IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Evaluation Of Potential Prosthetic Space In Partially Edentulous Patients: A Narrative Review

[1.] Dr.Bhakti Porwal, [2.]Dr.Sushma Munde, [3.]Dr.Babita Yeshwante, [4.]Dr. Shriya Mohite,[5.]Dr.Amruta Chavan
[1.] 2nd year MDS, [2.] 3rd year MDS, [3.] HOD & Proffesor, [4.] 2nd year MDS, [5.]Dr.Amruta Chavan
[1.] Department of Crown, Bridge & Implantology
[1.] C.S.M.S.S Dental College, Chh. Sambhajinagar, India

Abstract: The outcome of prosthodontic rehabilitation in partially edentulous individuals is highly dependent on an accurate appraisal of the available prosthetic space. Tooth loss initiates a series of biological and occlusal alterations, including resorption of the alveolar ridge, supraeruption of opposing teeth, and positional changes of adjacent teeth, all of which can negatively influence restorative space. In addition, neuromuscular adaptation and variations in occlusal vertical dimension further modify spatial relationships within the oral cavity. Inadequate evaluation of these changes may result in compromised function, esthetics, phonetics, and reduced longevity of prosthetic restorations. This narrative review outlines the concept of prosthetic space, factors responsible for its alteration, conventional and digital methods of assessment—including intraoral scanning—and their relevance in prosthodontic treatment planning.

Keywords: Prosthetic space, partial edentulism, interocclusal space, intraoral scanner, prosthodontic evaluation

1. Introduction

Partial edentulism represents an intermediate stage in the continuum of tooth loss and is associated with significant disruption of the stomatognathic system. The absence of teeth affects occlusal stability and triggers adaptive responses in the alveolar bone, periodontal ligament, temporomandibular joints, and associated musculature. The primary objective of prosthodontic rehabilitation is to re-establish function, esthetics, phonetics, and occlusal harmony; however, the predictability of treatment outcomes is strongly governed by the availability of sufficient prosthetic space.[1]

Prosthetic space is dynamic rather than static and continues to change following tooth loss as a result of biological remodeling and occlusal adaptation. Progressive alveolar ridge resorption, altered eruption patterns, and changes in vertical dimension often lead to space deficiencies over time. If these limitations are not identified during the diagnostic phase, prosthetic treatment may be compromised by inadequate material thickness, unfavorable occlusal relationships, and an increased risk of mechanical or biological complications such as prosthesis fracture, excessive wear, or peri-prosthetic tissue inflammation.[2,3]

2. Concept and Dimensions of Prosthetic Space

Prosthetic space may be described as the three-dimensional volume required to accommodate a dental prosthesis while satisfying biological, functional, and esthetic demands.[3] This space is defined by the residual alveolar ridge, adjacent teeth, opposing dentition, occlusal plane, and surrounding soft tissues. Adequate prosthetic space is essential to ensure optimal prosthesis contour, structural integrity, and harmonious integration within the oral environment.

2.1 Vertical Dimension

The vertical aspect of prosthetic space refers to the interocclusal distance between the edentulous ridge and the opposing dentition at the planned vertical dimension of occlusion. Sufficient vertical clearance is necessary to reproduce proper occlusal anatomy, provide adequate restorative material thickness, and withstand functional loading.[4] Insufficient vertical space frequently necessitates compromises in occlusal form or material selection, thereby increasing the likelihood of prosthetic failure.

2.2 Mesiodistal Dimension

The mesiodistal dimension influences the number, width, and alignment of prosthetic units. Following tooth loss, adjacent teeth often drift, tip, or rotate into the edentulous space, leading to a reduction in available mesiodistal width.[5] Such changes may adversely affect connector dimensions, pontic form, embrasure design, and the path of insertion, particularly in fixed and removable prostheses.

2.3 Buccolingual Dimension

Buccolingual space is determined by the morphology of the residual ridge, tongue position, and the functional activity of the lips and cheeks. Inadequate buccolingual clearance may result in overcontoured restorations, compromised esthetics, increased plaque accumulation, and difficulty in maintaining oral hygiene.[6] Thorough evaluation of this dimension is essential to achieve stable prosthetic contours and long-term patient comfort.

3. Factors Affecting Prosthetic Space in Partial Edentulism

3.1 Alveolar Ridge Resorption

Resorption of the alveolar ridge is an unavoidable consequence of tooth extraction and progresses at varying rates among individuals. The pattern and severity of resorption are influenced by anatomical characteristics, functional loading, systemic health, and previous prosthetic therapy. Loss of ridge height and width directly diminishes available prosthetic space and often increases restorative height requirements, especially in distal extension situations.[1],[11]

3.2 Supraeruption of Unopposed Teeth

When occlusal contact is lost, opposing teeth frequently undergo supraeruption as part of a dentoalveolar compensatory process. Numerous clinical investigations have demonstrated that unopposed posterior teeth commonly exhibit vertical displacement, often in combination with tipping or rotation.[2],[7] Supraeruption significantly reduces interocclusal clearance and may necessitate occlusal reduction, orthodontic intrusion, or endodontic intervention prior to definitive prosthetic treatment.

3.3 Migration and Tilting of Adjacent Teeth

The loss of proximal contacts following tooth extraction results in mesial or distal migration of adjacent teeth. This movement reduces mesiodistal space, alters occlusal relationships, and complicates prosthesis design.[5] Pronounced tilting may further compromise load distribution and negatively affect the long-term prognosis of abutment teeth.

3.4 Occlusal Plane Alterations

Posterior tooth loss frequently leads to disruption of the occlusal plane, posterior bite collapse, and uneven distribution of occlusal forces. These changes influence both static and dynamic occlusion and may further restrict prosthetic space if not corrected during treatment planning.[8] Restoration of a harmonious occlusal plane is therefore essential for predictable prosthodontic outcomes.

4. Conventional Methods of Prosthetic Space Evaluation

4.1 Clinical Examination

Clinical assessment provides initial information regarding interocclusal clearance, tooth position, ridge anatomy, and soft-tissue constraints. Evaluation of functional movements, phonetics, and occlusal contacts is essential; however, this approach remains subjective and should be supplemented with additional diagnostic methods.[3]

4.2 Diagnostic Casts and Articulator Analysis

Articulated diagnostic casts enable three-dimensional visualization of prosthetic space and occlusal relationships. Analysis on an articulator assists in identifying occlusal discrepancies, interferences, and spatial limitations that may not be apparent during intraoral examination.[4]

4.3 Radiographic Assessment

Radiographic examination provides valuable information regarding residual ridge height, crown–root ratios, opposing tooth position, and supporting bone quality. Although radiographs do not directly quantify prosthetic space, they are essential for interpreting spatial constraints and planning adjunctive procedures.[1,12]

4.4 Diagnostic Wax-Up

Diagnostic wax-ups allow simulation of the proposed prosthesis and facilitate evaluation of esthetics, phonetics, occlusal relationships, and restorative material thickness. They are particularly effective in identifying deficiencies in prosthetic space prior to definitive treatment.[3]

5. Digital Evaluation of Prosthetic Space Using Intraoral Scanners

5.1 Principles of Intraoral Scanning

Intraoral scanners obtain optical impressions using laser or structured light technology to generate highly accurate three-dimensional digital models of teeth and surrounding soft tissues.[9] These systems eliminate many of the inaccuracies associated with conventional impression techniques.

5.2 Assessment of Prosthetic Space Using Digital Models

Digital datasets permit precise measurement of vertical interocclusal clearance, mesiodistal width, and buccolingual dimensions. Occlusal plane discrepancies and supraeruption of opposing teeth can be objectively analyzed using software-based tools.[10,13]

5.3 Virtual Articulation and Digital Wax-Ups

Digital workflows enable virtual articulation and digital wax-ups, allowing clinicians to assess prosthetic designs and space availability before clinical intervention.[9] This approach enhances treatment predictability and supports effective interdisciplinary communication.

5.4 Advantages of Digital Evaluation

Compared with conventional techniques, digital evaluation offers superior accuracy, improved patient comfort, efficient data storage, reproducibility, and enhanced communication with dental laboratories. These benefits establish intraoral scanners as a valuable component of modern prosthodontic diagnostics.[10,14]

6. Clinical Significance of Prosthetic Space Evaluation

Insufficient prosthetic space may lead to reduced restorative material thickness, compromised occlusal morphology, esthetic limitations, phonetic disturbances, and increased susceptibility to mechanical or biological failure. Early identification of spatial deficiencies enables clinicians to plan appropriate pre-prosthetic interventions and improves the predictability and longevity of treatment outcomes.[3],[4],[15]

7. Management of Inadequate Prosthetic Space

Management of limited prosthetic space may involve selective occlusal reduction of supraerupted teeth, orthodontic intrusion or realignment, correction of the occlusal plane, surgical ridge modification, alteration of vertical dimension of occlusion, or selection of prosthetic designs that require minimal space. Treatment strategies should be tailored to individual clinical findings, patient expectations, and long-term prognosis.[4],[8]

8. Conclusion

Assessment of potential prosthetic space is a fundamental aspect of prosthodontic diagnosis in partially edentulous patients. Tooth loss initiates progressive biological and occlusal changes that can substantially compromise restorative space. A comprehensive diagnostic approach incorporating both conventional and digital techniques—particularly intraoral scanning—enhances accuracy, treatment predictability, prosthesis longevity, and overall patient satisfaction.

References (Vancouver Style)

1. Martone AL. The phenomenon of function in complete denture prosthodontics. *J Prosthet Dent*. 1962;12(5):817–829.
2. Craddock HL, Youngson CC. Incidence of overeruption and occlusal interferences in unopposed posterior teeth. *Br Dent J*. 2004;196(6):341–348.
3. Ahuja S, Cagna DR. Classification and management of restorative space in prosthodontics. *J Prosthet Dent*. 2011;105(5):332–337.
4. Craddock HL, Youngson CC, Manogue M. Occlusal changes following posterior tooth loss. *J Prosthodont*. 2007;16(6):495–501.
5. Kaplan P. Drifting, tipping and supraeruption of teeth following antagonist loss. *J Prosthet Dent*. 1987;58(1):49–54.
6. Kiliaridis S, Carlsson GE. Vertical position of unopposed molars. *J Oral Rehabil*. 2000;27(8):680–684.
7. Compagnon D, Woda A. Supraeruption of teeth without antagonists. *J Prosthet Dent*. 1991;66(1):29–34.
8. Sin EC, Briceag R, Raftu G, et al. Evaluation of potential prosthetic space parameters in partial edentation. *Rom J Med Dent Educ*. 2024;13(5):25–32.
9. Mangano F, Gandolfi A, Luongo G, Logozzo S. Intraoral scanners in dentistry. *BMC Oral Health*. 2017;17:149.
10. Güth JF, Keul C, Beuer F. Accuracy of digital impressions. *Clin Oral Investig*. 2013;17(4):1209–1217.
11. Atwood DA. Reduction of residual ridges: a major oral disease entity. *J Prosthet Dent*. 1971;26(3):266–279.
12. White SC, Pharoah MJ. *Oral Radiology: Principles and Interpretation*. 7th ed. St. Louis: Elsevier; 2014.
13. Ender A, Mehl A. Accuracy of complete-arch dental impressions. *J Prosthet Dent*. 2011;109(2):121–128.
14. Joda T, Brägger U. Digital vs conventional implant prosthetic workflows. *Clin Oral Implants Res*. 2015;26(12):1430–1435.
15. Goodacre CJ, Bernal G, Rungcharassaeng K, Kan JY. Clinical complications in prosthodontics. *J Prosthet Dent*. 2003;90(1):31–41.