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Occlusal wear and occlusal condition in a convenience sample of young adults

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ABSTRACT

Objective: To study progression of tooth wear quantitatively in a convenient sample of young adults and to assess possible correlations with occlusal conditions.

Methods: Twenty-eight dental students participated in a three-year follow up study on tooth wear. Visible wear facets on full arch gypsum casts were assessed using a flatbed scanner and measuring software. Regression analyses were used to assess possible associations between the registered occlusal conditions 'occlusal guidance scheme', 'vertical overbite', 'horizontal overbite', 'depth of sagittal curve', 'canine Angle class relation', 'history of orthodontic treatment', and 'self-reported grinding/clenching' (independent variables) and increase of wear facets (dependent variable).

Results: Mean increase in facet surface areas ranged from 1.2 mm^2 (premolars, incisors) to 3.4 mm^2 (molars); the relative increase ranged from 15% to 23%. Backward regression analysis showed no significant relation for 'group function', 'vertical overbite', 'depth of sagittal curve', 'history of orthodontic treatment' nor 'self-reported clenching. The final multiple linear regression model showed significant associations amongst 'anterior protected articulation' and 'horizontal overbite' and increase of facet surface areas. For all teeth combined, only 'anterior protected articulation' had a significant effect. 'Self reported grinding' did not have a significant effect ($p > 0.07$).

Conclusions: In this study 'anterior protected articulation' and 'horizontal overbite', were significantly associated with the progression of tooth wear. Self reported grinding was not significantly associated with progression of tooth wear.

Clinical significance: Occlusal conditions such as anterior protected articulation and horizontal overbite seem to have an effect on the progression of occlusal tooth wear in this convenient sample of young adults.

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1. Introduction

During the last decades an increase in the annual number of published studies on tooth wear and especially on erosive tooth wear can be observed.[1] From these studies it appears that more occlusal tooth wear can be found with an increasing age.[2] The majority of the data that demonstrate this wear-age relation stem from cross sectional studies. Although the cross sectional study design is appropriate to study trends in large groups of people, recall of specific individuals after an interim period is not anticipated, which hinders accurate longitudinal observations. Particularly, assessment of the dynamics in occlusal tooth wear needs individual monitoring over time instead of studying different cohorts at different observation moments as in cross sectional studies. However, prospectively collected data from individual patients are not widely available.[3–5]

The relationship between occlusal wear and occlusal conditions is subject of discussion and there are some indications that atypical tooth wear can be related to specific occlusal conditions.[6] Although outcomes from cross sectional studies indicate that there is no significant association between the type of dynamic occlusion and tooth wear status,[7,8] there are also indications that the spatial relationship of anterior teeth (Angle class, inclination and overbite) is of influence.[9] Nevertheless, case reports on the rehabilitation of worn dentitions often state that, from a preventive perspective, anterior guidance needs to be (re) established.[10] To elucidate the relationship between occlusal factors and tooth wear, individual monitoring is needed.

Tooth wear is mainly assessed by means of indices with ordinal scales. The diversity in used tooth wear indices makes it difficult to compare results. Moreover, several investigators agree that most indices cannot detect localized wear nor minor changes in tooth wear status. An alternative to assessing wear facets using ordinal indices is direct measurement of changes in the surface area of the wear facets that generate data for subtraction techniques. These quantitative methods are exact and reliable, but most often extensive and time consuming. In a previous report, we studied the reproducibility of a simple method to measure tooth wear using a flatbed scanner and measuring software.[11] Such method does not need sophisticated instruments, is reliable and is suitable to monitor early stages of occlusal tooth wear.

The purpose of this prospective follow-up study is to monitor occlusal tooth wear in a convenient sample of young adults and to assess associations of different occlusal conditions with changes in occlusal tooth wear facets.

2. Materials and methods

2.1. Participants

Thirty dental students (age 24.7 ± 2.6 years at the end of this study; 8 males and 22 females) from a cohort of 64 first years' students of the Nijmegen Dental School volunteered to participate in this follow-up study.[12] They agreed upon the purpose of the study and agreed to attend both baseline (T_0) and 3-years recall (T_3). One participant was excluded because of missing recall data. Furthermore, it was expected that all participants, being young adults, had complete dental arches, but one participant had a dental status that was not comparable to the others (missing teeth and cross bite) and was excluded for this reason. No subjects were excluded due to severe tooth wear status. It appeared that the tooth wear that was visible did not exceed the tooth wear index by Smith and Knight[13] (TWI) score 2; only wear limited to enamel and early exposure of dentine was present. Finally, 28 (6 male, 22 female) students were included in this study.

2.2. Registrations

Clinical registrations were made at T_0 and relevant dental history was noted. Occlusal guidance scheme was determined by clinical registration of the contacts between maxillary and mandibular teeth during lateral excursions (Table 1) and recorded as[14]: (1) incisor protected articulation (incisors disengage the posterior teeth in the excursive movements of the mandible, (2) canine protected articulation (canines disengage the posterior teeth in the excursive movements of the mandible), or (3) group function (multiple contact relations between the maxillary and mandibular posterior teeth in lateral movements). For this purpose a 12 μm polyethylene foil (Shim Stock, Hahnel) was hold and pulled between antagonistic teeth with the participants sitting in an upright position.[12]

Full arch impressions were taken using stock trays (Clan dental products) and a silicone impression material (Aquasil, Dentsply). The occlusal relationship between maxilla and mandible was recorded with a silicone registration material (Futar, Kettenbach). Impressions were poured in dental stone (Fuji Rock, GC). All casts were trimmed so that they could be placed on a scanning table with the occlusal surface in contact with the horizontal surface.

Table 1 – Descriptives of occlusal conditions of the participants at baseline (n = 28).

	Left side	Right side	Both sides
Dynamic occlusion			
Incisal guidance	2	2	1
Canine guidance	22	19	15
Group function	4	7	1
Canine Angle classification			
Class 1	26	19	19
Class 2	2	9	2
Class 3	0	0	0
Sagittal curve depth (mm)			
Mean (SD)	2.0 (0.7)		
Range	1.0–4.3		
Mean anterior overbite (mm)			
Horizontal			
Mean (SD)	3.2 (1.1)		
Range	1.5–6.4		
Median	3.0		
Vertical			
Mean (SD)	3.3 (1.2)		
Range	0.3–6.6		
Median	3.0		