

Preventive Prosthodontics: A Review

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ABSTRACT

Background: Time leaves its imprint on every living thing. The process of aging begins at birth, the physiologic age is the resultant effect of the passage of time on the functional elements of the body. The aging method is outlined as sum of all morphologic and functional alterations that occur in an organism and result in functional impairment, that reduces one's ability to survive the stress. The aim of preventive prosthodontics should at least stop further progression of oral disease and prevent the loss of remaining tissues.

Keywords: Preventive, prosthodontics, preservation.

INTRODUCTION

The aim of prosthodontics should be an attempt to converge to the dictum of DeVan "Perpetual preservation of what remains, rather than meticulous restoration of what is lost".^[1]

Mandel stated, "All the dental procedures must be considered not only in terms of dealing past or present disease, but in terms of preventing future diseases as well". Included in these dental procedures is the removable and fixed prosthodontics. This approach will ensure that preventive philosophy will include dentistry in totality, and not only those procedures to prevent the institution, progression and recurrence of disease.^[2]

Review of literature

Principles of prevention are applicable to the all the branches of Prosthodontics. Hence, the review of literature is considered under the following headings.

1. Role of nutrition in the prevention of oral diseases.

2. Preventive philosophy in complete denture prosthodontics:

- Role of impression in prevention
- Role of occlusion in preservation and prevention in complete denture
- Role of overdenture in prevention

3. Removable partial denture and its design as related to maintenance of tissue health.
4. Preventive philosophy in fixed prosthodontics.
5. Role of implants in preventive prosthodontics.

Role of nutrition in the prevention of oral diseases:

Kelsey CC (1971)^[3] reviewed alveolar bone resorption under complete dentures. Alveolar ridge resorption is an inevitable and irreversible process. He listed various denture factors which may effect alveolar bone; including occlusal forms of the teeth, alignment, deformation of denture base and loss of vertical dimension. Loss of VDO causes the mandible to be moved forward and upward leading to excessive trauma to the anterior region. Factors

Received: Nov. 8, 2019: Accepted: Dec. 20, 2019

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in complete dentures that can minimize loss of alveolar bone include optimum soft tissue health prior to making impressions; avoid locked denture occlusion, careful occlusal equilibration, regular recall and encouraging patients to remove the dentures while sleeping.

Wical K E and Swoope CC (1974) ^[4] studied the association of phosphorous and calcium to residual ridge resorption. Among recognized systemic influences which affect the resistance and resorption of bone, calcium deficiencies and calcium-phosphorous imbalances have been specifically implicated as contributing factors in the pathogenesis of alveolar bone destruction. They concluded that there is a positive correlation between low calcium intake, calcium phosphorous imbalance and more severe ridge resorption.

Page M E (1975) ^[5] reviewed various systemic and prosthodontic treatments to prevent bone resorption in edentulous patients. He concluded that there are two main factors responsible for loss of alveolar process under dentures. These are body chemistry and built-in defects of complete dentures

Wical K E and Brusse P (1979) ^[6] have established the outcome of calcium and vitamin D supplement on alveolar ridge resorption in immediate denture patients. The purpose of the study was to test the hypothesis that a daily calcium and vitamin D supplement would tend to reduce the rate and extent of alveolar bone resorption following extractions of teeth.

Massler M (1979) ^[7] in his account on osteoporosis has stated that the success or failure of an oral prosthesis depends upon the health and tolerance of the oral tissues as upon the technical skills of the prosthodontist. The first cause of osteoporosis is the low intake of calcium foods. The richest sources of soluble calcium for elderly persons are yogurt, cottage cheese and thick vegetable soups.

Massler M (1979) ^[8] stated that water balance in elderly is critical in preventing tissue dehydration. This "drying out" of tissues and organs including muscles and joints may lead to premature aging. Xerostomia is a major cause of denture discomfort and failure. The dentist is advised to inspect and if possible correct dehydration of the oral tissues prior to constructing the denture. Water

balance is achieved through ingestion of soups containing many of the solubilised nutrients essential to tissue health.

Wical K E (1983) ^[9] has given 'Commonsense dietary recommendations for geriatric dental patients as follows. Ideally every patient must eat 4 or more servings of vegetables and fruits, four servings of whole grain cereal foods, three servings of milk and cheese, 3 or more servings of meat or other protein foods, 1 teaspoon of vegetable oil and 6 glasses of water. The use of sugars, highly refined carbohydrates, solid fats and salt should preferably be minimized.

Johnson M S (1992) ^[10] suggested disease specific dietary interventions for older adults. Author said that prevention is more effective when begun early in life. Certain nutritional strategies are appropriate for protecting geriatric patients from the effects of postmenopausal (type I) osteoporosis and senile (type II) osteoporosis. He suggested that calcium, vitamin D supplements and trace elements like boron, magnesium and manganese should be included in the diet.

Preventive philosophy in complete denture prosthodontics

Alder P (1947) ^[11] suggested endodontic treatment for natural teeth and used them as support for overdentures as their sensory perception was the same as that of natural teeth.

De Van M M (1952) ^[12] discussed the basic principles of impression making. He stated that mucoperiosteum cannot be compressed. However, it can be displaced in the absence confining walls. Mucostatic dentures exhibit minimal mucosal irritation even in the presence of rough contacting surface because there exist no room for tissue movement. Dentures made from rest impressions will remain serviceable for a longer period time than dentures fabricated from impression made during displacement.

De Van M M (1954) ^[13] described neutrocentric occlusion for the preservation of alveolar bone. Neutrocentric occlusion denotes two concepts;

1. Neutralization of inclines.
2. Centralization of occlusal forces acting on denture foundation.

He said that denture stability is a major concept in neutrocentric occlusion.

Miller P A (1959) ^[14] reported that in full mouth extraction, some natural teeth and their supporting structures can be restored to health and serve a useful function for long time period. The use of teeth instead in addition to the mucoperiosteum precludes the patient from 'chewing on his gums' at least for a time. By reducing the trauma to the mucosal tissues, it is reasonable to expect that resorption will be lessened.

Tallgren A (1967, 1969) ^[15,16] found that the mean resorption of the anterior height of the mandibular process during the first 6 months of denture use was approximately twice more than maxillary resorption. This resorption of the alveolar process continued, at the 7-year stage, the mandible loss was approximately four times than in the maxillae.

Morrow R M, Trovillion (1969) ^[17] while reviewing tooth supported complete dentures, listed some advantages some of these are;

1. Soft tissues of residual ridges are spared of abuse since the prosthesis receives much of its support from abutment teeth.
2. The denture exhibits more horizontal stability especially when several teeth are used for support.
3. Increased vertical stability during functional loading results in an improvement in masticatory performance

They concluded that tooth supported complete dentures are a effective approach to preventive prosthodontics and a valuable part of the practicing dentists armamentarium.

Jones PM (1972) ^[18] reviewed the usage of monoplane occlusion for complete denture. The author briefly reviewed the history of denture occlusion starting with the spherical. The teeth therefore must be arranged with a compensating curve running anteroposteriorly and a monsoon curve running transversely.

Dodge CA (1973) ^[19] listed the advantages of retaining roots of selected key teeth for complete denture. Some of them are greatly enhanced stability, positive retention, proprioception, no loss of vertical dimension etc

Lord JL, Teel S (1974) ^[20] reviewed overdenture techniques in terms of patient selection, use of copings and follow-up evaluation. They suggested that acceptable periodontal architecture must be established, occlusal forces must be physiologically acceptable and the retained teeth and denture must be maintained free from plaque.

Levin AC (1976) ^[21], tested dimensional discrimination on three groups of patients: one group with natural teeth, other with complete dentures and a third group with overdentures. His findings suggested that receptors were not only capable of proprioception but also of dimensional discrimination. Hence, he included that it was very significant to retain natural teeth.

Crum R, Rooney GE (1978) ^[22], in their 5-year clinical study found that retention of mandibular canines for the overdentures led to preservation of bone.

Garver DG, Fenster RK, (1980) ^[23] demonstrated less alveolar bone reduction in patients with maxillary and mandibular over dentures compared to maxillary complete dentures and mandibular complete dentures.

Casey DM, Lauciello FR (1980) ^[24] concluded that the observable requisite to preserve alveolar bone for complete dentures had led to the overdenture concept. Studies indicated that non-infected vital roots are convenient and economical approach to preserve alveolar bone for the support of complete dentures.

Koran A (1980) ^[25] summarized techniques of impression making of the edentulous area.

1. Mucosa should be firm and healthy.
2. Impression material should be of low viscosity.
3. Pressure used to seat and hold the impression material should be kept to a minimum.

Fenton AH (1998) ^[26] summarized that tooth supported overdentures were the last line of defense that successfully kept patients from becoming edentulous. Patients could chew better, their ridges did not resorb as quickly and that they has dentures that were more stable and retentive.

Schmitt A, Zarb GA (1998) ^[27] concluded that there is a need for less invasive less costly, less

complex and equally effective treatment options like implant-supported overdenture.

Steenberghe DV, Quirynen M, Naert I, Maffei G, Jacobs R (2001) ^[28] conducted a study to assess marginal bone loss around implants retaining mandibular overdentures, at 4, 8 and 12 years follow-up. They concluded that implants had cumulative success rate (97.2%) and limited marginal bone loss can average 1.7mm after 12 years.

Williamson RA, Williamson AE, Bowley J, Toothaker R (2004) ^[29] explained the linear occlusion concepts to maximize denture stability. Author reported that linear occlusion minimizes horizontal force vectors that act to dislodge the prosthesis.

Removable partial denture and its design as related to maintenance of tissue health

Steffel VL (1951) ^[30] has classified the various methods of treating free-end saddles.

1. Those who believe that ridge and tooth supports can be best equalized by the use of stress breakers (stress breaking philosophy).
2. Those who insist on bringing about the equalization of ridge and tooth support by physiological basing, which is accomplished by a pressure impression.
3. Those who uphold the idea of extensive stress distribution for stress reduction at any point (stress distribution philosophy).

Shohet H (1969) ^[31] discussed relative magnitudes of stress on abutment teeth with different retainers. He stated following considerations to control and distributes the stress between mucosa and abutment tooth, condition of teeth and mucosa, impression techniques.

Aviv I, Ben-Ur Z, Cardash HS (1989) ^[32] analysed that an axis of rotation is created through the most distally placed occlusal rests when a distal extension RPD is loaded. If the residual ridges are of unequal lengths, this axis of rotation might not be perpendicular to the residual ridges. The denture base moves tissue ward, as movement of I bar retainers located on mesiobuccal aspect of

asymmetrical abutment teeth may torque the abutment teeth.

Fiet DB (1999) ^[33] discussed altered cast impression technique. He evaluated that a well-fitting denture base distributes stresses favourably to the supporting bone and abutment teeth. Increased residual ridge coverage coupled with a well-fitting denture base reduces stress per unit area, potentially preserving the remaining structures

Kalpna C, Prasad KV (2010) ^[34] emphasized the importance of procedure that can delay or eliminate future prosthodontic problems. In the past when patients presented themselves as candidates for a denture with teeth that were badly broken down with periodontal involvement, those teeth were extracted that could have been retained under more favourable conditions. Retention of the roots of one or more teeth for overdenture offers the patient a lot of benefits such as better stability, proprioception and support. The focus of the following case report, is on the merits of using anterior teeth. Overdenture abutments helps to increase stability of the long kennedy class IV design removable dental prosthesis.

Bansal P, Preetika, Sharma A, Bhanot R. (2010) ^[35] reported the use of bar and clip attachment overdenture in preserving the remaining natural teeth. The aim of the study was to highlight the importance of natural teeth remaining in the oral cavity and also the fact that by applying the basic principles of "preventive prosthodontics remaining teeth can successfully act as abutments to support overdenture prosthesis.

Jain DC, Hegde V, Aparna IN, Dhanasekar B (2011) ^[36] described a conservative approach to preserve root is a valid and practical measure in preventive prosthodontics. Overdentures is the best example for such an effort. Most vital advantage of a tooth borne overdenture is bone maintenance, because both the preservation of bone volume and vertical height can produce increased prosthesis retention and stability. It also gives patients better function and control because of presence of nerve receptors in the root.

Naveen YG, Jayantilal RP, Sethuraman R, Prajapati P. (2011) ^[37] described that removable

dentures attached by means of telescopic anchors are regarded to be a good clinical solution. This kind of restorations in patients with reduced and residual dentition gives an opportunity to reduce destructive rotational and horizontal occlusal forces by directing them more axially.

Preventive Philosophy in Fixed Prosthodontics:

Collett HA (1974) ^[38] discussed methods for the protection of dental pulp in the construction of fixed partial denture. He listed various factors which can induce pulpal response.

Burch JG (1975) ^[39] discussed coronal contours of restoration and associated periodontal consideration. He emphasized on the development of adequate margins of a restoration to prevent recurrent caries and plaque accumulation and to allow the patient to more effectively remove dental plaque.

Becker CM (1981) ^[40] discussed current theories of crown contour, margin placement, and pontic design. He concluded that the crown contours which promote favourable tissue response follow these guidelines: 1) buccal and lingual contours are flat; 2) embrasure spaces should be open; 3) contacts should be high(incisal one third) and buccal to central fossa(except between first and second molars).The pontic design of choice is the modified ridge lap for posterior spaces and the ridge lap facing for anterior spaces.

Singh S, Talwar N, Mishra N, Chand P (2011) ^[41] described the use of overdenture abutments under removable prosthesis to preserve alveolar bone and provide support. There exist a variety of clinical situations in which teeth or roots with questionable prognosis cannot be used as abutments for fixed partial dentures. In such situations these abutment teeth can be preserved under fixed partial dentures to provide vertical support and delay bone loss.

Role of implants in preventive prosthodontics

Mericke-Stern R, Hofman J, Wedig A ^[42] compared mastication between root overdentures and implant overdentures. The former was more discriminative, whereas the latter developed slightly harder chewing strokes and adapted to masticate more vertically.

Burns (1994, 1995) ^[43,44] compared implant overdentures with conventional complete dentures. Patient satisfaction improved when prosthesis retention and stability increased and thus satisfaction increased when mandibular implant overdentures were used rather than conventional complete dentures.

Zarb G, Schmitt A, (1998) ^[45] discussed the techniques to manage the maladaptive edentulous patient. They concluded that there is a need for less invasive, less expensive, less complex and equally effective treatment options like the implant-supported overdenture for the maladaptive edentulous patient. The study endorses the merits of implant supported overdentures for maladaptive edentulous patients.

Preventive Prosthodontics for head and Neck Radiotherapy

Mantri SS, Bhasin AS (2010) ^[46] discussed the adverse tissue reactions associated with the use of radiotherapy in the management of patients with head and neck cancer it is painful and that they diminish the standard of life, often discouraging the patient from taking treatment. Customized intraoral stents can help prevent the unnecessary irradiation of the encompassing normal tissues, thus reducing the severity of reactions.

DISCUSSION

Preventive Prosthodontics emphasizes the importance of any procedure that can delay or eliminate the future prosthodontic problem. Mandel stated, *"All the dental procedures must be considered not only in terms of dealing past or present disease, but in terms of preventing future diseases as well"*. The objective of preventive dentistry is the maintenance of a healthy dentition for the life of a patient.

Prosthodontists are more truly "Gerodentologists" than any other group of health professionals and providing dietary guidance for these patients can be a very rewarding aspect of a dental practice. Tissues of the oral cavity are often the first to be affected by nutritional disturbances. Soups contain vitamins, minerals, protein, fiber and water. Yogurt, cheeses

are the sources of calcium and vitamin D for those who avoid milk.

The dominant mission of Prosthodontics in the recent times is to conserve what the patient has. Unlike some parts of the body, teeth and the supporting structures are not regenerative. Therefore it is imperative that the remaining oral structures be conserved. Efforts should be made to converge to De Van's dictum of "*Perpetual preservation of what remains, rather than meticulous restoration of what is lost*". Today with greater stress on preventive measures, the dental profession has expanded this preventive concept into Prosthodontics as Preventive Prosthodontics.

CONCLUSION

Henry de Bracton quotes-"an ounce of prevention is worth a pound of cure". Hence preservation of what is remaining and prevention of further disease progression should be the goal of every prosthodontist and dental practitioner. The discussion and application of the preventive concepts will offer a long serviceable prosthesis without any complications and compromise. Hence a comprehensive treatment plan should be made for every patient who walks into our dental office with the aim of preservation of remaining structures and prevention of further progress of the disease.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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