Short Communication

Reliability of an Occlusal and Nonocclusal Tooth Wear Grading System: Clinical Use Versus Dental Cast Assessment

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The reliability of a newly developed tooth wear grading system was assessed both clinically and on dental casts by two observers using 20 participants. The reliability of clinical occlusal/incisal tooth wear grading was fair-to-good to excellent, while that of most of the clinical nonocclusal/nonincisal grades was at least fair-to-good. Dental cast assessment frequently yielded poor reliabilities, especially for nonocclusal/nonincisal surfaces. Hence, occlusal/incisal wear could be graded more reliably than nonocclusal/nonincisal wear, while the clinical assessment of tooth wear was more reliable than the grading of dental casts. *Int J Prosthodont 2009;22:388–390.*

A worn dentition has become an increasingly common finding in modern dentistry.[1,2] The decision of whether to start restorative procedures is a major clinical challenge. No clear guidelines are available as to the right time to begin such treatment, which may result in starting the restorative process too late. As part of the treatment planning process, monitoring the progression of tooth wear may be helpful in determining the right moment to start rehabilitation. For this, a well-defined and easy-to-use yet sensitive tooth wear grading system is necessary. Addy et al[1] provided an in depth review of previously reported systems. None of the currently available grading systems for clinical use[2–4] and/or for dental cast assessment[5,6] meet all of the aforementioned criteria. The aim of the present investigation, therefore, was to assess the reliability of a newly developed ordinal grading system for (non)occlusal/(non)incisal tooth wear as applied clinically as well as on dental casts.

Materials and Methods

Ten tooth wear patients (mean age: 37.7 ± 2.9 years) were recruited from the restorative clinic at the Academic Centre for Dentistry Amsterdam. In addition, 10 volunteers (mean age: 33.6 ± 9.7 years) from the departmental staff were included. Both groups were used to ascertain the inclusion of a broad range of tooth wear scores. All participants gave informed consent to the procedures, which were approved by the board of the Netherlands Institute for Dental Sciences.

During the first clinical session, two trained observers independently graded tooth wear, and alginate impressions were made. Observer one repeated the clinical tooth wear grading 2 to 4 weeks later. During a third (nonclinical) session approximately 2 weeks later, both observers independently graded the tooth wear on the dental casts. Observers were blinded to the outcomes of their own previous observations and to those of the other observer.

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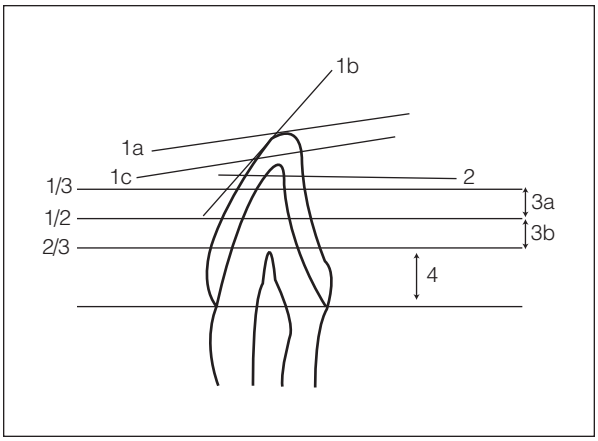

Fig 1 Schematic representation of the occlusal/incisal tooth wear grading system.

Table 1 Descriptions of the Ordinal Grading Scales for Occlusal/Incisal Tooth Wear and Nonocclusal/Nonincisal Tooth Wear

Grading scale/ grade	Description
Occlusal/Incisal	
0	No wear
1a	Minimal wear within the enamel of cusps or incisal tips
1b	Facets within the enamel parallel to the normal planes of contour
1c	Noticeable flattening of cusps or incisal edges within the enamel
2	Wear with dentin exposure and loss of clinical crown height of < 1/3*
3a	Wear with dentin exposure and loss of clinical crown height of 1/3–1/2*
3b	Wear with dentin exposure and loss of clinical crown height of 1/2–2/3*
4	Wear with dentin exposure and loss of clinical crown height of > 2/3*
Nonocclusal/Nonincisal	
0	No wear
1	Wear confined to the enamel
2	Wear into the dentin

*Determined with the imaginarily visualized original contour of the crown as a reference.[4]

Table 2 Distribution of Overall Occlusal/Incisal and Nonocclusal/Nonincisal Tooth Wear Scores per Approach, Session, and Observer

		Occlusal/Incisal (%)								Nonocclusal/Nonincisal (%)					
										Vestibular			Lingual		
Approach/ session	Observer	0	1a	1b	1c	2	3a	3b	4	0	1	2	0	1	2
Clinical															
1	1	2.5	5.3	11.1	32.4	26.0	15.5	6.4	0.7	81.8	1.6	16.6	84.8	1.1	14.1
2	1	3.0	1.8	11.8	33.3	26.7	17.5	5.9	0.0	79.9	1.2	18.9	84.1	0.0	15.9
1	2	3.2	8.2	5.2	35.5	33.2	11.6	2.7	0.5	77.7	10.7	11.6	84.7	2.7	12.7
Casts															
3	1	2.0	1.2	9.8	36.0	29.9	15.3	5.5	0.2	92.9	0.0	7.1	88.6	0.0	11.4
3	2	5.5	3.7	1.8	37.8	44.6	4.3	1.6	0.7	77.1	11.3	11.6	89.1	1.1	9.8

Both clinically and on dental casts, (non)occlusal/(non)incisal tooth wear was graded using scales adapted from previously published studies (Fig 1 and Table 1).[3–5] Reliability was assessed by calculating intraclass correlation coefficients (ICCs).[7]

Results

Five hundred sixty-one teeth were available for tooth wear grading. All possible wear scores were represented in the study sample (Table 2).

For the clinical grading of occlusal/incisal wear, most ICCs were excellent; only the interrater reliability for the assessment of incisal tooth wear was fair-to-good (Table 3). For the clinical grading of nonocclusal/nonincisal tooth wear, poor interrater reliability was found for the vestibular surfaces of incisors, while the other nonocclusal/nonincisal surfaces could at least be qualified as fair-to-good.

For the grading of occlusal/incisal tooth wear on the dental casts, most ICCs were fair-to-good (Table 3). For the nonocclusal/nonincisal wear grading on the dental casts, reliability scores were considerably lower, especially for the assessment of the vestibular surfaces of incisors and lingual surfaces of premolars.

Table 3 Interrater and Intrarater Reliability Scores (ICCs*) of Occlusal/Incisal Tooth Wear and Nonocclusal/Nonincisal Tooth Wear: Overall Values and Values per Element Type

						Nonocclusal/Nonincisal									
	Occlusal/Incisal					Vestibular					Lingual				
Approach/ comparison	O	I	C	P	M	O	I	C	P	M	O	I	C	P	M
Clinical															
Interrater	0.825	0.739	0.865	0.813	0.879	0.640	0.259	0.536	0.801	0.563	0.719	0.936	0.846	0.466	0.480
Intrarater	0.908	0.889	0.890	0.893	0.926	0.749	0.412	0.598	0.899	0.716	0.788	0.957	0.846	0.643	0.655
Casts															
Interrater	0.718	0.628	0.738	0.766	0.748	0.423	0.291	0.351	0.428	0.398	0.735	0.822	0.896	0.190	†

*ICC < 0.4 = poor reliability; 0.4 ≤ ICC ≤ 0.75 = fair-to-good reliability; and ICC > 0.75 = excellent reliability.[7]
†Prevalence too low to calculate a reliable ICC.
O = overall; I = incisors; C = canines; P = premolars; M = molars.

Discussion

This article describes a composite version of previous tooth wear grading systems[3–5] and demonstrates the reliability of this system for chairside (clinical) usage.

The new occlusal/incisal scale enables the assessment of enamel and dentin wear in small steps while maintaining the easy-to-use character that is a prerequisite for chairside applications. Further, the new scale allows grading of extensive wear conditions with more detail than previously published scales,[2,4,5] and is thereby void of subjective indications for the extent of wear. In the new nonocclusal/nonincisal scale, the two levels of exposed vestibular dentin (eg, half dentin and extensive dentin)[3] were fused into a single grade because the distinction between these two levels is difficult to make due to the use of the subjective term "extensive." This resulted in an easier-to-use nonocclusal/nonincisal tooth wear scale.

The data from this study indicate that clinically, most of the tooth wear could be graded with a reliability that varied between fair-to-good and excellent. However, for grading on dental casts where the presence or absence of dentin exposure is more difficult to establish,[6] only occlusal/incisal tooth wear could be scored with a reliability between fair-to-good and excellent, while nonocclusal/nonincisal grading often yielded poor reliability scores, especially the interrater reliability of vestibular incisal wear both clinically and on dental casts. Whether this finding is due to insufficient training for these surfaces or to the grading system itself remains to be established in future studies.

Conclusion

Occlusal/incisal wear can be graded more reliably than nonocclusal/nonincisal wear, while the clinical assessment of tooth wear is more reliable than the grading of dental casts. Since all tooth wear scores were represented in the current study sample, the conclusions are applicable to dentitions with every possible wear status. However, the actual practical merit of the proposed tooth wear grading system remains to be established in comparison with, for example, the well-established index developed by Smith and Knight.[2]

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