation on rough subgingival surfaces.

Yung TH et al concluded that to prevent periodontal destruction, supragingival restorative margins are highly recommended at the sites with less esthetic concerns. For the site that the subgingival margin is required, certain principles should be bear in mind including conservatively subgingival extension of restorative margin, sufficient width of keratinized gingiva (at least 2mm of keratinized gingiva including 1mm of attached gingiva), smooth restorative surfaces with proper finished margin and the avoidance of Biological Width breach. Adequate daily home care needs to be addressed to patients and regular professional maintenance is necessary[11].

5. Proximal Relationship:

The ideal interproximal embrasure should house the gingival papilla without impinging on it and should also extend the interproximal tooth contact to the top of the papilla so that no excess space exists to trap food or to be esthetically displeasing. Loss of interproximal papilla results in impaired esthetics and promotion of food impaction, aggravating periodontal destruction. Jernberg and colleagues in 1983 studied relationship between proximal tooth open contacts and periodontal disease and concluded that open contacts lead to greater pocket depth, greater prevalence of food impaction and in turn greater clinical attachment loss[15].

Open interproximal contacts have been invariably attached to the food impaction and thus initiating or promoting periodontal disease. So, clinicians should defer to place the open contacts and encourage the patient to do interproximal cleaning via the use of dental floss or other measures. The ideal size of the interproximal embrassure is one that permits the introduction of cleaning aids for the removal of plaque. The size of interproximal brush should be chosen such that it doesn't widen the already existing interproximal embrasure size. The subgingival margin of the restoration can irritate the interproximal papilla if it is not properly finished.

6. Pontic design:

There are four types of pontic designs: sanitary, ridge lap, modified ridge lap and ovate. The basic difference between different types of pontic is the esthetics and access for oral hygiene. Regardless of the design, the pontic should provide a stable occlusion, maintain normal mastication and does not put extra load on the abutment teeth. The physiological response of the material used for pontic doesn't matter much as long as the surfaces are thoroughly finished. The ovate pontic is the ideal pontic form, particularly in areas of aesthetic concern[16]. In the edentulous ridge a receptor area is created. This receptor area can be created with a bur, electrocautery or by creating a wound. This way a concave shaped area is created and when a convex pontic is placed, it adapts to the site and has an emerging profile. The depth of the receptor site depends on the aesthetic requirements of the pontic. In areas of high aesthetic concerns such as maxillary anterior region, a receptor area that is 1 to 1.5 mm below the tissue on the facial aspect is created. This creates the appearance of a free gingival margin and produces optimal aesthetics.

The "full ridge-lap pontic" is an outdated design and now days is not recommended to be used in any cases because it overlaps the ridge in buccolingual direction in such a way that it creates an undersurface that is entirely concave and hence can entrap food particles which cannot be cleaned. However, in areas where inadequate ridge is present to create an ovate pontic, a modified ridge-lap pontic is the second choice. In this modified design, the pontic follows the convexity of the ridge on the facial aspect but stops on the lingual crest of the ridge without extending down the lingual side of the ridge. This way, the esthetic areas on buccal or facial side has a concave shape, but the

pontic is open on lingual side which allows sufficient space to maintain oral hygiene.

The primary method for cleaning the undersurface of pontics is to draw a dental floss mesiodistally along the undersurface. The shape of the undersurface will determine with how much ease the area can be cleaned and which mechanical aid to be used to clean the surface. The convex undersurface of ridge lap and modified ridge lap pontics are easier to clean. But the concave undersurface traps more food and is difficult to clean. Out of all designs, sanitary pontic is easiest to clean but this design is rarely used clinically as it is unesthetic and low acceptance rate by patients.

7. Subgingival Debris:

Leaving debris below the tissue during restorative procedures can create an adverse periodontal response. The cause can be retraction cord, impression material, provisional material, or either temporary or permanent cement[17]. The diagnosis of debris as the cause of gingival inflammation can be confirmed by examining the sulcus surrounding the restoration with an explorer, removing any foreign bodies, and then monitoring the tissue response. It may be necessary to provide tissue anesthesia for patient comfort during the procedure.

8. Occlusal considerations:

The relation between periodontal disease and occlusion has been long debated. It is generally accepted that the inflammatory aspects of the case should be addressed first and resolved before any occlusal considerations. The rationale is that resolution of inflammation will change the tooth-tissue relationship including relationship of teeth to the opposing dentition. After resolution of inflammation, the occlusion can be evaluated and any negative consequences addressed. Occlusal therapy can be used to decrease loading of teeth that have lost bone due to periodontal disease. Clinicians should develop the skills to diagnose occlusal status, use splints (bonded external appliances, intracoronal appliances, or indirect cast restorations) for occlusal stability and develop techniques for occlusal adjustment (coronoplasty). Before considering splinting, the clinician must identify the etiology of the instability. Excessive occlusal forces from parafunction or deflective tooth contacts are frequent causes of excessive mobility. Whenever occlusion is the cause, occlusal therapy is always performed first. Occlusal therapy on periodontally involved teeth must produce an occlusal pattern that differentially loads individual teeth according to each tooth's periodontal bone support. In addition, any inflammation of the periodontal supporting apparatus must be controlled before making a decision on splinting[18].

CONCLUSION

The relationship between prosthodontics and periodontics is intimate and inseparable. Robust supporting periodontal tissues provide solid foundations for predictable prosthetic therapy. In addition, regaining stable periodontal conditions should rely on establishment of proper contact types, occlusal scheme and quality prosthesis. Frequent and efficient communications are essential between periodontists and prosthodontists through the entire treatment procedures, including plan, treatment procedures and maintenance, since both specialty share a common goal: to create pleasing esthetic with a harmonious stomatognathic system.

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