

# PREVENTIVE PROSTHODONTICS: A NARRATIVE REVIEW

Beyanso C P Daniel\*, Aparna Mohan\*\*, Giri Chandramohan\*\*\*,  
Ajai Praveen Jose\*\*\*\*, Sreelalitha M\*

\*Postgraduate, \*\* Professor, \*\*\*Professor & Head \*\*\*\*Senior Lecturer, Department of prosthodontics, Sree Mookambika Institute of Dental Sciences, Kulasekaram | Corresponding Author: Dr. Beyanso CP Daniel, Email: aromadcc@gmail.com

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## Abstract

*One of the core tenets of dentistry is prosthetic dentistry. Preventing the factors that lead to tooth extractions may be the most successful prosthetic prophylaxis. Modern treatment options significantly improve the quality of life for affected patients as well as the overall prognosis of the stomatognathic system. The importance of any procedure that can delay or eliminate future prosthodontic problems has been highlighted by preventive prosthodontics. The current review was carried out after conducting a thorough literature search across peer-reviewed publications and gathering data on preventive prosthodontics. The present article addresses the idea of preventive prosthodontics, encompassing the primary, secondary, and tertiary stages of prevention. The prosthetic interventions and procedures that can be performed at each stage are discussed.*

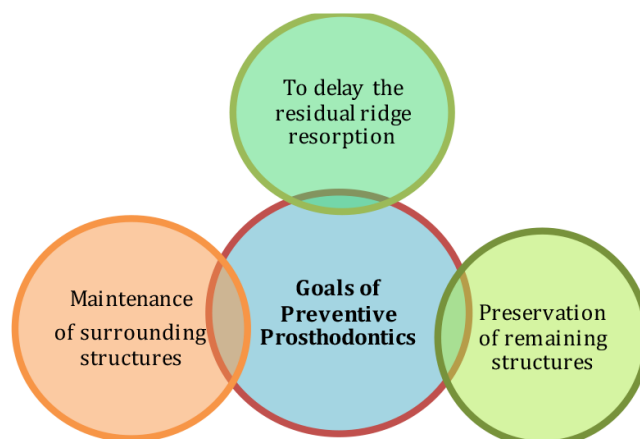
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## Introduction

The growing population of elderly people has not only increased their medical needs but also their dental needs.<sup>1</sup> One of the essential pillars

of dentistry is prosthetic dentistry. The principal aim of prosthetic dentistry is to follow the golden statement by MM Devan (1952), "Perpetual preservation of what remains is more important than the meticulous replacement of what is missing".<sup>2</sup> It is a universally accepted fact that prevention is better than cure and Preventive Prosthodontics signifies the importance of any procedure that can delay or eliminate future prosthodontic problems.<sup>3</sup>

### Goals of Preventive Prosthodontics<sup>4</sup>

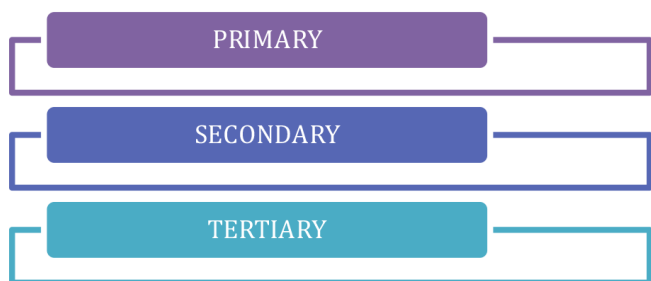


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## Discussion

Preventive prosthodontics emphasizes the preservation of existing oral structures while minimizing the need for extensive future restorations and timely prosthetic interventions. It promotes a holistic, patient-centered approach, ensuring functionality, esthetics and sustained oral well-being. It can be studied under the following strategies:



### Preventive Prosthodontics At Primary Level

The primary level includes the steps like health promotion and specific protection. Dental caries prevention, plaque control, regular check-up for caries activity diet counselling etc., are included in health promotional phase at primary prevention level.<sup>5</sup> It can be categorised as:

#### Prenatal Stage

It begins with prenatal care and clinical assessment. A thorough guideline of nutritional requirements during pregnancy and lactation is essential, followed by prenatal fluoride therapy, prevention of certain antibiotics that may harm the dento-facial growth, and reinforcing oral health care in pregnant women.

#### Postnatal Stage

Preventive prosthodontics at this stage focuses on maintaining integrity of normal developing dentition by including clinical assessment of oral growth and development, pathology, and/or

injuries, inclusion of anticipatory guidelines that include home dental care.

#### Obturator

It is used to close a congenital or acquired tissue opening primarily of the hard palate and contiguous alveolar tissues. Immediate obturator is placed immediately after the surgery with or without surgical packing, it helps re-establishing the oral contours, prevents the regurgitation of the fluids in the nasopharynx, protects the wounds from uneventful healing and prevents the cicatrization or shrinkage. Interim obturator can be given after the removal of the surgical packing. The interim obturator is retained up to 3 months with repeated checking and relining with the tissue conditioner, followed by definitive obturator.<sup>6</sup>

#### Adolescent Stage

Fluoride rinses and fluoridated toothpastes, periodic scaling, sealant therapy and radiographic examination at regular intervals are recommended. The primary prevention also involves the protection of the dentoalveolar structures from injuries such as tooth fractures, concussion, crown root fractures, TMJ fractures, dentoalveolar fractures, sport related and soft tissue injuries with the use of mouth guards.<sup>7</sup>

#### Mouth Guards

Use of mouth guards reduced the risk of dental and maxillofacial trauma less than 7.5%. The mouth guards with moderate resiliency absorb the forces, protect the teeth, TMJ and prevent the contact of teeth and thus prevent ankylosis.<sup>8</sup>

#### Radiation Shields

Radiation shields / radioprotective stents are used for the patients who are undergoing the radiotherapy. The protection can be provided by various methods like providing the radiation

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docking devices, making spacers in the interstitial brachytherapy for tongue cancer and fabrication of tongue shields.<sup>9</sup>

## Preventive Prosthodontics at Secondary Level

It includes the early detection of the disorders and providing prompt treatment. Various treatment modalities include preventive resin restorations of initial caries, direct and indirect pulp protection, scaling and curettage, etc.<sup>5</sup> Preventive prosthodontic procedures which can be performed at this level are occlusal interference correction, treatment for bruxism, treatment for trauma from occlusion (TFO), correction of plunger cusps and treatment of obstructive sleep apnea.<sup>3</sup>

## Occlusal Interference

Occlusal interference is any tooth contact that inhibits the remaining occluding surface from achieving stable and harmonious contact. If the occlusal interference cross the threshold of adaptive capacity of the Temporomandibular joint, muscles of mastication and neuromuscular system, it leads to muscle hypertrophy, muscle fatigue, spasm, headaches, craniomandibular dysfunction syndrome, wear facets, fractured cusps, tooth mobility, parafunctional habits like bruxism. Hence correction of occlusal interference is recommended in the early stages.<sup>10</sup>

## Bruxism

Is a condition where the patient tries himself to equilibrate the occlusion and thus develop the habit of clenching or grinding of teeth. This can occur due to periodontitis, over a contoured restoration, psychological and physical stresses, sleep disorder, CNS disturbances and alcohol. Bruxism leads to attrition, mobility, muscle hypertrophy, occlusal facets, alveolar bone loss and TMJ disorders. Treatment of bruxism involves controlling the psychological stress,

occlusal correction, coronoplasty and occlusal splints or intraoral orthoses.<sup>11</sup>

## Trauma from Occlusion (TFO)

It is a reversible condition. Acute TFO is due to sudden heavy forces. Chronic TFO is due to continuous and long duration occlusal forces, e.g. bruxism, drifting and extrusion of the teeth. Primary TFO is caused due to high occlusal forces whereas main cause of secondary TFO is a low threshold or low resistance of the periodontium. Occlusal corrections are needed for the correction of the TFO.<sup>12</sup>

## Plunger Cusps

The cusps which wedge the food forcefully into the interdental spaces of the opposing arch. These plunger cusps are usually the functional cusp (i.e., palatal cusp of maxillary teeth and buccal cusp of mandibular teeth) and sometimes palatal incline of maxillary buccal cusp and buccal incline of lingual cusp. Treatment involves rounding and shortening of the plunger cusps and the opposing interproximal space is protected by splinting the adjacent teeth.<sup>12</sup>

## Obstructive Sleep Apnea

It is characterized by cessation of airflow through upper airway while diaphragm movement continues. It can cause due to enlarges tonsils, enlarged soft palate, large tongue and retrognathism. This can be taken care by fabrication of prosthetic mandibular advancement appliances like soft palate lifters, tongue retainers, mandibular repositioners, snore guards etc., and surgery to remove portions of the soft palate and uvula.<sup>13</sup>

## Preventive Prosthodontics at Tertiary Level

Tertiary level prevention involves limiting the disability of the patient and rehabilitation. Prosthodontic rehabilitation incorporates

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procedures like post and core treatment, removable dentures, fixed dental prostheses and implants.<sup>14</sup>

## Timing of Extraction

Planned extraction of highly mutilated teeth prevents the rapid resorption of the alveolar ridges. Careful extraction should be done to avoid the presence of unantagonized tooth. If antagonists are not present, supra eruption of opposing dentition leads to contact between the mucosa and teeth of the opposing arches. As a result, arch stability is lost, and this leads to severe resorption of the alveolar ridge in edentulous arch.<sup>15</sup>

## Interim Denture/Treatment Denture

In the case of early loss of the permanent teeth, if the definitive treatment cannot be done for various reasons, the interim denture (treatment dentures) can be utilized as preventive measures. The treatment dentures acts as space maintainers, prevent the migration, prevent the supra eruption and prevent the contact between the teeth, alveolar ridge, restore the function, esthetics, restore the muscular tonicity, restore the vertical height, jaw health and avoids the abnormal jaw habits.<sup>16</sup>

## Provisional Restorations

After the tooth preparation is done for fixed prosthesis, provisional restoration is advocated to prevent the events like pulpal inflammation, mesial migration, supra eruption and arch integrity, protection of the tooth preparation margins and protection of the periodontium. Clinicians have many choices of provisional materials from which to choose when fabricating provisional restorations. While traditional materials are still in use today, temporary materials are continuously being updated and improved upon.<sup>17</sup>

## Single Complete Denture/Complete Denture

When the teeth are completely absent in any one of the arches, the fabrication of a single complete denture is recommended, to restore function, vertical dimension, esthetics and prevent the development of parafunctional habits. The complete dentures are provided with various occlusal schemes such as balanced occlusion, lingualized occlusion, neutrocentric concept and others depending upon the condition of the patients.<sup>18</sup>

## Tooth retained over dentures

Some authors advised to retain the stumps beneath the artificial teeth, and stated that these roots maintain the alveolar bone health and height for longer duration. This can be achieved by fabricating an overdenture. This can be advantageous in terms of conserving the natural teeth, reducing the rate of residual ridge resorption, proprioceptive feedback by existing periodontal ligaments and thus controlling the occlusive forces and preventing the rapid residual ridge resorption.<sup>19</sup>

## PREVENTIVE PHILOSOPHIES FOR REMOVABLE PARTIAL DENTURES

- Frameworks should be designed to contact sufficient abutment teeth for physiological stress distribution and avoidance of overloading.
- Clasps should be designed so that all the functional forces on abutment teeth are reciprocated.
- Major connectors should be fabricated with adequate rigidity.
- Denture bases should be designed to have maximum coverage of denture-bearing areas.
- Reducing the load by proper selection and placement of artificial teeth.

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- Establishing proper guiding planes.<sup>20</sup>

## Preventive Philosophy in Fixed Prosthodontics

### ♦ Preservation of tooth structure

❖ Preparation of teeth following the biomechanical principles of tooth preparation.

❖ The frequent use of supragingival margin whenever possible.

❖ Use of partial coverage rather than complete coverage restorations, wherever indicated.

❖ If necessary, teeth should be orthodontically repositioned.<sup>21</sup>

### ♦ Protection of Periodontium

It is essential for the longevity and health of the prosthesis. Well contoured margins, appropriate pontic design, accurate fit of the prosthesis, proper occlusion, use of biocompatible materials, patient education on oral hygiene and regular maintenance visits are vital for preserving periodontal health around FDPs.<sup>22</sup>

### ♦ Adjacent teeth

One of the common errors is the chances of iatrogenic damage to the adjacent tooth while restoring missing teeth with a fixed dental prosthesis. Many authors suggested the use of metal bands such as a matrix band, to be placed around teeth to prevent possible damage to the adjacent tooth. Others suggested leaving a thin lip or fin of enamel interproximally on the tooth being prepared, using fine tapering diamond instruments to protect the adjacent tooth. The fin is removed in the final stage of preparation.

### ♦ Soft tissues

Preserving the health of soft tissues is a critical aspect during fabrication and placement of FDPs. Contours and emergence profile of crowns

and pontics must be designed to support natural gingival architecture. Other preventive measure such as proper retraction and isolation of soft tissues can provide better visibility and access to the work area and may prevent injuries to adjacent soft tissues. Informing and instructing the patient about the dental procedure before commencing any treatment can aid to gain the patient's co-operation and prevent any iatrogenic damage.<sup>23</sup>

### ♦ Pulp protection

When performing tooth preparations even minor trauma may cause pulpal degeneration. Handpiece inadequacy, use of worn-out diamond burs, improper cutting techniques, excessive tooth preparation, inadequate water coolant, can all lead to the stressed pulp. Hence such activities should be avoided. Tooth preparation must be done following the biomechanical principles of tooth preparation, and proper selection of techniques and materials according to the individual case is recommended in order to prevent pulpal damage.<sup>24</sup>

### ♦ Temporization

Because of the sensitivity of prepared teeth and the accumulation of plaque on the areas that are not self-cleansing the prepared tooth needs to be protected from the oral environment. A provisional restoration helps to maintain relationship of the prepared tooth with the adjacent and opposite tooth. They also aid to maintain the health of gingival tissue and may serve as a blueprint for the design of the definitive prosthesis.

### ♦ Microleakage

All cements shrink on setting which results in microleakage. Microleakage can lead to postoperative sensitivity, secondary caries, pulp pathoses, plaque accumulation, cement dissolution and ultimately the failure of



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prosthesis. Thus, cements which are less soluble in oral environment are recommended.<sup>24</sup>

## ♦Use of resin retained fixed partial dentures

Resin retained fixed partial dentures was described by Rochette in 1973. Its advantages include minimal removal of tooth structure, use of more conservative supragingival margins, minimal potential for pulpal trauma and no requirement of anesthesia.

## ♦Use of fibre reinforced composite resin fixed prostheses

Fiber reinforced composite resin fixed prosthesis can be used as an alternative to traditional metal ceramic restorations. The associated advantages over conventional metal-framed resin-bonded bridges include better adhesion of the luting agent to the framework, lower cost and better aesthetics and less wear of opposing tooth structure.<sup>21</sup>

## Preventive Philosophies for Maxillofacial Prosthesis<sup>25</sup>

The success of a future maxillofacial prosthesis can be greatly enhanced by careful presurgical evaluation and communication involving the patient, the surgeon, and the prosthodontist. It is

the responsibility of the prosthodontist to educate surgeons about the prosthodontic requirements for restoring the patients that undergo ablative surgeries. The prosthodontist should suggest the advantages of removing or retaining tissue adjacent to the surgical site.

## Preventive Implant Therapy<sup>26</sup>

Preventive implantology is concerned with the preservation of the alveolar ridge of the (edentulous) jaw. Kalk et al. proposed the resorption stages of the residual ridges which are used in preventive implantology (Table 1).

## Partial Extraction Therapies (Pet) -An Approach of Preventive Prosthodontics<sup>27</sup>

PET represents the collective use of tooth itself to offset the loss of alveolar tissue (Table 2). By retaining the tooth root and its attachment to bone, the bundle bone-periodontal ligament (BB-PDL) complex with its vascular supply may be maintained. The techniques include

1. Root submergence
2. Socket-shield
3. Pontic shield
4. Proximal socket-shield

**Table 1: Preventive Implant Therapy**

Preventive stage I	Preventive stage II	Preventive stage III	Preventive stage IV
<b>Anatomic situation after tooth extraction:</b>  Further resorption can be prevented by implantation of the bone substituents.  E.g. A non-resorbable hydroxyapatite.	<b>After the initial resorption has occurred.</b>  In this case, further resorption can be prevented by placing cylindrical endosteal implants to maintain adequate width and height.	<b>Knife edged ridge.</b>  Bone removal is necessary for implant placement.	<b>Severe resorption of the alveolar ridge.</b>  Only basal bone is present. Implants are placed directly into the basal bone to prevent total loss of function of the arches.

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**Table 2** Partial extraction therapies (PET) and their indications

S.No	PET	Clinical situation(s) indicated
1	Root submergence	❖ Unrestorable tooth crown or tooth indicated for extraction
		❖ Absence of apical pathology
		❖ Healthy amputated pulp or endodontic therapy completed
		❖ Intention to preserve the alveolar ridge
		❖ Planned removable full or partial prosthesis
		❖ Planned pontic site beneath fixed prosthesis
		❖ Cantilever pontic site as an alternative to two adjacent implants
		❖ Actively growing young patient planned for implant treatment later
		❖ Ridge preservation in conjunction with other PET
2	Socket-shield	❖ Unrestorable tooth crown or tooth indicated for extraction
		❖ Tooth root with or without apical pathology
		❖ Intention to preserve the alveolar ridge, specifically to prevent buccopalatal collapse
		❖ Immediate implant placement
		❖ Ridge preservation in conjunction with other PET
3	Pontic shield	❖ Unrestorable tooth crown or tooth indicated for extraction
		❖ Tooth root with or without apical pathology
		❖ Intention to preserve the alveolar ridge
		❖ Planned pontic site(s) beneath fixed prosthesis
		❖ Cantilever pontic site as an alternative to two adjacent implants
		❖ Ridge preservation in conjunction with other PET
4	Proximal socket-shield	❖ Unrestorable tooth crown or tooth indicated for extraction
		❖ Tooth root with or without apical pathology
		❖ Intention to preserve interdental papillae
		❖ Planned immediate implant placement sites of two or more adjacent implants
		❖ Papillae preservation in conjunction with other PET

## Conclusion

Prevention is both a dental profession's responsibility and an imperative obligation to patients. Despite being a speciality area for replacing lost teeth / soft and hard tissues, prosthodontics cannot be disregarded for its preventive value. A preventative prosthodontic procedure can be carried out methodically to address and prevent various issues.

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