



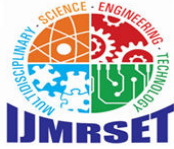
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‘Oral Mucos Membrane’- The Unsung Anatomical Structure- A Narrative Review

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ABSTRACT: The oral mucosa functions as a crucial contact between the oral cavity and prosthetic devices, significantly contributing to the support, retention, and stabilization of prostheses. It consists of separate layers—epithelium and connective tissue—that offer mechanical strength, sensory capabilities, and defense against microbial intrusion. Prosthodontic treatment necessitates a thorough comprehension of the three varieties of oral mucosa: masticatory, lining, and specialized mucosa. Each type possesses distinct characteristics that affect prosthesis design and functionality. Inadequate prostheses or unsuitable materials may result in mucosal injury, inflammation, and pathological alterations including denture stomatitis, epulis fissuratum, and residual ridge resorption. Furthermore, systemic health and mucosal conditions considerably influence therapy outcomes. Preventive strategies, meticulous prosthesis design, and consistent follow-ups are essential for preserving oral mucosal health and achieving successful prosthodontic rehabilitation. This underscores the need of incorporating mucosal factors into prosthodontic practice to enhance patient comfort and prolong prosthesis durability.

I. INTRODUCTION

There is a noticeable variation in the structure and form of the oral mucous membrane from one region to another. The stratified squamous form of epithelium that borders the oral cavity exhibits significant variations in degree of development, which are related to the functions of a specific location. [1]

Healthy oral mucosa denotes the tissue that lines the oral cavity, characterized by a moist, smooth, and unblemished appearance. Its coloration is generally pink or reddish, contingent upon vascularity and thickness. The oral mucosa is essential for immunological protection, sensory perception, and salivary retention. Every function is vital for preserving oral and systemic health: [2-4]

1. Immune Defense: The oral mucosa functions as a physical and immunological barrier, safeguarding against microbial invasion and environmental damage. Its immunological functions encompass: [5,6]

Physical Barrier: The keratinized epithelium in specific areas (e.g., hard palate, gingiva) withstands mechanical and microbiological invasion.

Innate Immunity: Epithelial cells synthesize defensins and cathelicidins, exhibiting antibacterial properties.

Langerhans cells and dendritic cells in the epithelium function as antigen-presenting cells, triggering immunological responses.

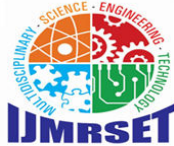
Components of Saliva: Secretory IgA in saliva attaches to microorganisms, inhibiting their adherence and facilitating elimination.

Adaptive Immunity: The oral mucosa comprises lymphoid tissues, such as tonsils and adenoids, which are integral components of the mucosa-associated lymphoid tissue (MALT), facilitating both local and systemic immune responses.

2. Sensory Perception: The oral mucosa possesses abundant sensory innervation, allowing it to detect diverse stimuli. [7,8]

Mechanical Sensation: Merkel cells located in the basal layer of the epithelium perceive mechanical pressure and texture, facilitating mastication and speech.

Thermal and Pain Sensation: Free nerve terminals in the subepithelial tissue facilitate the detection of temperature variations and nociceptive stimuli, hence contributing to pain perception.



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Taste Perception: Although taste buds are predominantly situated on the tongue, the soft palate and additional mucosal regions enhance the impression of taste by integrating tactile and thermal stimuli.[8,9]

3. Salivary Retention: The oral mucosa contributes to the retention of saliva in the oral cavity, guaranteeing adequate hydration and supporting its functions in digesting, lubrication, and immune defense.

Adherence: Saliva attaches to mucosal surfaces owing to the presence of mucins and glycoproteins, resulting in the formation of a protective biofilm. The mucosal glycocalyx preserves moisture, averting desiccation and sustaining tissue integrity.

Enhancing Salivary Secretion: Saliva lubricates the mucosa, minimizing friction during chewing and deglutition.

Histological Features of Oral Mucosa

The oral mucosa comprises two layers:

1.Mucosa and 2.Submucosa

1. Mucosa: Made up of a thin layer of connective tissue called the lamina propria and stratified squamous epithelium, which is frequently keratinised on the outside.

2. Submucosa: Made up of connective tissue that differs greatly in thickness and width based on where it is located in the mouth, and varies in character from dense to loose alveolar tissue. It carries the blood supply to the mucosa and may contain muscle, fat, or glandular cells.

The submucosa is securely affixed to the periosteum of the residual ridge's underlying bone in a healthy mouth, and it can typically withstand the pressures of dentures.[10,11]

Roles of Each Layer of the Oral Mucosa [12-15]

Epithelium:

Serves as a defensive barrier against physical, chemical, and microbiological threats. Contributes to sensory perception (e.g., temperature, pressure, pain). Keratinized epithelium offers increased resistance to abrasion.

Lamina Propria: Offers structural support to the epithelium and houses immune cells for protection, such as lymphocytes and macrophages. Vascularized, facilitating nourishment and recovery.

Submucosa : Facilitates the mobility of the mucosa in areas requiring flexibility (e.g., cheeks, lips). Includes small salivary glands for lubrication and enzymes that enhance dental health. Offers padding and assistance.

The oral mucosa is a specialized membrane that lines the interior of the mouth cavity. It functions as a protective barrier and is crucial for sensory perception, immunological response, and mechanical activities such as mastication. This text provides a comprehensive analysis of its structure, classification, and functions.

Classification of Oral Mucosa

The oral mucosa is categorized into three categories according to function and location: [10,11]

A. Masticatory mucosa:

Encompasses regions exposed to significant friction and pressure, including the gingiva and hard palate. Keratinized epithelium. Offers resistance to mechanical stress when chewing.

B. Lining Mucosa:

Envelops the inner cheeks, lips, floor of the mouth, ventral surface of the tongue, and soft palate. Non-keratinized epithelium. Facilitates flexibility and motion, assisting in articulation, mastication, and deglutition.

C. Specialized Mucosa:

Located on the dorsal surface of the tongue. Keratinized and non-keratinized epithelium. Houses taste buds for sensory perception and aids in mastication.

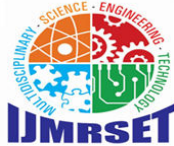
Systemic diseases will have any signs and symptoms on the oral mucosa

Numerous systemic disorders present with signs and symptoms in the oral mucosa. These manifestations may act as preliminary markers of underlying systemic diseases, facilitating prompt identification and care. The following is a discourse on systemic disorders impacting the oral mucosa, classified by their etiological categories: [16-17]

1. Hematologic Disorders

Systemic disorders that impact blood and hematopoietic organs frequently influence the mouth mucosa.

A. Anemia Symptoms: Pale oral mucosa resulting from diminished hemoglobin levels. Atrophic glossitis (a tongue that is smooth and glossy). Angular cheilitis (fissures at the commissures of the lips).



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Illustrations: Iron-deficiency anemia. Pernicious anemia may present with a meaty red tongue and a burning feeling.

2. Endocrine Disorders [19]

A. Diabetes Mellitus Symptoms: Xerostomia (dry mouth), Elevated risk of oral candidiasis, prolonged wound healing in the mouth cavity and periodontal disease.

B. Thyroid Pathologies

Hypothyroidism: Macroglossia (enlarged tongue). Enlargement of the salivary glands.

Hyperthyroidism: Rapid progression of periodontal disease. Osteopenia in the maxillofacial region.

3. Autoimmune Disorders

A. Systemic Lupus Erythematosus (SLE): Manifestations: Erythematous mouth ulcers featuring center white radiating striae and Cheilitis.[20]

B. Pemphigus Vulgaris Symptoms: Painful, delicate blisters that break to create erosions. Nikolsky's sign refers to the phenomenon where moderate pressure applied to the mucosa results in blister formation.

C. Lichen Planus Signs: Reticular white striae (Wickham's striae). Erosive lesions accompanied by a burning feeling.

4. Gastrointestinal Disorders [21]

A. Crohn's Disease

Cobblestone texture of the oral mucosa. Profound longitudinal ulcerations in the vestibule.

B. Celiac Disease Symptoms: Recurrent aphthous ulcers. Atrophic glossitis.

5. Communicable Diseases [22]

A. HIV/AIDS Symptoms: Oral candidiasis (pseudomembranous, erythematous). Hairy leukoplakia located on the lateral aspect of the tongue. Kaposi's sarcoma (violet or crimson vascular lesions).

B. Syphilis Symptoms:

Primary syphilis: Chancre (asymptomatic ulcer). Secondary syphilis: Mucous membrane lesions and condylomata lata.

Tertiary syphilis: Gummas present in the oral cavity.

6. Dermatological Conditions [23]

A. Erythema Multiforme Symptoms: Painful erosions and ulcerations. Hemorrhagic crusting on the lips.

B. Psoriasis Signs: Geographic tongue (erythematous lesions with white margins).

7. Nutritional Deficiencies [24]

A. Deficiency of Vitamin B12

Symptoms: Burning sensation on the tongue. Glossitis accompanied by papillary atrophy.

B. Vitamin C Deficiency (Scurvy) Symptoms:

Hemorrhaging and edematous gingiva. Prolonged wound healing.

Malnutrition can profoundly impact the oral mucosa, since it necessitates sufficient calories for cellular regeneration, immunological protection, and tissue repair. Deficiencies in macronutrients (proteins, carbs, and fats) or micronutrients (vitamins and minerals) can result in noticeable alterations in the oral cavity. The following is a comprehensive elucidation of the effects of malnutrition on the oral mucosa.

1. Consequences of Protein-Energy Malnutrition (PEM) Manifestations on Oral Mucosa:

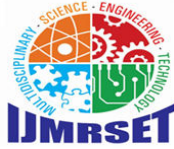
Prolonged wound healing resulting from impaired collagen synthesis. Atrophic alterations in the oral epithelium result in a thin, delicate mucosa.

Heightened vulnerability to oral infections, including candidiasis.

The mechanism involves protein shortage impairing keratinocyte proliferation and immunological responses, hence undermining the mucosal barrier.

2. Deficiencies in Vitamins [25]

A. Vitamin A Deficiency Symptoms: Keratinization of non-keratinized oral mucosa. Xerostomia resulting from salivary gland atrophy. Elevated susceptibility to infections resulting from diminished mucosal immunity. Vitamin A is crucial for preserving epithelial integrity and mucosal immunity.



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Deficiency of Vitamin B Complex

B1 (Thiamine): Glossitis (inflamed, sore tongue). Oral cavity burning sensation.

B2 (Riboflavin): Angular cheilitis (fissures at the corners of the mouth). Tongue with magenta hue.

B3 (Niacin): Stomatitis linked with pellagra (painful erythematous mucosa). Fissures and ulcers of the tongue.

B6 (Pyridoxine): Cheilitis, glossitis, and atrophic mucosa. B12 (Cobalamin): Glossitis accompanied by papillary atrophy (beefy red tongue). Recurrent aphthous stomatitis.

C. Vitamin C Deficiency (Scurvy)

Indications: Enlarged, hemorrhaging gingiva (gingival hemorrhage). Mobility of teeth resulting from compromised periodontal ligaments. Prolonged wound healing in the mouth cavity. Vitamin C is essential for collagen formation, which is vital for the integrity of connective tissue.

D. Deficiency of Vitamin D

Indicators: Hypomineralized enamel, elevating the susceptibility to caries. Osteomalacia of the mandible, resulting in dental mobility.

E. Vitamin K Deficiency Symptoms: Unprovoked hemorrhaging of the gums. Vitamin K is essential for the production of coagulation factors.

3. Deficiencies in Minerals [26]

A. Iron Deficiency Symptoms: Atrophic glossitis (smooth tongue accompanied by a burning feeling).

Angular cheilitis. Hypochromic oral mucosa. Potentially associated with Plummer-Vinson syndrome, characterized by oral symptoms as a hallmark feature.

B. Zinc Deficiency Symptoms: Diminished taste perception (hypogeusia or dysgeusia).

Prolonged wound healing in the oral mucosa. Atrophic glossitis.

C. Deficiency of Calcium and Phosphorus Indicators: Hypomineralized enamel, resulting in heightened susceptibility to caries. Periodontal bone loss resulting from osteopenia.

4. Fatty Acid Deficiency Symptoms: Desiccated, scaly oral mucosa.

Chapped lips with angular cheilitis. Essential fatty acids are necessary for preserving membrane integrity and epithelial health. [27]

5. Influence of Malnutrition on Oral Infections

Malnutrition undermines the immune system, heightening vulnerability to oral candidiasis (fungal infections).

Periodontal disease. Persistent mouth ulcerations. Nutritional deficits compromise mucosal immunity and hinder tissue repair mechanisms. [28]

Malnutrition significantly impacts the oral mucosa, resulting in morphological, functional, and immunological changes. Dental healthcare practitioners are essential in recognizing these indications, which may act as preliminary markers of systemic nutritional inadequacies.

Effect of Prosthodontic treatment on the oral mucosa

Prosthodontic treatment may provide both positive and negative effects on the oral mucosa, contingent upon the type of prosthesis, the materials employed, and the efficacy of its design, fabrication, and maintenance. This overview delineates the effects, classified by the category of prosthodontic treatment.

1. Impact of Removable Prosthodontics on Oral Mucosa [29-33]

A. Beneficial Outcomes Restoration of Function: Well-constructed removable dentures evenly disperse masticatory forces, hence minimizing stress on oral tissues. Facilitates the restoration of speech, mastication, and aesthetics, so enhancing oral health and overall quality of life.

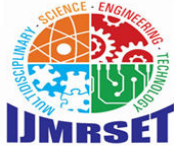
Prevention of Mucosal Injury: Properly placed dentures can safeguard the underlying mucosa against mechanical injury due to irregular ridges or sharp bony projections.

B. Adverse Effects:

Trauma and Irritation

Improperly fitting dentures can lead to frictional keratosis, ulcerations, and mucosal inflammation.

Excessive pressure from inadequately fitted dentures may result in localized erythema and ulcerations.



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Denture Stomatitis:

Marked by erythema and edema of the palatal mucosa. Typically linked to *Candida albicans* infection, inadequate cleanliness, and prolonged denture usage.

Epulis Fissuratum: Hyperplastic tissue proliferation due to persistent stress from excessively stretched denture flanges.

Residual Ridge Resorption (RRR): The ongoing degradation of alveolar bone behind dentures results in alterations to mucosal support, perhaps exacerbating mucosal thinning and susceptibility.

Hypersensitivity Responses: Certain patients may exhibit allergic reactions to denture base materials, including polymethyl methacrylate (PMMA) or metallic frameworks.

2. Impact of Fixed Prosthodontics on Oral Mucosa [34-35]

A. Beneficial Outcomes Safeguarding of Oral Tissues:

Correctly positioned fixed prostheses, including crowns or bridges, can protect exposed dentin and diminish sensitivity. They facilitate the restoration of function and preservation of periodontal health when margins are accurately constructed and sealed.

Preservation of Periodontal Health: Well-constructed prostheses with optimal marginal fit inhibit plaque accumulation and gingival discomfort.

B. Negative Consequences

Mucosal Inflammation: Inadequately shaped restorations with protruding borders can accumulate plaque and food particles, resulting in gingivitis or periodontitis.

Discomfort from Provisional Restorations: Improperly fitted temporary crowns or bridges may induce irritation, particularly if the ingredients used, like as eugenol, are mucosal irritants.

Electrochemical Reactions: Metal restorations in contact with oral fluids may induce galvanic responses, resulting in mucosal discomfort in certain instances.

3. Prostheses Supported by Implants [36-38]

A. Beneficial Outcomes

Conservation of Alveolar Bone: Implants preserve bone volume by conveying masticatory pressures to the alveolar bone. Minimized mucosal injury relative to traditional dentures.

B. Negative Consequences

Peri-implant mucositis: Mucosal inflammation surrounding implants caused by inadequate cleanliness or excessive cement from implant crowns.

Peri-implantitis: Severe inflammation resulting in bone resorption surrounding implants, attributed to microbial infection and inadequate management.

Complications of Soft Tissue Associated with Prostheses: Inadequately designed implant-supported prostheses may cause trauma and irritation to the peri-implant mucosa.

4. Consequences of Occlusal Loading [39]

Excessive occlusal stresses from poorly built prostheses might result in traumatic lesions on the oral mucosa.

Extended parafunctional behaviors (e.g., bruxism) coupled with inadequately fitted prostheses may intensify mucosal injury.

5. Strategic Management Approaches

Consistent Monitoring: Regular assessment of prosthesis for compatibility, cleanliness, and mucosal well-being is essential.

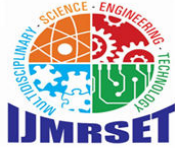
Sanitation Guidelines: Instructing patients on appropriate prosthesis maintenance and sanitation diminishes the likelihood of mucosal problems.

Prosthesis Design: Precision in the construction and adjustment of prostheses to reduce trauma and ensure functionality.

Material Selection: Employ biocompatible materials to avert allergic responses and tissue irritation.

Final Assessment

Prosthodontic therapies significantly impact the oral mucosa, enhancing function and protection but also presenting potential problems. Effective design, maintenance, and patient education are crucial to mitigate harmful effects and improve oral health outcomes.



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How to manage the diseased oral mucosa

Management of damaged oral mucosa include ascertaining the underlying etiology, providing symptomatic treatment, and averting additional problems. Treatment options differ based on the individual problem impacting the mucosa, although overarching management principles encompass addressing local causes, treating systemic diseases, and restoring mucosal integrity. Presented herein is a comprehensive description of management strategies:

1. Fundamental Principles of Management [12,14,18,22,24,40]

A. Precise Diagnosis

Crucial Stage: A comprehensive clinical evaluation and medical history are essential for determining the etiology of the mucosal disease.

Diagnostic assessments may encompass: Biopsy (for histopathological analysis).

Microbial cultures. Hematological assays (for systemic conditions such as anemia or diabetes). Allergy patch testing.

B. Removal of Local Irritants

Eliminate or modify improperly fitting dentures, prostheses, or orthodontic devices. Refrain from irritants such tobacco, alcohol, or spicy foods. Maintain proper dental hygiene to reduce damage and prevent infection.

C. Nutritional and Dietary Support

Rectify nutritional deficits that affect mucosal health (e.g., Vitamin B12, iron, folate). Promote a healthy diet abundant in vital vitamins and minerals.

2. Condition-Specific Management

A. Infectious Pathologies; Candidiasis (Fungal Infection), Topical antifungals: Nystatin or Clotrimazole.

Systemic antifungals: Fluconazole for severe or resistant instances, Highlight the need of denture hygiene to avert reinfection.

Herpes Simplex Virus (HSV)

Antiviral pharmaceuticals: Acyclovir or Valacyclovir, Analgesia: Topical anesthetics such as lidocaine.

Supportive care: Sufficient water and avoidance of irritants.

B. Autoimmune Disorders Oral Lichen Planus (OLP)

Topical corticosteroids: Clobetasol propionate or fluocinonide. Systemic corticosteroids for critical patients.

Immunosuppressants, such as tacrolimus, are utilized in refractory patients. Consistent monitoring required due to the risk of malignant transformation.

Pemphigus Vulgaris- Systemic corticosteroids, such as prednisone. Adjunctive immunosuppressive therapy: Azathioprine or mycophenolate mofetil. Management of pain utilizing topical anesthetics.

C. Traumatic Injuries

Therapeutic Intervention: Eliminate the causal agent (e.g., sharp teeth or dental prosthesis). Topical analgesics and protective pastes, such as Orabase. Facilitate recovery by preventing more stress.

D. Nutritional Deficiency Disorders

Iron Deficiency Anemia : Iron supplementation via oral or parenteral routes. Address fundamental causes (e.g., gastrointestinal hemorrhage).

Deficiency of Vitamin B12

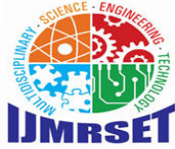
Intramuscular vitamin B12 injections or oral supplementation. Address concomitant glossitis and burning feelings.

Cease or replace the problematic medication or allergy. Administer antihistamines or corticosteroids for symptomatic alleviation.

Topical analgesics: Benzocaine or lidocaine formulations. Systemic analgesics: Nonsteroidal anti-inflammatory medications (NSAIDs) or paracetamol.

Management of Xerostomia

Salivary replacements or stimulants, such as pilocarpine or cevimeline. Hydration and the utilization of sugar-free chewing gums.



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4. Adjunctive Therapies

Laser Treatment :Effective for alleviating pain and facilitating healing in conditions such as oral lichen planus or aphthous ulcers.

Photodynamic Therapy (PDT)

Effective for oral candidiasis and precancerous lesions.

5. Prevention of Recurrence

Consistent follow-ups to assess healing and recurrence.

Instructing patients on the preservation of oral hygiene and the mitigation of risk factors.

Reference: Scully, C. (2008). Oral mucosal disorders: a manual for the general practitioner. Dental Update.

Prosthodontic Applied aspects of Mucosa

The oral mucosa is essential in prosthodontic treatment since it serves as the interface between prosthetic devices and the oral environment. Comprehending the practical implications of the oral mucosa is crucial for the design and maintenance of successful prosthodontic appliances, assuring patient comfort and reducing unwanted effects. Presented herein is a comprehensive examination of the prosthodontic applications concerning the oral mucosa.

Essential Prosthodontic Factors Pertaining to Oral Mucosa

A. Assistance [32]

The oral mucosa, especially the masticatory mucosa, supports complete and detachable dentures.

Clinical Consequences:

The maxillary and mandibular ridges require evaluation of mucosal thickness and health.

Atrophic or thin mucosa heightens the likelihood of mucosal injury and ulceration.

B. Retention [41]

The retention of removable prostheses is affected by the quality of the mucosa and the fit of the denture base to the underlying mucosal surface.

Clinical Consequences:

Appropriate adjustment of the denture base mitigates discomfort and improves comfort.

Salivary flow and mucosal characteristics, such as adhesion, influence retention.

C. Stability [11]

Stability is preserved when the denture withstands displacement during use.

Clinical Consequences:

Suboptimal mucosal health or uneven ridges undermine stability. Functional impression techniques can enhance the stability of prostheses on the mucosal surface.

A. Traumatic Ulcerations [41]

Improperly fitting dentures might result in localized mucosal damage. Management: Modifying the denture base or occlusal contacts. Utilization of tissue conditioners to facilitate mucosal healing.

Denture Stomatitis

Palatal mucosal inflammation linked to Candida albicans colonization.

Predisposing Factors: Inadequate hygiene, prolonged denture usage, and dry mouth.

Management: Enhancing denture cleanliness, administering antifungal medication, and conducting regular denture removal.

C. Epulis Fissuratum [10]

Hyperplastic tissue proliferation resulting from persistent trauma caused by denture flanges.

Management: Surgical removal of the lesion and prosthesis adjustment.

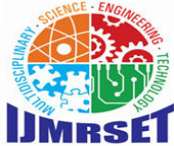
D. Residual Ridge Resorption (RRR) [32]

Ongoing bone resorption beneath dentures modifies mucosal support over time.

Clinical Consequences:

Necessitates regular relining or rebasing of dentures.

Prostheses supported by implants may aid in the preservation of bone.



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4. Prosthodontic Materials and Oral Mucosa [33]

A. Materials for Denture Bases

Polymethyl methacrylate (PMMA) is frequently utilized but may induce adverse responses in certain patients. The material's biocompatibility influences mucosal health.

B. Flexible Liners [42]

Soft liners can evenly disperse functional stresses on delicate mucosa.

Indications: Atrophic ridges and diminished mucosal thickness. Frequent substitution is essential to avert microbial infestation.

5. Unique Considerations for Implant Prosthetics [43]

The peri-implant mucosa is crucial for establishing a biological seal around implants to avert infection. Mucosal thickness influences implant aesthetics and long-term viability.

Clinical Consequences:

Accurate implant positioning and prosthetic design avert trauma and peri-implant pathologies.

Mucosal Management in Prosthodontics [10,11]

A. Prophylactic Strategies

Routine assessment of the mucosa to detect initial indications of injury or pathology.

Instructing patients about denture maintenance and regular examinations.

B. Tissue Conditioning

Tissue conditioners enhance mucosal healing and adaptability to prosthetic devices.

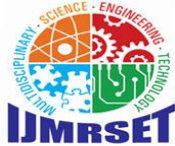
C. Functional Impressions Techniques that record mucosal dynamics to improve the comfort and fit of prosthesis.

II. CONCLUSION

In prosthodontics, the oral mucosa functions as an essential basis for favorable treatment results. Comprehending its anatomy, functions, and practical applications is crucial for creating prostheses that are biocompatible, pleasant, and enduring. By emphasizing mucosal health through meticulous assessment, appropriate prosthesis design, and regular maintenance, prosthodontists can improve patient satisfaction and sustain long-term oral function. The incorporation of mucosal knowledge into prosthodontic practice highlights its essential role in providing comprehensive patient care.

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