The signs and symptoms of tooth wear in a referred group of patients

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IN BRIEF

- Reports that males tend to present to dentists with a more advanced stage of tooth wear than females.
- Suggests appearance is the main driver for treatment rather than functional problems.
- Highlights that, somewhat surprisingly, severely worn teeth have a low prevalence of apical pathology.
- Stresses that examining for and monitoring tooth wear are increasingly important in patient management.

RESEARCH

Aim To determine the prevalence of signs and symptoms in a group of tooth wear patients referred to a hospital-based consultant clinic. **Method** The clinical records of 290 patients referred to the Liverpool University Dental Hospital for tooth wear were reviewed retrospectively. A systematic sampling technique was used to select every alternate patient held on the consultant database. **Results** There were significantly more males than females in a ratio of 2.3:1. Significantly more males (56%) presented with severe tooth wear compared with females (31%) ($p < 0.001$). Aesthetic concerns were the most prevalent presenting complaint (59%) and sensitivity was the second most common presenting complaint (40%). Functional problems and pain were less prevalent at 17% and 14% respectively. Subjects who had lost posterior support had more severe wear and more worn anterior teeth, which was statistically significant ($p = 0.001$). The proportion of subjects with undiagnosed apical pathology on worn teeth was 13%. **Conclusions** Tooth wear predominated in males in this study. Patient dissatisfaction with appearance is the most common complaint and endodontic signs and symptoms are low in prevalence. Contrary to previous studies, lack of posterior support resulted in greater severity of wear, therefore restoring support is recommended.

INTRODUCTION

Tooth wear is defined as the loss of tooth tissue to processes of attrition, erosion and abrasion. Tooth wear may result from one of these processes but it is more commonly seen as a multi-factorial process.[1] Furthermore, it is generally accepted that it is a normal part of the physiological ageing process, although the rate and degree of wear determines if the process should be viewed as pathological.[2]

Tooth wear is increasing in prevalence and affects 77% of dentate adults' anterior teeth.[3] There is also an increase in tooth wear in the younger age groups and is therefore of increasing relevance to the general dental practitioner.

The symptoms of tooth wear may vary widely.[4] Indeed many patients may present without any symptoms or concerns regarding wear to the teeth and given that physiological wear is normal, this may not be surprising.[4] Sensitivity has often been cited as a common presenting feature of worn or eroded teeth, but anecdotally the main complaint is poor appearance. Despite the presence of advanced wear, patients do not complain of pain or sensitivity, which may imply slow progression allowing deposition of tertiary dentine or pulpal necrosis with or without undiagnosed apical pathology.[5,6] The prevalence of undiagnosed apical pathology in subjects with severely worn teeth was reported to be only 5 out of 523 teeth (0.1% of teeth), although expressing the tooth as a unit of population is confusing and therefore the prevalence should be nearly 10% for 5 subjects from a sample of 54 patients. A sample of 76 tooth wear patients were reported to have greater dissatisfaction with appearance, pain and chewing ability compared to subjects with tooth wear within the normal range matched for age, gender and educational attainment.[4]

Exposure of dentine by acid erosion increases the likelihood of sensitivity or allows bacteria and noxious substances to irritate the pulp.[7,8] Wear may also cause teeth to appear shorter or out of proportion, which the patient may find unsatisfactory.[9] Excessive wear may lead to functional problems, however, compensatory mechanisms to maintain tooth contact in the presence of wear may occur. Functional problems are more likely to arise when the rate of wear exceeds compensatory mechanisms within the stomatognathic system such as dento-alveolar compensation.[10]

Whether function is impaired by tooth wear and is a common problem has not been assessed previously. Previous studies have examined individual components of pathological tooth wear,[5,11-14] but few have assessed the occurrence and prevalence of presenting signs and symptoms. Small sample size in many studies hinders the generalisability of the results. The main aim of this study was to determine the prevalence of signs and symptoms in a referred group of patients with tooth wear.

METHODS

The diagnosis and specific aetiology of tooth wear was confirmed by medical and dietary history and from the clinical presentation.

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A power calculation showed that if the observed prevalence of undiagnosed apical pathology in tooth wear cases is 10%, as in Rees *et al.*,[5] then a sample size of 300 allows estimation of this proportion with a 95% confidence interval of ±3.4%. If the prevalence is higher, the sample size of 300 would give a maximum width confidence interval of ±5.7%. Hence the target sample size was set at 300.

A systematic sampling technique was used to select every alternate patient held on the consultant database, referred for a tooth wear problem, from 2005 through to the end of 2010. The total period for assessment was six years. The clinical records of 290 patients, referred for tooth wear problems to one consultant at the Liverpool University Dental Hospital (UK), were identified for this period and reviewed in 2011; the study was a retrospective case series.

Demographic data included the age and gender. The presenting complaints or symptoms were recorded as pain/sensitivity, functional issues and/or aesthetic concerns. Patients were asked at the time of consultation whether they had any difficulty chewing or eating food and therefore functional ability was recorded as present or absent according to the patient's subjective perception.

The extent of tooth wear was recorded as mild for loss of enamel, moderate for exposure of dentine, or severe for secondary dentine/pulpal exposure, with the worst affected teeth recorded for each patient. Only one examiner coded wear in all subjects. Occlusal factors included loss of posterior support (defined as no posterior contacts), number of teeth present, number of posterior missing teeth and the Angle's classification of malocclusion. Endodontic signs included swelling, sinus, exposure of pulp chamber and radiographic signs. The radiographs of the worn teeth were examined for apical pathology and existing root fillings. Apical pathology was only coded as present if there were no other possible causes (for example, caries/deep restorations). A diagnosis of the type of tooth wear according to prime aetiology was made at the time of consultation from the history and the presentation of the wear.

The data collection forms were transferred onto an electronic database, and statistical analysis carried out with SPSS version 19.0 software. Statistical analysis included t-tests, ANOVA and chi-square tests.

RESULTS

A total of 290 subjects were included in this study. Significantly more males were referred with tooth wear than females (Table 1; male 69.7%, females 30.3%; p = 0.002). Furthermore, males were significantly older than the females (Table 1; mean age males 49.1 years, mean age females 42.6 years; p = 0.002). At initial consultation, males presented with more severe wear than females (Table 2, p <0.001). More cases of severe wear were observed in the older age groups (Table 2, p <0.003), however, a significant proportion of moderate and severe wear was present in the younger age groups (Table 2).

Males and females presented to the consultant clinic with similar complaints and the most frequent complaint in 58.9% of males and 59.1% of females was poor appearance (Table 3). The proportion of patients complaining of aesthetic concerns in the mild/moderate category was the same as the severe tooth wear category at 60%. Sensitivity was the next most common complaint (male = 37.6%, female = 45.5%) but actual pain in the form of tooth ache was quoted less often (male = 13.4%, female = 14.8%). Functional problems, such as difficulty eating and chewing, were observed in a small number of cases

Table 1 Number and age of tooth wear subjects by gender

	Male	Female
Mean age (SD)	49.1 (SD ± 15.01)	42.6 (SD ± 16.22)
Number	202 (69.6%)	88 (30.3%)

Table 2 Severity of tooth wear by age and gender

Age (years)	Severity			
	Mild	Moderate	Severe	Total
<16	1	2	1	4
16-24	2	15	6	23
25-34	1	24	17	42
35-44	9	27	23	59
45-54	1	19	34	54
55-64	2	34	33	69
65-74	1	8	21	30
75-84	1	2	6	9
85+	0	0	0	0
Total	18	131	141	290
Gender				
Male	5 (2.5%)	84 (41.6%)	113 (55.9%)	202
Female	13 (14.8%)	47 (53.4%)	28 (31.8%)	88
Total	18 (6.2%)	131 (45.2%)	141 (48.6%)	290

Table 3 Presenting complaints by gender

	Male	Female	Total
Pain	27 (13.4%)	13 (14.8%)	40 (13.8%)
Sensitivity	76 (37.6%)	40 (45.5%)	116 (40%)
Functional problems	38 (18.8%)	10 (11.4%)	48 (16.6%)
Aesthetic concerns	119 (58.9%)	52 (59.1%)	171 (59%)
Tooth/restoration fracture	37 (18.3%)	11 (12.5%)	48 (16.6%)
No Complaint	31 (15.3%)	9 (10.2%)	40 (13.8%)

(male = 18.8%, female = 11.4%), and equally prevalent was tooth or restoration fracture (male = 18.3%, female = 12.5%). There was no significant gender difference in the proportion of subjects who complained of pain, sensitivity, aesthetic concerns, functional problems or fractured restorations.

Investigation of the aetiology of the tooth wear revealed that attrition only was the most common cause (Table 4, 35.9%) followed by erosion only (33.1%). Multifactorial wear was seen in over a quarter of the cases (29.7%), but abrasion as the sole aetiological factor was uncommon with only 1.4% cases seen. Erosion was present in 47.3% of the cohort, whether it was in isolation or in combination (multifactorial). The aetiology of tooth wear was not significantly different between males and females.

Patients who had lost posterior support (no molar or premolar contacts) had more severe wear ($p = 0.001$) and had a significantly higher number of worn anterior teeth (mean = 8.38 teeth) than those with posterior support (mean = 6.97 teeth, Table 5). There was a weak but statistically significant correlation ($r = 0.3$, $p < 0.001$) between loss of posterior support and number of worn anterior teeth. Subjects with severely worn teeth had greater functional problems than those with mild or moderate wear, but this was not statistically significant.

Twenty-one patients did not have radiographs taken of their worn teeth and were therefore not included in the statistics for prevalence of apical pathology (n = 269). The number and proportion of patients with undiagnosed apical pathology on worn teeth was 37 (12.7%). Patients with severe wear were more likely to have undiagnosed apical pathology (Table 6, $p = 0.004$). The aetiology of the wear was not associated with the prevalence of apical pathology.

Table 4 Aetiology by gender

	Male	Female	Total
Attrition only	76 (37.6%)	28 (31.8%)	104 (35.9%)
Abrasion only	2 (1.0%)	2 (2.3%)	4 (1.4%)
Erosion only	61 (30.2%)	35 (39.8%)	96 (33.1%)
Multi-factorial	63 (31.2%)	23 (26.1%)	86 (29.7%)
Total	202	88	290

Table 5 Posterior support by severity of tooth wear (number and percentage of all subjects)

	Presence of posterior support	Absence of posterior support
Mild	18 (6.2%)	0 (0.0%)
Moderate	116 (40%)	15 (5.2%)
Severe	104 (35.8%)	37 (12.8%)

Table 6 Undiagnosed apical pathology by severity of tooth wear as seen on radiographs in 269 subjects. (Radiographs were not taken in 21 subjects)

	Apical pathology absent	Undiagnosed apical pathology present
Mild	15 (100.0%)	0 (0.0%)
Moderate	108 (92.3%)	9 (7.7%)
Severe	109 (79.6%)	28 (20.4%)
Total	232 (86.2%)	37 (13.8%)

DISCUSSION

The wear was recorded according to the Adult Dental Health Survey (1998, 2011) coding criteria,[3] with the worst affected tooth being recorded for each patient, rather than per tooth surface. Expressions of prevalence in this study are for the number of subjects and not teeth.

The number of males referred with tooth wear was significantly higher than females, with a ratio of 2.3:1, which is higher than 1.8:1, previously reported by Al-Omari *et al.*[4] and the 1.7:1 reported by Rees *et al.*[5] The difference between genders may be attributable to the greater masticatory force males are able to generate,[15] and differences in lifestyle such as stress and diet. Males presented with a significantly higher prevalence of severe wear compared to females (56% and 32% respectively) and this may be due to males delaying or avoiding seeking dental services until the disorder is fairly advanced.[16,17]

This study found a much higher prevalence of moderate and severe wear than the Adult Dental Healthy Survey (ADHS),[3] presumably because patients in this study were a referred sample with tooth wear compared to a screened sample of the population. The prevalence of severe wear in the younger age groups was 4% in the 16-24-year-old group and 12% in the 25-34-year-old group. The ADHS found a prevalence of 0.5% severe wear in the younger adults and moderate wear in 4% and 7% of the 16-24-year-olds and 25-34-year-olds groups respectively. It is important to note that the prevalence of pathological tooth wear is increasing in the younger age groups and appropriate preventive advice needs to be delivered.

This study corroborates the results in the study by Al-Omiri *et al.*[4] which found aesthetic concerns to be the most common presenting complaint, and highlights that functional problems and pain are not very common in patients suffering with tooth wear, even in severe cases. The total satisfaction scores using a dental impact on daily living questionnaire (DIDL) found that only 11% of the wear patients were totally satisfied with their teeth and that the control subjects had greater satisfaction, although the correlation coefficients between satisfaction and personal factors in the small study sample of 76 were all weak.[4]

In males, attrition as the sole factor for tooth wear was commonest, whereas in females erosion only was the commonest factor. Again this may reflect lifestyle differences such as bruxism and diet. Unsurprisingly, extrinsic erosion was more prevalent in the younger age groups of patients (14-24 years 63.0%), and intrinsic erosion more common in the older age groups (75-84 years 33.3%). A

thorough history is required to ascertain the aetiology of tooth wear, with management and advice delivered according to the diagnosis. Increasing patients' awareness of dietary erosion[18] and liaison with GMPs regarding possible causes of intrinsic erosion are advisable preventive measures. At 2%, the prevalence of abrasion only was very low, compared to the previously reported 19.7%.[4] This may be as a result of GDPs managing abrasion in primary care without referral. Tooth wear is commonly multi-factorial in nature and this study supports other studies[1,11,14] with 29.7% of patients found to have more than one pattern of wear or aetiological factor. This emphasises the need for a generalised tooth wear index to be used in future prospective studies in preference to specific aetiology indices.[19]

The prevalence of sensitivity in patients with moderate and severe tooth wear were very similar at 18.3% and 18.6% respectively, compared with 3.1% in the mild category.

Previous studies have found no correlations between occlusion and tooth wear. A survey of 1,007 adults in South East England found that anterior tooth wear was not associated with posterior tooth loss.[11] A systematic review also found no studies that suggested absent posterior support necessarily leads to increased attrition, and only one study found a weak but statistically significant correlation (r = 0.3) with fewer number of teeth and a higher tooth wear index.[20,21] The present study also found a weak but statistically significant correlation between loss of posterior support and severity of wear, as well as increased anterior tooth wear. It may therefore be advisable to provide patients exhibiting signs of tooth wear with posterior support as a preventive measure. Tooth wear is a slow process which allows the pulp dentine complex to respond by laying down reparative (tertiary) dentine,[22] with a reduction in the number of patent dentinal tubules. This slow process also allows for dento-alveolar compensation, which maintains the occlusal vertical dimension and tooth contact.[23] Therefore, it would be expected that more wear would be found on the incisal edges and anterior guiding surfaces once posterior teeth are lost, particularly in bruxism, as normal or excessive loads are imposed across a small surface area.

The prevalence of undiagnosed apical pathology in this study was greater at 12.7% compared to a recent study by Rees *et al.* who found 9% of patients with apical pathology.[5] An explanation for this difference could be that the earlier study had a smaller sample size (n = 54) and recorded apical pathology in teeth with severe wear only.

CONCLUSION

The most common presenting symptom in this group of referred patients with tooth wear was dissatisfaction with the appearance of worn teeth. The prevalence of pain or undiagnosed apical pathology remained considerably low and endodontic treatment was therefore rarely indicated.

Despite the fact that females access secondary care more than males, it is noteworthy that males predominated in this group of referred patients at a ratio of 2.3:1.

Contrary to previous results, lack of posterior support resulted in the presence of anterior tooth wear and greater severity of wear. Intuitively this is unsurprising and therefore a treatment recommendation would be to restore posterior support.

In the light of these results, a prospective study investigating the signs and symptoms of tooth wear would help overcome the limitations of this retrospective study.

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