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Original Article

Evaluation of the Resting Tongue Position in Partially Dentate and Completely Edentulous Patients

Samreen Zubair[1], Irfan Ahmed Shaikh[2], Abdul Bari Memon[3]*, Zia Sohail[4], Shahzad Baloch[5], Sohaib Noor[2], Faisal Saleem[6], Ghazanfar Ali Bhellar[7]

[1]Bhitai Dental and Medical College, Mirpurkhas.
[2]Liaquat University of Medical and health Sciences, Jamshoro.
[3]Shaheed Mohtarma Benazir Bhutto Medical University, Larkana.
[4]Dental Care Zone.
[5]Shahzad Medical Center, Tando Adam.
[6]SMBB Institute of Trauma, Karachi.
[7]University Bibi Aseefa Dental College, Larkana.
Corresponding Author: Abdul Bari Memon, Associate Professor; Email: drabmemon@yahoo.com

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ABSTRACT

Background: The human tongue plays a critical role in various oral processes and its position can be significantly affected by dental status, particularly in partially dentate and completely edentulous patients. Understanding the relationship between tongue position and dental status is essential for optimal prosthodontic treatment and patient quality of life.

Objective: This study aimed to evaluate the differences in the resting tongue position between partially dentate and completely edentulous patients and to understand how these differences could influence prosthodontic treatment strategies.

Methods: A descriptive cross-sectional study was conducted at the Institute of Dentistry, Liaquat University of Medical and Health Sciences, Jamshoro/Hyderabad, from 02-02-2021 to 30-11-2022. The study included 400 patients, divided into partially dentate (200 patients) and completely edentulous (200 patients) groups. Patients were further classified based on gender, age, and Kennedy classification. The tongue position was categorized as normal upper, normal lower, abnormal upper, and abnormal lower. The data was analyzed using SPSS version 22.0, with a significance level set at $p \leq 0.05$.

Results: In the partially dentate group, 57% and 63% were males in Group A and B, respectively, while 43% and 37% were females. In the completely edentulous group, males constituted 50% and 43% in Group A and B, respectively, with females making up the remaining percentages. Age-wise, 63% of partially dentate patients in both groups were aged 35-45, compared to 6% and 12.1% in the completely edentulous groups. Kennedy classification showed varying distributions with Class 2 being most prevalent in partially dentate Group B (43%). Tongue position analysis revealed that normal upper position was present in 28% of partially dentate and 16% of completely edentulous patients, with a statistically significant difference ($P < 0.001$). Abnormal upper position was noted in 36% of partially dentate and 38% of completely edentulous patients.

Conclusion: The study concluded significant differences in tongue positions between partially dentate and completely edentulous patients. These findings underscore the importance of considering tongue position in prosthodontic treatment planning, especially for completely edentulous patients.

Keywords: Resting Tongue Position, Partially Dentate, Completely Edentulous, Prosthodontics, Dental Status.

INTRODUCTION

The human tongue is an intricate muscular organ within the oral cavity, enveloped in mucosa, a pink, nerve and blood vessel-rich tissue that also facilitates salivary flow (1-3). Its role extends beyond mere physiological functions, playing a pivotal part in various oral processes such as speech, taste, dental hygiene, and mastication. Additionally, it collaborates with other cervical and facial muscles for the manipulation and transport of the food bolus (4).

Anatomically, the tongue is divided into two primary sections: the oral and the pharyngeal parts. In a normal resting state, the tongue comfortably occupies the oral cavity, slightly open and resting on the mouth's floor, constrained either by the mandibular teeth or

the upper ridge (5). However, in some cases, this standard positioning can be disrupted. The tongue may retract or move backward in the oral cavity, exposing the anterior portion of the floor. This "abnormal," "awkward," "returned," or "retracted" position is often a reflexive response to various functional or parafunctional changes in the oral environment. Such changes might include altered eating habits, loss of teeth, use of dentures, or anatomical malformations (6).

Interestingly, these deviations in tongue position do not necessarily cease after birth but can develop or become more pronounced with age, particularly in response to changes in the functional and anatomical conditions of the oral environment (7). One common alteration observed is the proptosis lingualis, where the tongue extends into the gaps left by missing teeth. This change in position or function of the tongue can have a cascading effect, leading to modifications in the surrounding structures (8).

The loss of occlusal support, as Yoshikawa et al. have noted, leads to complex tongue-tip movements and increased tongue activity due to the absence of mandibular fixation (9). When a patient transitions from being dentate to edentulous and starts using partial or complete dentures, the functional demands on the tongue intensify. Therefore, it becomes paramount to pay meticulous attention to the tongue's physiological and anatomical characteristics, including its size, shape, strength, and the normal pattern of movement and position. Prior to the successful fabrication of a mandibular denture, a thorough evaluation of its surrounding environment is essential (10).

The tongue's abnormal positioning can disrupt the seal between the oral mucosa and the denture border, impacting denture stability and retention, and potentially compromising the prosthodontic rehabilitation of the edentulous mandible. On the flip side, a broad, thick tongue, while leaving a robust impression, can enhance the denture's seal, although an excessively large tongue may destabilize the denture (11).

In the realm of denture therapy, comprehending the tongue's role across various stages is vital to surmount the challenges it poses to the success of prosthesis (11). This understanding requires meticulous planning and patient education. Especially crucial in the fabrication of complete dentures is the positioning of the resting tongue relative to the surrounding musculature (12). This is because the prosthesis relies on several factors such as the impression technique, the extent of the denture border, the level of the occlusal plane, and the positioning of teeth (1, 13, 14).

The findings of this study are not only beneficial for clinicians but also for the laboratory processes involved in crafting stable and functional prostheses. These insights can significantly enhance the quality of life for patients and provide substantial psychological benefits, underscoring the importance of the tongue's role in dental health and prosthodontic success.

MATERIAL AND METHODS

The study, a descriptive cross-sectional analysis, was meticulously conducted in the outpatient department of the Department of Prosthodontics at the Institute of Dentistry, Liaquat University of Medical and Health Sciences, Jamshoro/Hyderabad (15). This comprehensive study spanned nearly two years, from February 2, 2021, to November 30, 2022. Prior to data collection, the study received ethical approval from the university's ethical review committee, ensuring adherence to ethical standards in research. In addition, written informed consent was obtained from each participant, aligning with ethical research practices (16).

The study's sample size was thoughtfully calculated using a specific formula, accounting for various factors such as the hypothesized frequency of the outcome factor in the population, confidence limits, and design effect. Initially calculated to be 377, the sample was strategically increased by 23 additional subjects, bringing the total to 400, to enhance the study's statistical power. This augmentation was based on the understanding that a larger sample size could provide more reliable and valid results (17).

Participants were recruited using a non-probability convenient sampling technique. The inclusion criteria were specifically defined: patients with partial dentition or complete edentulism in the mandibular arch, encompassing both genders, and aged between 35 and 65 years. Conversely, the study excluded individuals with edentulism due to trauma, those with surgical soft or hard tissue defects, surgical tongue tie, mental handicaps, neuromuscular disorders, or those unwilling to participate (18).

In the study, patients who were partially dentate were divided into two groups based on the duration of their edentulism. Group A comprised short-term extracted edentulous subjects (less than 1 year), and Group B included long-term edentulous subjects (more than 1 year). Additionally, these patients were further classified into four groups according to the Kennedy classification (19). Similarly, completely edentulous patients were also divided into two groups based on the duration of their edentulism.

The key focus of the study was the resting position of the tongue (20). This was meticulously categorized based on the visibility of the floor of the mouth, the lateral borders in relation to the lingual surfaces of teeth or lingual side of the ridge, and the apex in relation to the lingual surfaces of the teeth or lingual aspect of the mandibular anterior ridge. The resting tongue positions were classified as normal upper, normal lower, abnormal upper, or abnormal lower (21).

Each participant underwent a detailed examination process. They were asked to sit upright, and their resting tongue position was observed discreetly to ensure natural behaviour. The final position of the tongue was recorded after the patient had opened their

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mouth multiple times, allowing them to relax more naturally (22). Throughout the examination, patients were instructed to remain calm and open their mouths slowly, facilitating accurate observation. In cases where the tongue appeared abnormal, participants were asked to close their mouth, swallow, and then open it again. This procedure was repeated to ensure that the tongue was relaxed and free from muscular contractions when recordings were made. Each position was recorded three times by the same operator and documented in a proforma.

Data analysis was conducted using SPSS version 22.0. Frequency and percentages were calculated for qualitative variables such as gender, Kennedy classification, and tongue position. Age was expressed as mean and standard deviation. The Chi-Square test was employed to evaluate the significant association between the resting tongue position in partially dentate and completely edentulous patients. The significance level was set at $p \leq 0.05$ with a 95% confidence interval, ensuring a rigorous and statistically robust analysis of the data (23).

RESULTS

In the study, a total of 400 patients were evaluated, divided into two main categories: partially dentate and completely edentulous. Among the partially dentate patients, Group A and Group B comprised equal numbers of 100 individuals each, while the completely edentulous group was further divided into Group A with 84 patients and Group B with 116 patients.

Focusing on gender distribution (Table 1), the partially dentate groups showed a higher proportion of male patients, with 57% in Group A and 63% in Group B, compared to the females at 43% and 37% respectively. In contrast, the completely edentulous groups had a more balanced distribution in Group A (50% male and female each) but a female predominance in Group B (56.9% female, 43.1% male).

Age distribution (Table 2) revealed interesting patterns. The 35-45 age group was predominant in the partially dentate categories, both Group A and B, each with 63% of their respective populations. However, in the completely edentulous groups, this age bracket was significantly lower (6% in Group A and 12.1% in Group B). The majority of the completely edentulous patients were older, particularly in the 56-66 age range, which constituted 45.2% of Group A and 62.9% of Group B.

When examining the Kennedy Classification of the partially dentate patients (Table 3), Class 2 was more prevalent in Group B (43%) compared to only 4% in Group A. In contrast, Class 1 showed a higher percentage in Group A (40%) than in Group B (25%). Classes 3 and 4 were more evenly distributed between the two groups.

Table 1 Gender and Dental Status

Gender	Partially Dentate Group A	Partially Dentate Group B	Completely Edentulous Group A	Completely Edentulous Group B
Male	57 (57.0%)	63 (63.0%)	42 (50.0%)	50 (43.1%)
Female	43 (43.0%)	37 (37.0%)	42 (50.0%)	66 (56.9%)

Table 2 Age Groups and Dental Status

Age Groups	Partially Dentate Group A	Partially Dentate Group B	Completely Edentulous Group A	Completely Edentulous Group B
35-45	63 (63.0%)	63 (63.0%)	5 (6.0%)	14 (12.1%)
46-55	21 (21.0%)	17 (17.0%)	41 (48.8%)	29 (25.0%)
56-66	16 (16.0%)	20 (20.0%)	38 (45.2%)	73 (62.9%)

Table 3 Kennedy Classification (Partially Dentate Patients Only)

Classification	Group A (n=100)	Group B (n=100)
Class 1	40 (40.0%)	25 (25.0%)
Class 2	4 (4.0%)	43 (43.0%)
Class 3	32 (32.0%)	28 (28.0%)
Class 4	24 (24.0%)	4 (4.0%)

Table 4 Distribution of Tongue Position in Patients (n=400)

Tongue Position	Partially Dentate (n=200)	Completely Edentulous (n=200)	P-Value
Normal Upper	56 (28.0%)	32 (16.0%)	<0.001

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Tongue Position	Partially Dentate (n=200)	Completely Edentulous (n=200)	P-Value
Normal Lower	64 (32.0%)	32 (16.0%)	
Abnormal Upper	72 (36.0%)	76 (38.0%)	
Abnormal Lower	8 (4.0%)	60 (30.0%)	
Total	200 (100.0%)	200 (100.0%)	

The assessment of tongue position (Table 4) revealed significant differences between the partially dentate and completely edentulous groups. In the partially dentate group, normal upper tongue position was observed in 28% of the patients, while the same was seen in only 16% of the completely edentulous group, a difference that was statistically significant ($P < 0.001$). Normal lower tongue position was found in 32% of partially dentate patients and 16% of completely edentulous patients. Abnormal tongue positions were more common in the completely edentulous group, with 38% showing abnormal upper and 30% abnormal lower positions, compared to 36% and 4% respectively in the partially dentate group.

These results highlight the intricate relationship between dental status and tongue position, illustrating the significant impact of tooth loss on the oral cavity's functional dynamics.

DISCUSSION

The study underscores the intricate relationship between tongue position and dental status, particularly in the context of denture therapy. Understanding this relationship is vital for clinicians when designing and fabricating dentures, especially full dentures, where the resting position of the tongue relative to surrounding musculature significantly impacts the fit and functionality of the prosthesis. The gender distribution in the partially dentate and completely edentulous groups aligns with findings by Rajeshwari K. et al., suggesting a slightly higher prevalence of tooth loss in males (11). This pattern might reflect broader trends in oral health and hygiene practices across genders. It's noteworthy that male patients, particularly with increasing age, are more prone to becoming either partially dentate or completely edentulous. This could be indicative of underlying factors such as lifestyle choices, access to dental care, or biological predispositions that warrant further investigation.

The distribution of partially dentate patients according to Kennedy Classification in this study mirrors the results of Bhukary D. et al., indicating a consistent pattern in the manifestation of partial edentulism (1). This correlation might suggest common etiological factors, potentially pointing towards inadequate oral hygiene practices as a contributing element. The prevalence of different Kennedy classes in partial edentulism also highlights the need for targeted dental care strategies that address specific patterns of tooth loss.

The study's findings on resting tongue position are particularly revealing. The normal tongue position was significantly more prevalent in partially dentate patients compared to completely edentulous patients. In contrast, a higher percentage of abnormal tongue positions was observed in the completely edentulous group. This disparity is consistent with the observations made by Kotsiomiti E. et al. and Rajeshwari K. et al., suggesting a direct correlation between the extent of edentulism and the deviation of the tongue from its normal resting position (11, 24).

The abnormal tongue position in completely edentulous patients, especially those with a longer duration of edentulism, underscores the adaptive changes that occur in the oral cavity in response to tooth loss. This adaptation may have significant implications for the design and fitting of dentures. A denture that does not accommodate the altered tongue position might lead to discomfort, decreased functionality, and overall dissatisfaction for the patient (25).

These findings hold crucial implications for dental practice, particularly in the realm of prosthodontics. They highlight the need for a comprehensive approach to denture fabrication that considers not just the anatomical dimensions but also the functional dynamics of the oral cavity. Clinicians must recognize the importance of tailoring dentures to accommodate changes in tongue position, thereby enhancing the comfort and efficacy of the prosthesis (26).

In conclusion, the study illuminates the dynamic interplay between dental status and tongue position, providing valuable insights for the field of prosthodontics. It emphasizes the need for personalized dental care and patient education, ensuring that each prosthesis not only fits anatomically but also aligns with the functional realities of the patient's oral cavity. This patient-centred approach is crucial for enhancing the quality of life for individuals transitioning to partial or complete edentulism.

CONCLUSION

In conclusion, this study reveals a significant variation in tongue position between partially dentate and completely edentulous patients, with a higher prevalence of abnormal positions observed in the latter group. These findings underscore the importance of

considering tongue posture in the design and fabrication of dentures, particularly in fully edentulous cases. For clinicians and dental prosthetists, this emphasizes the necessity of adopting a holistic approach in prosthodontic treatment, ensuring that dentures not only fit anatomically but also accommodate the functional dynamics of the oral cavity. This approach is vital for enhancing patient comfort, prosthesis functionality, and overall oral health outcomes.

REFERENCES

1. Bukhary DM, Bukhary D. Teeth Rehabilitation and Nutritional Influence on Diabetic Patients: A Review. Cureus. 2023;15(9).
2. Chalub LLFH, Ferreira RC, Vargas AMD. Influence of functional dentition on satisfaction with oral health and impacts on daily performance among Brazilian adults: a population-based cross-sectional study. BMC Oral Health. 2017;17:1-12.
3. de Groot RJ, Merkx MA, Hamann MN, Brand HS, de Haan AF, Rosenberg AJ, et al. Tongue function and its influence on masticatory performance in patients treated for oral cancer: a five-year prospective study. Supportive Care in Cancer. 2020;28:1491-501.
4. Drake RL, Vogl AW, Mitchell AW. Gray's anatomy for students flash cards e-book: Elsevier Health Sciences; 2019.
5. Dula LJ, Shala KS, Tmava-Dragusha A, Lila-Krasniqi Z, Pustina-Krasniqi T, Bicaj T. Evaluation of masticatory efficiency among subjects with removable partial dentures: a comparative study. Journal of International Dental and Medical Research. 2020;13(2):622-7.
6. Fatima F, Fida M. The assessment of resting tongue posture in different sagittal skeletal patterns. Dental press journal of orthodontics. 2019;24:55-63.
7. Gadonski AP, Carletti TM, de Medeiros MMD, Garcia RCMR. Effects of tongue lesions and palatal coverage on oral sensory functions. The Journal of Prosthetic Dentistry. 2023.
8. Lamster IB, Asadourian L, Del Carmen T, Friedman PK. The aging mouth: differentiating normal aging from disease. Periodontology 2000. 2016;72(1):96-107.
9. Nayar S. A Review on Occlusal Plane Analysis in Edentulous Patients. Indian Journal of Forensic Medicine & Toxicology. 2020;14(4).
10. Pedrinaci I, Sun TC, Sanz-Alonso M, Sanz-Esporrin J, Hamilton A, Gallucci GO. Implant survival in the anterior mandible: A retrospective cohort study. Clinical Oral Implants Research. 2023;34(5):463-74.
11. Rajeshwari K, Kohli S, Mathew XK. Evaluation of resting tongue position in recently extracted and long term completely edentulous patients: A prospective interventional study. Journal of clinical and diagnostic research: JCDR. 2017;11(4):ZC61.
12. Baba NZ, Goodacre BJ, Goodacre CJ, Müller F, Wagner S. CAD/CAM complete denture systems and physical properties: A review of the literature. Journal of Prosthodontics. 2021;30(S2):113-24.
13. Zielke M, Jasnoch J, Maciejewska I. Different approaches in determining the vertical and horizontal jaw relations during complete denture fabrication–a literature review. Journal of Stomatology. 2021;74(3):195-202.
14. Yoshihara A, Suwama K, Miyamoto A, Watanabe R, Ogawa H. Diet and root surface caries in a cohort of older Japanese. Community Dentistry and Oral Epidemiology. 2021;49(3):301-8.
15. Lippi L, D'Abrosca F, Folli A, Dal Molin A, Moalli S, Maconi A, et al. Closing the gap between inpatient and outpatient settings: Integrating pulmonary rehabilitation and technological advances in the comprehensive management of frail patients. International journal of environmental research and public health. 2022;19(15):9150.
16. Novitzky P, Bernstein MJ, Blok V, Braun R, Chan TT, Lamers W, et al. Improve alignment of research policy and societal values. Science. 2020;369(6499):39-41.
17. Lakens D. Sample size justification. Collabra: Psychology. 2022;8(1):33267.
18. Pace DS. Probability and non-probability sampling-an entry point for undergraduate researchers. International Journal of Quantitative and Qualitative Research Methods. 2021;9(2):1-15.
19. Nayyer M, Khan DA, Gul H, Aslam A, Khan NB, Aslam F. Patterns of partial edentulism according to kennedy's classification-a cross sectional study. Pakistan Armed Forces Medical Journal. 2020;70(Suppl-1):S87-90.
20. Zaghi S, Shamtoob S, Peterson C, Christianson L, Valcu-Pinkerton S, Peeran Z, et al. Assessment of posterior tongue mobility using lingual-palatal suction: Progress towards a functional definition of ankyloglossia. Journal of oral rehabilitation. 2021;48(6):692-700.
21. Scoppa F, Saccomanno S, Bianco G, Pirino A. Tongue posture, tongue movements, swallowing, and cerebral areas activation: a functional magnetic resonance imaging study. Applied Sciences. 2020;10(17):6027.

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22. Wang H, Tang H, Fang Y, Tan L, Yin J, Shen Y, et al. Morbidity and mortality of patients who underwent minimally invasive esophagectomy after neoadjuvant chemoradiotherapy vs neoadjuvant chemotherapy for locally advanced esophageal squamous cell carcinoma: a randomized clinical trial. JAMA surgery. 2021;156(5):444-51.
23. Sadriddinovich JT. Capabilities of SPSS Software in High Volume Data Processing Testing. American Journal of Public Diplomacy and International Studies (2993-2157). 2023;1(9):82-6.
24. Michalinos A, Zogana S, Kotsiomitis E, Mazarakis A, Troupis T. Anatomy of the ophthalmic artery: a review concerning its modern surgical and clinical applications. Anatomy Research International. 2015;2015.
25. Özkan YK, Abbasgholizadeh ZS, Akmansoy ŞC. Evaluation of the Edentulous Patient. Complete Denture Prosthodontics: Planning and Decision-Making. 2018:49-85.
26. Balasubramaniam MK, Chidambaranathan AS, Shanmugam G, Tah R. Rehabilitation of glossectomy cases with tongue prosthesis: a literature review. Journal of clinical and diagnostic research: JCDR. 2016;10(2):ZE01.