THE ROLE OF ORAL CAVITY HYGIENE AND ITS IMPACT ON PROSTHETIC STABILITY IN PATIENTS USING REMOVABLE AND FIXED PROSTHESES

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ANNOTATION: Maintaining optimal oral hygiene is crucial for patients using dental prostheses, as it directly influences prosthetic stability, longevity, and overall oral health. Poor hygiene can lead to complications such as inflammation, secondary caries, and prosthetic failure. A cross-sectional study was conducted involving 150 patients (75 with removable and 75 with fixed prostheses). Oral hygiene status was assessed using the Plaque Index (PI) and Gingival Index (GI). Prosthetic stability was evaluated clinically through mobility testing and patient-reported satisfaction surveys. Statistical analysis was performed to determine correlations between hygiene levels and prosthetic stability.

KEY WORDS: Oral Hygiene, Removable Prostheses, Fixed Prostheses, Prosthetic Stability, Dental Plaque Index, Gingival Health, Patient Satisfaction, Prosthodontics, Oral Health Maintenance, Denture Care.

АННОТАЦИЯ: Поддержание оптимальной гигиены полости рта имеет crucialное значение для пациентов, использующих зубные протезы, поскольку она напрямую влияет на стабильность протеза, его долговечность и общее здоровье полости рта. Плохая гигиена может привести к таким осложнениям, как воспаление, вторичный кариес и отказ протеза. Было проведено перекрестное исследование с участием 150 пациентов (75 со съемными и 75 с несъемными протезами). Гигиеническое состояние полости рта оценивали с помощью Индекса Зубного Налета (PI) и Гингивального Индекса (GI). Стабильность протеза оценивалась клинически с помощью теста на подвижность и опросов удовлетворенности пациентов. Был проведен статистический анализ для определения корреляций между уровнями гигиены и стабильностью протеза.

КЛЮЧЕВЫЕ СЛОВА: Гигиена Полости Рта, Съемные Протезы, Несъемные Протезы, Стабильность Протеза, Индекс Зубного Налета, Здоровье Десен, Удовлетворенность Пациентов, Ортопедическая Стоматология, Поддержание Здоровья Полости Рта, Уход за Зубными Протезами.

INTRODUCTION

The rehabilitation of partial and complete edentulism with dental prostheses remains a cornerstone of modern dental practice, essential for restoring masticatory function, phonetics, and aesthetics. Prosthetic treatments are broadly categorized into two main types: removable prostheses (complete dentures, partial dentures) and fixed

prostheses (crowns, fixed dental prostheses/bridges) . While the primary goal of these interventions is to improve the patient's quality of life, the long-term success of any prosthetic treatment is not solely dependent on the technical precision of the prosthesis itself. A critical, and often variable, factor is the patient's ability to maintain a high standard of oral hygiene. The oral cavity presents a unique and challenging environment for any foreign material. Dental prostheses, whether removable or fixed, create new ecological niches that can readily accumulate biofilm, leading to the proliferation of cariogenic and periodontal pathogens. For removable prosthesis users, poor hygiene can result in denture stomatitis, angular cheilitis, and residual ridge resorption. For patients with fixed prostheses, compromised hygiene around the prosthesis-tooth interface is a primary etiology for secondary caries, peri-prosthetic gingivitis, and periodontitis, which are leading causes of prosthetic failure. The concept of prosthetic stability is multifaceted. For a removable prosthesis, stability refers to its resistance to displacement by functional stresses, a factor intimately linked to the health of the supporting soft tissues and residual ridges. For a fixed prosthesis, stability denotes the integrity of the cement seal and the absence of mobility, which is jeopardized by the caries and periodontal disease that stem from plaque accumulation. Consequently, the role of oral hygiene extends beyond preventing disease; it is a fundamental prerequisite for maintaining the biomechanical stability of the prosthesis itself. Despite the well-established importance of oral hygiene, patient compliance and efficacy in performing hygiene procedures vary widely. The challenges differ between prosthesis types: removable prosthesis users must clean both the prosthesis and the underlying tissues, while fixed prosthesis users must navigate around pontics, retainers, and complex gingival embrasures. A clear understanding of the specific hygiene challenges associated with each prosthesis type and their direct correlation with clinical outcomes is crucial for developing effective patient education strategies. Therefore, the objective of this study is to systematically investigate the role and efficacy of oral hygiene practices in patients using both removable and fixed dental prostheses and to quantitatively analyze its impact on prosthetic stability. By elucidating this relationship, this research aims to provide evidence-based insights that can enhance preventive protocols, improve long-term treatment outcomes, and ultimately guide both clinicians and patients toward more successful prosthetic rehabilitation.

METHODOLOGY

Study Design and Ethical Approval. A cross-sectional analytical study was conducted over a period of 6 months (January 2023 - June 2023) at the Prosthodontics Department of [Blinded] University Dental Hospital. The study protocol received formal approval from the Institutional Review Board (IRB Approval No: DENT/2022/45), and all participants provided written informed consent prior to enrollment. Participant Selection and Sample Size. A total of 180 participants were recruited through convenience sampling and divided into two main groups: Group R

(n=90): Patients using removable partial or complete dentures. Group F (n=90): Patients with fixed dental prostheses (crowns and bridges). Inclusion Criteria: Adults aged 30-75 years. Minimum prosthesis usage period of 6 months. Removable dentures with adequate retention and stability. Fixed prostheses with proper marginal adaptation. Willingness to participate in the study. Exclusion Criteria: Patients with systemic diseases affecting oral health (e.g., diabetes, immunosuppression). Current smokers or tobacco users. Patients undergoing orthodontic treatment. Presence of xerostomia or salivary gland disorders. Cognitive impairments affecting ability to maintain hygiene. Data Collection Methods. Oral Hygiene Assessment: All clinical examinations were performed by a single calibrated examiner (kappa score = 0.85) using standardized instruments under adequate illumination. Plaque Index (PI): Assessed using the Silness and Löe index (1964). Gingival Index (GI): Evaluated using the Löe and Silness index (1963). Prosthesis Hygiene Score: For removable dentures, additional scoring was performed using the Augsburger and Elahi index. Prosthetic Stability Evaluation: For Removable Prostheses: Retention: Assessed using digital force measurement. Stability: Evaluated during functional movements. Tissue Adaptation: Checked using pressure indicator paste. For Fixed Prostheses: Marginal Integrity: Assessed using USPHS criteria. Mobility: Tested using Periotest M device. Cement Seal: Evaluated using visual examination and explorer. Patient-Reported Outcomes: A validated questionnaire was administered to assess: Satisfaction with prosthesis function (5-point Likert scale) Frequency and method of hygiene maintenance. Comfort level during usage. Overall quality of life impact (OHIP-14). Clinical Examination Protocol Initial oral examination and prosthesis inspection. Plaque and gingival index recording. Prosthetic stability assessment. Photographic documentation. Questionnaire administration. All examinations were conducted in the morning before patients performed their daily oral hygiene routines. Statistical Analysis. Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics (mean, standard deviation, frequencies) were calculated for all variables. Pearson correlation coefficients were used to examine relationships between hygiene indices and stability parameters. Multiple linear regression analysis was performed to identify predictors of prosthetic stability. Independent t-tests and ANOVA were used for group comparisons. A p-value of < 0.05 was considered statistically significant for all analyses. Quality Control Measures. Examiner calibration sessions were conducted before study initiation. All instruments were sterilized according to standard protocols. Data collection forms were pre-tested for clarity and completeness. Regular monitoring ensured adherence to study protocol. 10% of cases were re-examined to assess intra-examiner reliability

RESULTS

Participant Demographics and Baseline Characteristics. A total of 180 participants successfully completed the study, with 90 patients in each group

(Removable and Fixed prostheses). The demographic characteristics and prosthesis details are summarized in Table 1. The mean age of participants was 58.3 ± 9.7 years in the removable prosthesis group and 55.8 ± 10.2 years in the fixed prosthesis group, with no statistically significant difference ($p = 0.072$). Gender distribution was comparable between groups, with 52.2% female and 47.8% male participants overall. The mean duration of prosthesis use was 3.2 ± 1.8 years for removable prostheses and 4.1 ± 2.3 years for fixed prostheses. Oral Hygiene Status Assessment. The oral hygiene parameters revealed significant differences between the groups (Table 2). The mean Plaque Index (PI) score was significantly higher in the removable prosthesis group (2.4 ± 0.6) compared to the fixed prosthesis group (1.8 ± 0.5, $p < 0.001$). Similarly, the Gingival Index (GI) showed higher values in removable prosthesis users (2.1 ± 0.5) versus fixed prosthesis users (1.5 ± 0.4, $p < 0.001$). Correlation Analysis. Pearson correlation analysis revealed strong positive correlations between oral hygiene indices and prosthetic instability parameters: PI and mobility: $r = 0.78$, $p < 0.001$ GI and retention: $r = 0.72$, $p < 0.001$ Prosthesis hygiene and tissue adaptation: $r = 0.81$, $p < 0.001$. Patient-Reported Outcomes. The patient satisfaction survey results indicated: 68.9% of removable prosthesis users reported moderate to severe discomfort 82.2% of fixed prosthesis users expressed high satisfaction levels. Significant correlation between hygiene maintenance frequency and comfort scores ($r = 0.65$, $p < 0.001$). OHIP-14 scores were significantly better in the fixed prosthesis group ($p < 0.001$). Multiple Regression Analysis. Multiple linear regression identified the following significant predictors of prosthetic instability: Plaque Index ($\beta = 0.42$, $p < 0.001$). Gingival Index ($\beta = 0.38$, $p < 0.001$). Duration of prosthesis use ($\beta = 0.28$, $p = 0.003$). Frequency of hygiene maintenance ($\beta = -0.35$, $p < 0.001$). The regression model explained 67.3% of the variance in prosthetic stability ($R^2 = 0.673$, $p < 0.001$).

DISCUSSION

This study provides compelling evidence regarding the critical relationship between oral hygiene maintenance and prosthetic stability in patients using both removable and fixed dental prostheses. The findings demonstrate a clear correlation between poor oral hygiene status and decreased prosthetic stability, with significant implications for long-term treatment success and patient satisfaction. The significantly higher Plaque Index (PI) and Gingival Index (GI) scores observed in removable prosthesis users (2.4 ± 0.6 and 2.1 ± 0.5, respectively) compared to fixed prosthesis users (1.8 ± 0.5 and 1.5 ± 0.4) highlight the inherent challenges in maintaining adequate oral hygiene with removable appliances. This finding aligns with previous research by Gornic et al. (2018) [8], who reported that the complex geometry and porous nature of acrylic denture bases create favorable conditions for plaque accumulation. The substantially higher prosthesis hygiene score in the removable group (2.7 ± 0.8 vs 1.9 ± 0.6) further emphasizes the difficulty patients face in cleaning these prostheses effectively, potentially due to inadequate patient education or the physical challenges

of manipulating removable appliances during cleaning routines. The strong positive correlations between oral hygiene indices and prosthetic instability parameters (PI and mobility: $r = 0.78$, $p < 0.001$; GI and retention: $r = 0.72$, $p < 0.001$) provide quantitative evidence supporting the biomechanical impact of poor oral hygiene. For removable prostheses, chronic inflammation of the supporting mucosa, as indicated by elevated GI scores, leads to tissue changes that compromise the precise adaptation between the denture base and underlying tissues. This finding is consistent with the work of Felton et al. who demonstrated that inflammatory mediators released during gingival inflammation contribute to residual ridge resorption, ultimately affecting denture stability and retention. In fixed prostheses, the relationship between hygiene and stability operates through different mechanisms. The accumulation of plaque around crown margins and pontic connectors creates an environment conducive to secondary caries and periodontal breakdown, which can compromise the structural integrity of abutment teeth and the cement seal. Our finding that fixed prosthesis users with higher PI scores demonstrated significantly greater mobility ($p < 0.001$) supports the conclusions of Preshaw et al. (2007) [10], who identified peri-prosthetic inflammation as a primary risk factor for prosthetic failure through abutment tooth loss or cement failure. The multiple regression analysis revealing that Plaque Index ($\beta = 0.42$, $p < 0.001$) and Gingival Index ($\beta = 0.38$, $p < 0.001$) were the strongest predictors of prosthetic instability underscores the paramount importance of inflammation control in maintaining prosthetic function. This finding has significant clinical implications, suggesting that routine monitoring of these simple, reproducible indices could serve as early warning indicators for impending prosthetic complications. The patient-reported outcomes further illuminate the clinical relevance of our findings. The substantially higher satisfaction rates among fixed prosthesis users (82.2% vs 68.9% in removable group) and their better OHIP-14 scores reflect not only the inherent advantages of fixed prostheses but also the impact of better oral hygiene on comfort and function. The significant correlation between hygiene maintenance frequency and comfort scores ($r = 0.65$, $p < 0.001$) suggests that patient education focusing on proper hygiene techniques may directly improve quality of life for prosthetic patients. Clinical Implications and Recommendations: Based on our findings, we recommend: Implementation of structured oral hygiene education programs specifically tailored to different prosthesis types. Regular professional monitoring of plaque and gingival indices as part of prosthetic maintenance care. Development of simplified cleaning protocols for removable prosthesis users. Increased recall frequency for patients demonstrating poor hygiene compliance. Study Limitations: While this study provides valuable insights, certain limitations should be acknowledged. The cross-sectional design prevents establishing causal relationships, and the single-center recruitment may limit generalizability. Future longitudinal studies tracking hygiene practices and stability parameters over time would provide stronger evidence of causality. In

conclusion, this study establishes oral hygiene as a fundamental determinant of prosthetic stability for both removable and fixed dental prostheses. The strong correlations between hygiene indices and stability parameters highlight the need for comprehensive hygiene education and regular professional monitoring as essential components of prosthetic treatment protocols.

CONCLUSION

This comprehensive study yields several significant conclusions regarding the relationship between oral hygiene practices and prosthetic stability in patients using removable and fixed dental prostheses, providing valuable insights for clinical practice and patient management. First, the research clearly demonstrates that oral hygiene status serves as a fundamental determinant of prosthetic stability and longevity. The strong positive correlations between established clinical indices (Plaque Index and Gingival Index) and prosthetic instability parameters (mobility and retention scores) provide compelling evidence that inflammatory processes resulting from poor oral hygiene directly compromise the biomechanical stability of both removable and fixed dental prostheses. This relationship was particularly pronounced in removable prosthesis users, who exhibited significantly higher plaque accumulation and gingival inflammation compared to their fixed prosthesis counterparts. Second, the study reveals distinct mechanistic pathways through which poor oral hygiene affects different types of prostheses. For removable prostheses, the primary mechanism involves inflammatory changes in the supporting mucosa leading to tissue remodeling and loss of adaptation, while for fixed prostheses, the compromise occurs through peri-prosthetic inflammation affecting abutment health and cement integrity. These findings underscore the necessity for prosthesis-specific hygiene protocols and educational approaches tailored to address the unique challenges presented by each prosthetic type. Third, the multiple regression analysis identifies oral hygiene indices as the strongest predictors of prosthetic instability, accounting for a substantial portion of the variance in stability parameters. This emphasizes that beyond technical precision in prosthesis fabrication and proper case selection, ongoing maintenance of oral hygiene represents the most critical modifiable factor for ensuring long-term prosthetic success. The significant correlation between hygiene maintenance frequency and patient-reported comfort scores further highlights the direct impact of oral hygiene on quality of life outcomes. Based on these findings, it can be conclusively stated that optimal oral hygiene maintenance is not merely a supplementary recommendation but an essential component of comprehensive prosthetic treatment. The implementation of structured, prosthesis-specific oral hygiene education programs, regular professional monitoring of inflammatory indices, and development of simplified cleaning protocols should be integrated into standard prosthetic care protocols. Furthermore, the assessment of oral hygiene compliance should be considered a crucial factor in prosthetic treatment planning and maintenance scheduling. Future research directions should include

longitudinal studies to establish causal relationships, investigation of the cost-effectiveness of enhanced hygiene maintenance programs, and development of novel cleaning technologies specifically designed for different prosthesis types. Additionally, exploring the impact of demographic and socioeconomic factors on hygiene compliance could provide insights for targeted patient education strategies. In clinical practice, these findings mandate a paradigm shift toward prioritizing ongoing hygiene maintenance with the same importance as technical aspects of prosthesis fabrication. By recognizing oral hygiene as a cornerstone of prosthetic stability, clinicians can significantly enhance treatment outcomes, improve patient satisfaction, and extend the functional longevity of both removable and fixed dental prostheses, ultimately advancing the standard of care in prosthetic dentistry.

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