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COMPARISON OF TOOTHBRUSH-RELATED CERVICAL DENTAL ABRASION BETWEEN LEFT- AND RIGHT-HANDED INDIVIDUAL

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ABSTRACT

Objective: *To compare toothbrush-related cervical dental abrasion between left- and right handed individual*

Materials and methods: *This comparative cross-sectional study was conducted at Rawal General and dental hospital from January 1, 2023 to October 1, 2023 on 383 individuals selected through non-probability consecutive sampling. Subjects with an age range from 18 to 60 years, of both genders, who are Pakistani nationals and seeking dental treatment, were included. Those individuals with abnormal habits such as smoking, heavy stains, and plaque deposits, non-compliance with brushing, existing medical conditions, and those unwilling to participate were excluded from the study. The participants were divided into two groups right and left handed through history. Tooth Wear Index (TWI). The TWI scores were utilized to diagnose the presence and type of cervical defects, and the assessment extended to comparisons both between and within different groups. Chi-square test and student t test was employed to compare tooth wear with brushing between the two groups.*

Results: *The mean age was 39.23 ± 12.01 years, with 45.17% females and 54.83% males. About 16.71% of participants used their left hand. Among those who brushed with their left hand, 64 (60.94%) exhibited no tooth wear, while 39.06% showed signs of tooth wear. For individuals brushing with their right hand, 319 (68.34%) had no tooth wear, and 31.66% displayed evidence of tooth wear. The mean tooth wear scores were 0.86 ± 1.22 for left-handed individuals and 0.68 ± 0.16 for right-handed individuals, with no statistically significant difference (p = 0.29). Tooth wear severity analysis revealed no significant difference (p = 0.43) between left and right-handed individuals across various categories.*

Conclusion: *Left-handedness was observed in 16%, and there was no significant difference in tooth-brushing-related abrasion in the cervical area between left and right-handed individuals.*

Keywords: *Left-handedness, right-handedness, cervical abrasion, non-carious tooth loss*

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INTRODUCTION

Dental caries is the most common cause of tooth loss.[1] It involves attached Streptococcus mutans to the tooth surface and attached food debris in the form of plaque.[2] The bacteria release acids, leading to the demineralization of the tooth structure and resulting in cavities.Dental caries adversely affect oral health of individual. The impact of caries and plaque on oral hygiene is assessed through indices like Decayed, Missing, and Filled Teeth(DMFT) and Simplified Oral Hygiene Index(OHI-S), providing insights into both cleanliness and caries prevalence.[3] Protective measures, especially brushing, not only deter plaque but also reduce caries, improving overall oral hygiene.[4]

Cervical tooth wear, or tooth abrasion, involves the loss of tooth substance at the cementoenamel junction without carious mechanisms.[5] This condition varies in presentation among individuals and may lead to dentinal hypersensitivity, causing pain. Additionally, it can pose challenges to maintaining oral hygiene during tooth-brushing due to alterations in tooth surface characteristics. Addressing cervical tooth wear is crucial for managing discomfort and preserving overall oral health through targeted preventive and therapeutic interventions.[6] Dentists may recommend strategies to alleviate dentinal hypersensitivity and provide guidance on maintaining effective oral hygiene in the presence of cervical abrasion.[7]

The effectiveness of brushing is closely tied to motor

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ability, and addressing plaque control in primary dentition is challenging due to issues like motivation and manual dexterity in some children. Emphasis has been on differences between right and left-handed individuals in dental procedures, highlighting the significance of motor ability in effective oral care. Recognizing these factors can lead to more tailored oral hygiene strategies for improved dental health.[3,8]

Ozgoz M et al examined the impact of handedness on tooth-brushing abrasion in 488 participants, dividing them into left handed and right-handed groups. No significant differences were found in tooth-brushing habits, plaque index, or gingival index between the two groups according to Ozgoz Eand few past studies.[1,2,8] Oral hygiene practices affect structure of tooth and leads to cervical abrasion.[9,16] Mokhtari et al investigated handedness as one of the individual characteristics that causes different mental and practical capabilities including different abilities to perform oral hygiene instructions. It seems that the right-handed and left-handed individuals have different ability in brushing and removing plaque at different areas of the mouth.They found that there was no significant relationship between any of the variables with being left- or right-handed.[10,17]

Understanding the impact of handedness on dental abrasion is crucial for personalized oral care. Variations in biomechanics during tooth brushing, potential biases in toothbrush design favoring right-handed individuals, and the need for tailored oral health education highlight the importance of investigating this relationship. Identifying handedness-related patterns can inform clinical practices, enhance risk assessment, and guide future developments in oral care for a more comprehensive and personalized approach. There is lack of local literature on this topic.

The objective of present study is to compare tooth brush related cervical abrasion between right-handed and left-handed individuals.

METHODOLOGY

This comparative cross-sectional study was conducted at the Out patient diagnosis with a sample size of 383 individuals selected through non-probability consecutive sampling technique from January 1, 2023 to October 1, 2023. The sample size was calculated using openepi at a 95% confidence level and a 5% margin of error, based on a 47% prevalence of abrasion-associated lesions in right-handed brushing patients from a previous study.[8]

Individuals with an age range from 18 to 60 years, of both genders, who are Pakistani nationals, seeking dental treatment and gave consent for the study were included in the study. Those who lack manual dexterity,having parafunction habits,bruxer patients and those with motor disabilities were excluded from the study. The participants were divided into two groups (left and right-handed) through history.

Examination was done under proper illumination by the principal investigator at chair side using essential tools such as an explorer, a periodontal probe, and a mouth mirror. Oral hygiene was evaluated as good,fair and poor as well as cervical defects were identified in each individual with the help of tooth wear index (TWI). The TWI scores were utilized to diagnose the presence and type of cervical defects, and the assessment extended to comparisons both between and within different groups. The TWI scores were classified into distinct categories:

- A score of 0 denoted no change in contour.
- A score of 1 represented minimal loss of contour.
- A score of 2 indicated a defect of less than 1 mm in depth.
- A score of 3 signified a defect ranging from 1 to 2 mm in depth.
- A score of 4 identified a defect exceeding 2 mm in depth, which could include pulp exposure or exposure of secondary dentine.

The scoring process involved measuring the depth of the defect at the cervical tooth area using a Williams-type periodontal probe. Subsequently, the mean values of these scores were recorded for each patient.

Data analysis was conducted using SPSS version 22. Descriptive statistics were computed in terms of mean and standard deviation for continuous variables, and frequency with percentages for categorical data. A Chi-square test was employed to compare tooth wear with brushing between the two groups (left and right-handed). Tooth wear score was compared between two groups using student t test. A significance level of $p \leq 0.05$ was considered statistically significant.

RESULTS

Table 1 provides a summary of the distribution of age, gender, and the handedness of brushing among the study participants (n= 383). The mean age of the participants is presented as 39.23 ± 12.01. Gender distribution indicates that 45.17% are female, while 54.83% are male. Regarding handedness during brushing, 16.71% of participants use their left hand, while the majority (83.29%) use their right hand.

In the overall study, 126 individuals (32.9%) exhibited some degree of abrasion related to tooth brushing. (Fig 1)

Table 2 presents a detailed comparison of tooth wear between left and right-handed individuals. For individuals who brushed with their left hand (n = 64), 60.94%

exhibited no tooth wear, while 39.06% showed signs of tooth wear. Among those who brushed with their right hand (n = 319), 68.34% had no tooth wear, and 31.66% had evidence of tooth wear. The mean tooth wear scores were 0.86 ± 1.22 for left-handed individuals and 0.68 ± 0.16 for right-handed individuals, with no statistically significant difference (p = 0.29). Tooth wear severity analysis showed no significant difference (p=0.43) between left and right-handed individuals across various categories (<1mm, >2mm, 1-2mm, minimal, and no loss).

TABLE 1: DISTRIBUTION OF AGE, GENDER AND HANDED OF BRUSHING

Characteristic	N = 383
Age	39.23 ± 12.01
Gender	
Female	173 (45.17)
Male	210 (54.83)
Side of brushing(handed)	
Left	64 (16.71)
Right	319 (83.29)

* Mean ± SD; n (%)

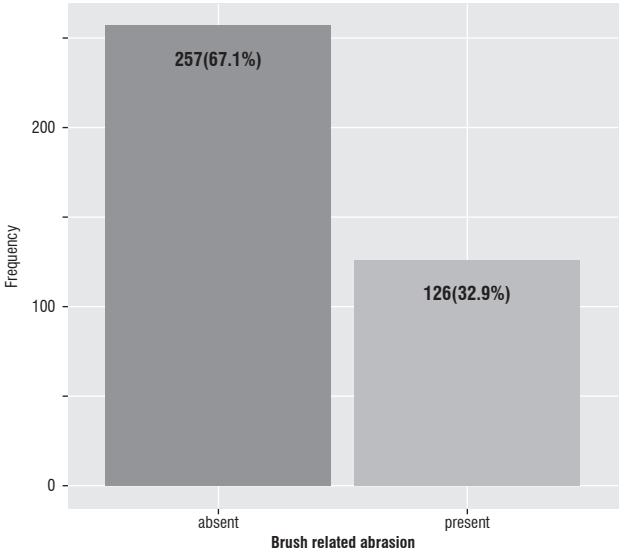

Fig 1: Frequency of abrasion in overall study

TABLE 2: COMPARISON OF TOOTH WEAR BETWEEN LEFT AND RIGHT HANDED

variable	Characteristic	Left handed , N = 64	Right handed, N = 319	p-value
Tooth wear	Absent	39 (60.94)	218 (68.34)	0.32*
	Present	25 (39.06)	101 (31.66)	
Tooth wear score	mean ±SD	0.86 ±1.22	0.68±.16	0.29**
Tooth wear severity	<1mm	10 (15.63)	27 (8.46)	0.43*
	>2mm	2 (3.13)	12 (3.76)	
	1-2mm	7 (10.94)	27 (8.46)	
	Minimal	6 (9.38)	35 (10.97)	
	No loss	39 (60.94)	218 (68.34)	

*chi-square test, **student t test

DISCUSSION

This study was conducted to examine tooth loss attributed to tooth-associated abrasion in both right-handed and left-handed individuals. The results revealed no statistically significant difference in the frequency and severity of tooth-associated abrasion between those who brush with their right hand and those who brush with their left hand.

Cervical tooth abrasion is a condition characterized by the pathological wearing down of teeth, and it can be attributed to a range of contributing factors. Among these factors are improper tooth-brushing techniques, the use of abrasive toothpaste, reliance on hard toothbrushes, occlusal stress (pressure during biting and chewing), and non-bacterial chemical dissolution.When individuals engage in insufficient tooth-brushing practices, the cumulative effect may manifest as both the wear of tooth surfaces and the recession of the gingival tissue in the cervical region. Essentially, the combination of these factors can lead to the gradual deterioration of teeth and the surrounding gum area, highlighting the importance of adopting proper oral hygiene practices to prevent such adverse effects.[11]

Consistent tooth-brushing plays a vital role in safeguarding against dental and periodontal diseases.[12] Nevertheless, the use of improper brushing techniques

poses a potential risk to the gingiva, dentine, and enamel. Effective tooth-brushing hinges on both manual dexterity and motivation, given its intricate nature that demands skillful manipulation and proficiency. Those with inadequate brushing habits may encounter challenges in attaining optimal oral-hygiene outcomes due to the intricate nature of the task.Tezel A et al assessed oral hygiene proficiency in left-handed individuals known for their skills in drawing, geometry, and graphics compared to right-handed individuals on 28 participants (12 female, 16 male). Both groups received oral hygiene education, and initial Silness-Löe (GI) and Quigley-Hein (PI) scores were recorded. Statistical revealed no initial difference ($p > .05$).[13]

Our study revealed that a mere 16% of individuals were left-handed.8 This aligns with a previous study conducted on the Turkish population, which reported a comparable frequency of left-handedness (8%). Other international studies have indicated a range of left-handedness cervical abrasion range 9% to 15% .[13.14,15]

Present study showed that no statistically significant difference in the frequency and severity of tooth-associated abrasion between those who brush with their right hand and those who brush with their left hand. A previous study conducted by Ozgoz et al, on Turkish population is also found to be in agreement with present study 8 Other studies have also reported that there is no significant difference in non-carious tooth loss between left-handed and right-handed individuals.[8,9,15,16]

Limitations of this study include potential sample selection bias from non-probability consecutive sampling, demographic representation confined to a specific healthcare facility, and exclusion criteria limiting diversity. The subjective nature of TWI scoring introduces subjectivity, and the controlled dental examination setting may not fully reflect real-world conditions. The study's single-center focus may impact external validity.

CONCLUSION

Based on the study findings, it can be concluded that ,there was no significant difference in tooth-brushing-related abrasion in the cervical area between left and right-handed individuals.

REFERENCES

1 Mattos-Graner RO, Klein MI, Smith DJ. Lessons learned from clinical studies: roles of mutans streptococci in the pathogenesis of dental caries. Curr Oral Health Reports. 2014;1:70-8.

2 de Sousa Né YG, Lima WF, Mendes PFS, Baia-da-Silva DC, Bittencourt LO, Nascimento PC, et al. Dental caries and salivary oxidative stress: global scientific research landscape. Antioxidant. 2023;12:330.

3 Çakur B, Yildiz M, Dane S, Zorba YO. The effect of right or left handedness on caries experience and oral hygiene. J Neurosci Rural Pract. 2011;2:040-2.

4 Jeong J-S, Kim K-S, Lee J-W, Kim K-D, Park W. Efficacy of tooth brushing via a three-dimensional motion tracking system for dental plaque control in school children: a randomized controlled clinical trial. BMC Oral Health. 2022;22:1-8.

5 Warreth A, Abuhijleh E, Almaghribi MA, Mahwal G, Ashawish A. Tooth surface loss: A review of literature. Saudi Dent J. 2020;32:53-60.

6 Bhundia S, Bartlett D, O'Toole S. Non-carious cervical lesions-can terminology influence our clinical assessment? Br Dent J. 2019;227:985-8.

7 Wetselaar P, Wetselaar□Glas MJ, Katzer LD, Ahlers MO. Diagnosing tooth wear, a new taxonomy based on the revised version of the Tooth Wear Evaluation System (TWES 2.0). J Oral Rehabilit. 2020;47:703-12.

8 Özgöz M, Arabaci T, Sümbüllü MA, Demir T. Relationship between handedness and toothbrush-related cervical dental abrasion in left-and right-handed individuals. J Dent Sci. 2010;5:177-82

9 Goodacre CJ, Eugene Roberts W, Munoz CA. Noncarious cervical lesions: Morphology and progression, prevalence, etiology, pathophysiology, and clinical guidelines for restoration. J Prosthod. 2023;32:e1-e18.

10 TA AS, Varghese SS, Shenoy RP. The Cervical Abrasion Index of Treatment Needs (CAITN) Procedure for Population Groups and Individuals. Cureus. 2023;15(3).

11 Gheorghiu I-M, Mitran L, Mitran M, Sc□rl□tescu S, Perlea P. Modern guidelines in the clinic and diagnosis of cervical dental lesions of non-carious etiology. Oto-Rhino-Laryngol. 2023;11:23-7.

12 Zimmermann H, Zimmermann N, Hagenfeld D, Veile A, Kim TS, Becher H. Is frequency of tooth brushing a risk factor for periodontitis? A systematic review and meta□analysis. Commun Dentist Oral Epidemiol. 2015;43:116-27.

13 Tezel A, Orbak R, Çanakçi V. The effect of right or left-handedness on oral hygiene. Int J Neurosci. 2001;109:1-9.

14 Dane S, Gümüstekin K. Handedness in deaf and normal children. Int J Neurosci. 2002;112:995-8.

15 Addy M. Tooth brushing, tooth wear and dentine hypersensitivity are they associated? Int Dent J 2005;55(4 Suppl. 1):261e7.

16 Ali AST, Varghese SS, Shenoy RP. Association Between Cervical Abrasion, Oral Hygiene Practices and Buccolingual Dimension of Tooth Surfaces: A Cross-Sectional Study J Pharm Bioallied Sci. 2022 Jul;14(Suppl 1):S403-S409.

17 Mokhtari S, Sanati I, Babaki FA, Alamdari S, Tavana N. Investigating the effect of handedness on the dental caries pattern, gingival index, and plaque index in 6-10 years old children. Niger J Clin Pract. 2020;23:545-549.

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