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Review Article

Effect of prosthetic factors on periodontal health: a literature review

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ABSTRACT

In modern dentistry, the relationship between periodontics and prosthodontics is inseparable, especially in terms of treatment plans, implementation procedures, outcome achievement and maintenance. A healthy periodontium will allow the prosthesis to last a long time. Prosthetic factors in the form of biologic width, proximal contact relationship, restoration contour, restoration margin location, trauma from occlusion and gingival retraction technique if considered carefully, can minimize damage to the periodontal tissue. Good and efficient communication between periodontists and prosthodontists during treatment procedures must be achieved to achieve the common goal of creating a harmonious aesthetic and stomatognathic system.

Keywords: Periodontics, Prosthetics, Biologic width, Gingival inflammation

INTRODUCTION

All disciplines in modern dentistry are interrelated with one another. As an example of multidisciplinary integration, periodontics and prosthodontics have strong and close relationships with each other. A healthy periodontium is required for prosthetic and restorative therapy for good results. Conversely, poor prosthesis can contribute to the development of periodontal disease.^{1,2}

Based on a cross-sectional study conducted by Mishra et al (2014), it was found that there was a relationship between the wearer of removable/fixed dentures and periodontal health in the adult population. In this study, the symptoms of periodontal disease in users of removable/fixed dentures were obtained where the percentage of patients with periodontal pockets was relatively high at 57.2%.³ Sinaidi & Preethanath (2013) conducted a study on a group of Saudi women who used fixed partial dentures. The results showed an increase in plaque on the supporting teeth by 94%. This increase in plaque causes gingival inflammation which triggers gingivitis.⁴ From these data, it is necessary to know the prosthetic factors that affect periodontal health.

LITERATURE REVIEW

The Role of a Healthy Periodontium in Prosthetic Therapy: All prosthetic and restorative therapies generally require a healthy periodontium to get good results. A healthy periodontium is required

for a good implant prognosis, so any peri-implant or periodontal disease should be treated prior to prosthodontic construction.⁵

The pathological signs of the periodontium are pocket formation, bleeding on probing and changes in the gingival tissue in the form of changes in gingival texture, color, size and consistency. If inflammation in the periodontal tissue is not treated, it will cause damage to the periodontal tissue so that the function of the prosthesis will be disrupted and will not last long.^{5,6}

Prosthetic Factors Affecting Periodontal Health

Prosthodontic treatment should provide comfort for the patient and improve function, health and aesthetics. The prosthesis must be carefully designed and installed, and well adapted to the surrounding periodontal tissue.¹

Studies have shown that improper cervical adaptation of fixed prostheses, excessive subgingival positioning of the fixed edges, rough surface of the prosthesis and larger surfaces of the restorations can cause periodontal inflammation.⁷ The prognosis of fixed dentures is highly dependent on their relationship to the periodontium tissue, which known as "symbiotic relationship" or "mutual protection relationship".⁸

Biologic Width: Biologic width defined as the dimensions of the soft tissue, which adhere to the coronal portion of the tooth to the crest of the alveolar bone.⁵ Gargiulo et al. reported the following mean dimensions: groove depth 0.69 mm, epithelial attachment 0.97 mm, and

connective tissue attachment 1.07 mm. Based on this, the biological width was expressed as 2.04 mm, which is the sum of epithelial adhesions to connective tissue adhesions.⁹ Similar biologic width dimensions were also reported by Vacek et al (1994) evaluating 171 tooth surfaces on cadavers. The mean measurements observed were 1.34 mm for sulcus depth, 1.14 mm for epithelial adhesions and 0.77 mm for connective tissue adhesions.¹⁰

Deviation biologic width is a contributing factor to the breakdown of periodontal tissue structures.^{11,12} Clinically, signs deviation biologic width consists of pain, gingival inflammation, localized gingival hyperplasia, pocket formation, and loss of the periodontal apparatus. Therefore, corrective procedures should be considered prior to restorative treatment if there is any doubt about biologic width deviations, including orthodontic extrusion and crown lengthening surgical procedures.^{5,6}

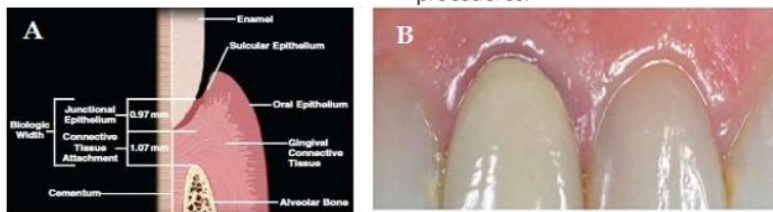


Fig.1: (A) Measurement Biological Width. (B) Biologic width deviation and discoloration of the gingiva in the cervical area of the maxillary right central incisor.^{13,14}

Proximal Contact Relationships

Proximal contact protects the periodontal tissue and maintains the integrity of the dental arch.¹⁵ Clinically, open or loose proximal contact can lead to the formation of periodontal pockets.¹² Loss of interproximal papillae results in aesthetic disturbances and food impaction which can exacerbate periodontal damage.¹⁶ Jenberg et al. Performed a cross-sectional study involving 104

patients with unilateral open contact, to demonstrate the effect of exposed contact on the periodontium. Apart from the occurrence of large food impaction, open contact also indicates a greater pocket depth and clinical attachment loss.¹⁷ Therefore, clinicians should avoid placing open contact between fixed prostheses. Proximal cleaning should always be recommended to the patient.¹⁸



Fig.2: (A) Proximal exposed contact between the implant restoration and the maxillary right second premolar.¹⁹ (B) Open contact in the second premolar and first molar of the maxilla that have been restored, causing food impaction resulting in plaque accumulation, pockets formation and periodontal tissue damage.²⁰

Restoration Contour: The contour of the restoration is essential for the maintenance of periodontal health. The most common cause of overcontour restorations is inadequate tooth preparation.²¹ Overcontour can have a negative effect on the periodontium by increasing plaque retention.^{22,23} Sackett and Gildenhuys conducted

their research using acrylic surfaces as the standard overcontour. 59% of the mandible and 70% of the maxilla showed significant gingival inflammation in relation to the overcontour.²⁴ In inadequate crown preparation, excessive use of restorative materials should be avoided to prevent overcontour of the crown.²⁵

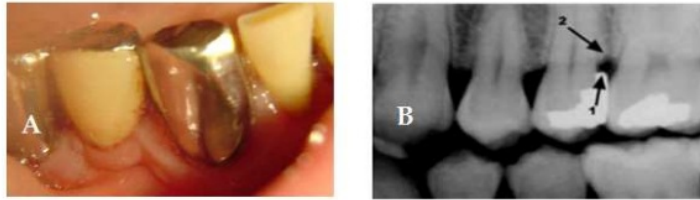


Fig.3: (A) Excessive crown margin, causing damage to the gingival groove. (B) Restoration overhanging, (1) causing bone damage, (2) causing food retention and accumulation of plaque which makes it difficult for the patient to clean.²⁶

Restoration Margin Position

For periodontal health, supragingival restorations are considered the best design because they are easy to clean.²⁷ Restoration of the subgingival margins can cause a tissue biotype that is harmful to the periodontium tissue because it carries a higher risk of biologic width invasion, thereby

increasing further periodontal damage.²⁸ Restoration margins supragingiva is highly recommended in locations where aesthetics are less concerned to prevent periodontal damage. Patients are encouraged to undertake adequate home care and regular professional care if necessary.²⁹



Fig.4: Gingival inflammation due to errors in determining the position of the gingival margins. (A) Appear gingival inflammation at the subgingival margin with Porcelain Fuse to Metal (PFM) crown on the maxilla. (B) Gingival inflammation at the margin of the knife edge. 30

Trauma From Occlusion

As a functional unit, the tooth and its supporting structures bear occlusal stress on the crown. As a result of excessive pressure or reduced periodontal support, a tooth with TFO exhibits clinical symptoms: tooth pain, increased tooth mobility, percussion sensitivity, fremitus, occlusal wear, and even tooth fracture. On the radiographic image, there are changes in the form of ligament

enlargement, lamina dura disruption, root resorption and peri-apical or furcation radiolucency.³¹ To prevent mechanical complications, examining occlusion is the first step to determine etiological factors. All contributing factors must be controlled or eliminated before repairing or replacing loose / fractured components.³²



Fig.5: Trauma from occlusion. (A) Oblique fracture occurring in Element 21 due to occlusal trauma. Clinically there is a deep pocket in Element 21. (B) There is a thin biotype and shorter clinical crown on Elements 13 and 12. (C) Buccal wall defects and periapical lesions can be observed with CBCT.³³

Gingival Retraction Technique

Adequate gingival retraction is essential to get a good print. Placement of the retraction cord and thread into the gingival groove can cause injury to

the epithelial groove. Damage to the soft tissue depends on the chemicals in the retraction cord, the pressure applied during retraction and the

length of time the retraction cord is attached to the groove.^{34,35}

The pressure applied during retraction should be as minimal as possible to avoid pressing the retraction cord to the subepithelial connective

tissue.^{34,35} Differences in manipulation of gingival retraction techniques such as material and timing control are key factors in avoiding permanent tissue damage during the printing process.^{36,37,38,39,40}



Fig.6: (A) The retraction cord is placed in the gingival groove with a plastic instrument.³⁷ (B). There is gingival inflammation around the abutment after the imprinting process is complete.³⁸

DISCUSSION

The health of the periodontal tissue depends on a restoration process that is designed using the right material. Overhanging restoration and exposed interproximal contact should be addressed and corrected during periodontal disease therapy. The restorative margin can remain placed coronally until the gingiva is free. Subgingival margin placement often unavoidable, therefore efforts are made to involve the sulcus as little as possible during the treatment.^{10,41,42,43}

Several studies have shown that minimal disturbance to the subgingival tissue can damage the periodontium. Furthermore, placement of the margin into the gingiva will induce inflammation of the plaque. The periodontium responds to the aggression of the biofilm through inflammation, evolution and expansion of inflammation in the periodontal support tissue characterized by changes in gingivitis and superficial chronic periodontitis to deeper chronic periodontitis.⁸ If the restorative margin is placed close to the alveolar crest, then crown-lengthening surgery or orthodontic extrusion may be considered in order to maintain adequate tooth structure and maintain biological width integrity. Although the soft tissue attachment varies from person to person, it is generally agreed that a minimum of 3 mm from the restorative margin to the alveolar bone is 2 mm for biological space width and 1 mm for groove depth.¹⁰

CONCLUSION

Restoration process prosthetics that change crown morphology to produce a new clinical crown and are considered a risk factor for periodontal disease if they do not meet the rules for placing a restoration in a biologic width area. By understanding prosthetic risk factors and

etiopathogenic mechanisms in periodontal disease, the prognosis of prosthetic restoration can be predicted. The relationship between prosthodontics and periodontics is very close and cannot be separated from one another. A strong periodontal support network will provide a solid basis for prosthetic therapy. In order to obtain stable periodontal conditions, proper contact formation, a quality occlusal scheme and prosthesis are required. Good and efficient communication is essential between periodontists and prosthodontists through plans, treatment procedures, and maintenance. Thus the goal of creating a good aesthetic and a harmonious stomatognathic system can be achieved.

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