

Prevalence Of Tooth Wear with Canine Guided and Group Function Occlusion in Patients At Rehman College Of Dentistry, Peshawar

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Background: Tooth wear is the progressive loss of dental hard tissue caused by attrition, abrasion, and erosion. Occlusal scheme influences force distribution; canine guidance is considered protective, while group function may increase load. Limited local data compare tooth wear in these occlusal schemes among young adults.

Objective: To determine the prevalence and extent of tooth wear in canine guided and group function occlusion in patients at Rehman College of Dentistry, Peshawar.

Methodology: This cross-sectional study was conducted from 27-02-2025 to 27-08-2025 at the Department of Prosthodontics, Rehman College of Dentistry, Peshawar. A total of 383 patients aged 18–30 years attending the OPD for restorative treatment were included. Occlusal scheme was determined clinically as canine guidance or group function. Tooth wear was assessed using the Bardsley classification, and associated factors including soft drink intake, abrasive brushing, bruxism, parafunctional habits, and gastroesophageal reflux disease were recorded. Data were analyzed using SPSS version 24, with chi-square test and $P \leq 0.05$ considered significant.

Results: Mean age was 23.86 ± 3.74 years; 54.8% were males. Canine guidance was observed in 61.9% and group function in 38.1% participants. Prevalence of severe tooth wear was significantly higher in group function compared to canine guidance ($P < 0.001$). All evaluated risk factors showed significant association with tooth wear.

Conclusion: Tooth wear was more prevalent and severe in group function than canine guidance occlusion, with dietary, behavioral, and medical factors also showing significant association.

Keywords: *Tooth wear, occlusal scheme, canine guidance, group function, young adults.*

Introduction

The growing trend of retaining natural teeth into older age has contributed to higher prevalence of tooth wear among elderly individuals. The term “tooth wear” describes gradual loss of hard dental tissues caused by friction between opposing tooth surfaces or between tooth surface and food during both functional and non-functional activities occurring in absence of dental caries. Erosion as well as abrasion are primary contributing factors while attrition refers to natural wearing down of tooth structure resulting from direct tooth to tooth contact without external impacts¹⁻⁴.

Globally, tooth wear is now recognized as significant oral health concern particularly in older populations where its occurrence is considerably higher. While physiological wear may not produce noticeable symptoms; yet pathological wear can cause substantial enamel loss along with dentin loss and may negatively affect oral function and overall quality of life with clinical signs depending on underlying cause^{5,6}. In canine-guided occlusion, maxillary and mandibular canines interact in way that separates posterior teeth during mandibular movements whereas in group function occlusion, multiple teeth maintain contact on working side during lateral excursions^{7,8}.

Although there is no definitive evidence supporting superiority of one occlusal scheme over other, canine guidance is generally preferred due to its simpler design and lower

forces applied to teeth compared with group function^{9,10}. Recent advances in digital occlusal analysis have improved assessment of functional occlusal patterns. Traditional articulating paper though widely used for its simplicity and low cost has limitations in precisely depicting dynamic occlusal changes. In contrast digital technologies including T Scan provide detailed along with quantitative measurements of occlusal forces and timing that enables more accurate evaluation of disclusion patterns as well as anterior guidance^{11,12}.

The rationale of this study is to evaluate the prevalence of tooth wear in relation to different occlusal schemes specifically canine guided occlusion and group function among patients at Rehman College of Dentistry as occlusal patterns play critical role in distribution of functional forces across dentition. By determining whether one occlusal pattern predisposes patients to greater wear than other within this population, study aims to provide evidence based insights that can guide diagnostic decisions, preventive strategies and treatment planning in restorative and prosthodontic practice.

Material and Methods

A cross-sectional descriptive study was conducted in the Department of Prosthodontic, Rehman College of Dentistry, Peshawar. Ethical approval for this study was obtained from the Institutional Ethical Review Committee of Rehman College of Dentistry, Peshawar, Pakistan (Approval No: RCD-01-24-162). The sample size was calculated to be 383 using the RaoSoft sample size calculator with 95% confidence interval and 5% margin of error and a previously reported prevalence of tooth wear in group function occlusion 53%.¹³ A consecutive non-probability sampling technique was employed for the enrollment of the patients.

Patients aged between 18 to 30 years, who visited the OPD for dental checks for restorative treatment. These patients had canines, premolars, and first molars in all four quadrants. These teeth were healthy and had restorations placed using a confirmative approach. Patients were excluded if they had any missing canines, premolars, or first molars, or if their teeth were affected by caries, trau-

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ma, or other non-carious lesions. Patients with conditions that could make it difficult for them to make lateral excursive movements were not included. Patients with genetic or systemic disorders known to affect enamel and dentin development were also excluded.

Written consent was obtained from every patient before their enrolment in the study. Demographic and clinical information was recorded for each patient. The occlusal scheme for each participant was determined clinically. Participants were instructed to perform lateral excursive movements. Canine guided occlusion was defined by the disocclusion of all posterior teeth on the working side, with contact confined solely to the canine and an absence of contacts on the non-working side. Group function occlusion was characterized by simultaneous contact of multiple teeth, which could include the canine along with one or more posterior teeth on the working side during lateral excursion, again with no contact on the non-working side. For classification of the occlusal scheme, only contacts involving the canine, premolars, and first molar on the working side were considered. Contacts involving the second and third molars were not considered for classification.

The extent of tooth wear was evaluated on all erupted permanent teeth present in the oral cavity according to the Bardsley classification system. This system categorizes wear into four distinct grades. Grade 1 represents no wear extending into the dentin. Grade 2 describes wear where the dentin is just visible. Grade 3 is assigned when the exposed dentin covers more than one-third of the tooth surface. Grade 4 indicates exposure of the dental pulp.

In addition to the primary variables of occlusal scheme and tooth wear grade, several associated factors were analyzed for their potential contribution to tooth wear. These factors included the frequency of acidic soft drink consumption in a week and abrasive brushing technique. The presence of an abrasive brushing habit was determined by direct questioning. Participants who reported brushing their teeth with excessive force or using a hard horizontal scrubbing technique were classified as having an abrasive brushing habit. The presence of bruxism was assessed by direct questioning during history taking. Parafunctional habits, such as nail-biting or pen-chewing were also recorded. Gastroesophageal reflux disease was also considered.

Statistical Package for the Social Sciences (SPSS) 24 was used for analysis. Age was calculated using mean and standard deviation. Gender, occlusion and grading of tooth were presented using frequency and percentages. Tooth wear was compared between the occlusion using chi square test. Tooth wear was stratified with the factors leading to tooth wear using chi square test. Although tooth wear was assessed using all four Bardsley grades, no participants fulfilled the criteria for Grade 3 or Grade 4 tooth wear; therefore, statistical analyses were limited to Grades 1 and 2. For chi square tests performed, P value ≤ 0.05 was considered significant.

Results

Based on the study findings, the analysis included 383 participants with a mean age of 23.86 ± 3.74 years. The gender distribution showed a higher proportion of males 210 (54.8%) (Figure 1).

Regarding occlusal schemes, canine guidance was more common, observed in 237 patients (61.9%), while group function occlusion was present in 146 patients (38.1%).

Tooth wear was assessed using the Bardsley classification. Among those with canine guidance, one hundred four cases (43.9%) exhibited no tooth wear, eighty six (36.3%) had Grade 1 wear (no dentin exposure), and 47 (19.8%) had Grade 2 wear (dentin exposed). In the group function occlu-

sion category, forty four cases (30.1%) had no wear, forty six (31.5%) had Grade 1 wear, and 56 (38.4%) were presented with Grade 2 wear ($P < 0.001$) (Table I).

Several factors were associated with tooth wear severity, in the overall population. Soft drink consumption showed a clear trend, those who consumed soft drinks once a week had a higher frequency of no wearing of the tooth ($P < 0.001$). Among those reporting abrasive brushing, only 8 cases (5.4%) showed no wear, while 116 (87.9%) had Grade 1 wear and 92 (89.3%) had Grade 2 wear ($P < 0.001$). Bruxism demonstrated a strong association with tooth wear. Bruxism was significantly associated with tooth wear ($P < 0.001$). Among participants with bruxism ($n = 193$), 6 (3.1%) had no tooth wear, whereas 104 (53.9%) had Grade 1 wear and 83 (43.0%) had Grade 2 wear. Parafunctional habits, including nail biting and pen chewing, were totally present in participants with tooth wear ($P < 0.001$). Gastroesophageal reflux disease was only reported among participants with tooth wear. No affected individuals were free from tooth wear, while 93 (70.5%) of those with Grade 1 wear and 72 (69.9%) with Grade 2 wear reported this condition ($P < 0.001$) (Table II)

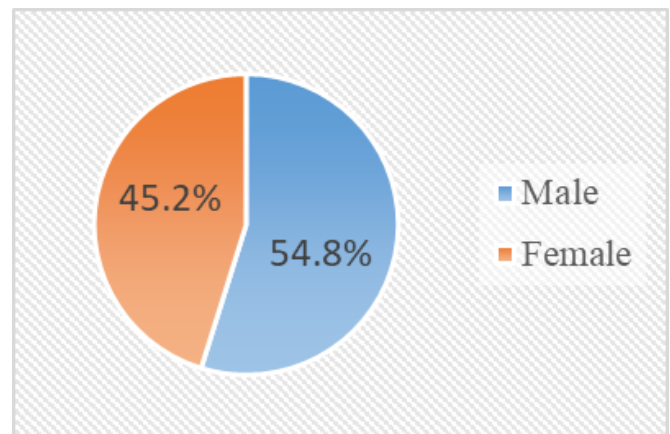


Figure 1: Gender distribution

Table I: Comparison of tooth wear between canine guid-

Tooth wear (Bardsley classifica- tion)	Occlusion				P value
	Canine guid- ance		Group func- tion		
	n	%	n	%	
No tooth wearing	104	43.9 %	44	30.1%	P < 0.001
Grade 1 ((No wear into dentin)	86	36.3 %	46	31.5%	
Grade 2 (Dentin ex- posed)	47	19.8 %	56	38.4%	

Discussion

This study provides a detailed analysis of tooth wear in canine guided and group function occlusion and the associated factors of tooth wear among a sample of 383 patients. The demographic profile revealed a mean age 23.86 years, which is notably younger than the cohorts examined in several other studies. For instance, the research by Shahab et al. included patients aged 18 to 48 years, while Akhtar et al. focused on an age range of 20 to 60 years.^{14,15} The relatively young age of the present sample is significant, as it sug-

Table 2: Comparison of tooth wear with factors leading to tooth wear

Factors leading to tooth wear		Tooth wear (Bardsley classification)						P value
		No tooth wearing		Grade 1 ((No wear into dentin)		Grade 2 (Dentin exposed)		
		n	%	n	%	n	%	
Soft drink consumption	Once a week	119	80.4%	0	0.0%	0	0.0%	P < 0.001
	Twice a week	26	17.6%	125	94.7%	11	10.7%	
	More than two times a week	3	2.0%	7	5.3%	92	89.3%	
Abrasive brushing	Yes	8	5.4%	116	87.9%	92	89.3%	P < 0.001
	No	140	94.6%	16	12.1%	11	10.7%	
Bruxism	Yes	6	4.1%	104	78.8%	83	80.6%	P < 0.001
	No	142	95.9%	28	21.2%	20	19.4%	
Parafunctional habits (Nail biting/ Pen chewing)	Yes	0	0.0%	96	72.7%	73	70.9%	P < 0.001
	No	148	100.0%	36	27.3%	30	29.1%	
Gastroesophageal reflux disease	Yes	0	0.0%	93	70.5%	72	69.9%	P < 0.001
	No	148	100.0%	39	29.5%	31	30.1%	
Chi Square was used								

gests that the observed tooth wear is occurring early in life. The gender distribution showed a male predominance of 54.8%, which aligns with the findings of Shahab et al., who also reported a higher proportion of male participants at 71.2%.¹⁴ This common trend across studies may indicate either a higher susceptibility or greater exposure to risk factors among males.

Regarding occlusal schemes, canine guidance was more prevalent, found in 61.9% of patients. This finding is consistent with the study by Altaf et al., which reported canine guidance as the most common pattern in their sample of undergraduate students.¹⁶ However, the present investigation reveals a crucial contrast: the distribution and severity of tooth wear were significantly different between the two occlusal schemes. A higher prevalence of severe, dentin-exposing wear (Grade 2) was observed in the group function occlusion category compared to the canine guidance group. Similar observation was reported by Shah et al., as they noted that tooth wear had a higher proportion in group function occlusion.¹³ This supports the biomechanical principle that canine guidance offers a protective effect by discluding the posterior teeth during lateral excursions, thereby distributing forces away from the premolars and molars.¹⁷

The findings from the implant study by Sayed et al. reported that group function occlusion led to significantly greater distal bone loss around certain implants, indicating concentrated stresses that could similarly manifest as tooth wear in a natural dentition.¹⁸ Conversely, Leonan-Silva et al. concluded that restoring canine guidance was not effective in controlling wear from bruxism, highlighting the complex, multifactorial nature of the condition where central nervous system factors can override occlusal anatomy.¹⁹ The present results, however, strongly suggest that in a general population, the occlusal scheme plays a statistically significant role in wear severity.

The analysis of associated factors revealed profound correlations of soft drink intake frequency, bruxism, GERD, abrasive brushing and parafunctional habits. Studies have shown that tooth wear in non-carious tooth can be attribut-

ed to several factors such as diet, age, medication.²⁰ The findings from Akhtar et al. further corroborate the role of acids, noting that patients with gastroesophageal reflux disease exhibit increased tooth wear due to the presence of stomach acid.¹⁵ Abrasive brushing was another significant factor in this study. This aligns with the results from Shahab et al., who identified that a horizontal brushing technique with medium force was correlated with more tooth surface loss.¹⁴ Bruxism demonstrated one of the strongest associations with tooth wear. A large majority of patients who reported bruxism exhibited either Grade 1 or Grade 2 wear. Bruxism generates forces that exceed those of normal mastication, leading to pronounced attrition of the occlusal and incisal surfaces.¹⁴ Parafunctional habits such as nail biting and pen chewing were present in participants with tooth wear. These habits create atypical, localized forces that lead to microfractures and accelerated wear on the involved teeth.

The novelty of this study lies in its specific focus on young adult population and the integrated analysis of occlusal scheme alongside a comprehensive set of behavioural and medical risk factors. While many studies have examined these factors in isolation or in older cohorts, this research demonstrates that significant, severe tooth wear is already present in a population with a mean age under 24 years. This study was the first one in our local setting which analysed factors involved with tooth wear.

Despite the clear findings, some limitations of this study must be acknowledged. The study relied on self-reported data for factors like soft drink consumption, bruxism, GERD reflux and brushing habits, may lead to bias. The cross-sectional design of the study captures associations but cannot definitively establish causality. The absence of severe tooth wear grades (Grades 3 and 4) in our sample, likely due to the young age of participants, limits the ability to assess the full spectrum of wear severity associated with different risk factors. Future studies with older cohorts or those presenting with advanced wear are recommended to explore the progression to more severe stages.

Conclusion

This study found that prevalence and severity of tooth wear was significantly higher in the group function occlusion compared to canine guided occlusion. The study also identified several factors leading to tooth wear such as, frequent intake of soft drinks, bruxism, nail/pen biting and GERD.

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Author Contributions

1. **Mohid Hayat Awan:** Conception, funding support, data collection , Data analysis , literature review, and manuscript writing.
2. **Jodat Askari:** Study design, supervision, materials/patient referral support, and project responsibility.
3. **Hira Raza:** Funding support, materials/patient referral support, and analysis
4. **Afreen Shameem:** Literature review.
5. **Mubashir Hayat Awan:** Manuscript writing and critical review.
6. **Aeras Aslam:** Data collection and/or processing.