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Tooth surface loss: does recreational drug use contribute?

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Abstract *Objective:* This pilot study was designed to measure tooth wear in a sample of 13 subjects who regularly use amphetamine-like drugs (Ecstasy, amphetamines) and compare the observed wear with a matched sample of nondrug users. *Design:* The two groups, both composed of 13 undergraduate students, were matched for age and sex. Other factors influencing tooth wear were controlled by matching the groups on their responses to a questionnaire asking about recognised common causes of tooth wear. The participants teeth were examined and the degree of wear scored according to a tooth wear index. *Results:* Severity of occlusal tooth wear of the lower first molar teeth was significantly greater in the drug user group than in the control group ($P<0.05$). No other statistically significant differences between the groups were found. *Conclusion:* Regular use of amphetamine-like drugs could be associated with increased posterior tooth wear.

Keywords Tooth wear · Drugs · Dental · Aetiology

Introduction

Tooth surface loss is an increasing problem in dentistry [1]. Many cases of tooth wear still present with unknown aetiology [2], although commonly cited factors include gastric regurgitation, citrus fruit intake, soft drinks, xerostomia and bruxism. Other causative factors include competitive swimming, industrial acids, and various forms of abrasion. The treatment of tooth wear can be complex, and diagnosis of the aetiology is essential for successful management.

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Duxbury first suggested the possibility of an association between tooth surface loss and recreational drugs [3]. The postulated connection resulted from the observation that these drugs were found to cause bruxism and xerostomia in pharmacological studies [4]. These effects have also been reported in questionnaire-based studies as some of the most common and severe side effects [5]. It is thought that the bruxist and xerostomic effects last for up to 48 h after the drug is consumed [6]. In addition, it has also been suggested that chewing gum containing sugar (to relieve bruxism) and consuming soft drinks (to relieve xerostomia) may exacerbate the dental complications [3].

The group of drugs involved in recreational drug abuse that may be important in terms of tooth wear includes cocaine, amphetamine sulphate, and its related derivative MDMA (or “Ecstasy”). These drugs act as sympathomimetics and are thought to be abused widely in the UK, despite being illegal class A drugs [7]. The actual numbers of people abusing these drugs is still unknown, although the proportion is likely to be significant in certain age groups. In one study of 776 14–15-year-olds in the northwest in 1991, 6% said they had tried MDMA and 10% had tried amphetamines [7]. Studies among students in the UK have shown levels of illicit drug use exceeding those of the general population, and one major study has shown that 13% of students had tried Ecstasy and 19% amphetamines [8]. Moreover, HM Customs estimate that around one million ecstasy pills are taken each week in the UK and that this use is mainly confined to younger adults [9].

The aim of the study was therefore to determine the prevalence of tooth wear in a group of recreational drug users and compare that with a control group of age- and sex-matched, nondrug users.

Materials and methods

Assessment of subjects was carried out by asking all participants to answer a short questionnaire on activities

Table 1 Copy of the Smith and Knight tooth wear index [10]. *B* buccal or labial, *L* lingual or palatal, *O* occlusal, *I* incisal, *C* cervical

Score ^a	Surface	Criterion
0	B/L/O/I/C	No loss of surface characteristics No loss of contour
1	B/L/O/I/C	Loss of enamel surface characteristics Minimal loss of contour
2	B/L/O I C	Loss of enamel exposing dentine for less than one third of the surface Loss of enamel just exposing dentine Defect less than 1 mm deep
3	B/L/O I C	Loss of enamel exposing dentine for more than one third of surface Loss of enamel and substantial loss of dentine not exposing secondary dentine or pulp Defect 1–2 mm deep
4	B/L/O I C	Complete loss of enamel, or pulp exposure, or exposure of secondary dentine Pulp exposure or exposure of secondary dentine Defect more than 2 mm deep, or pulp exposure, or exposure of secondary dentine

^a In case of doubt, lower score is given

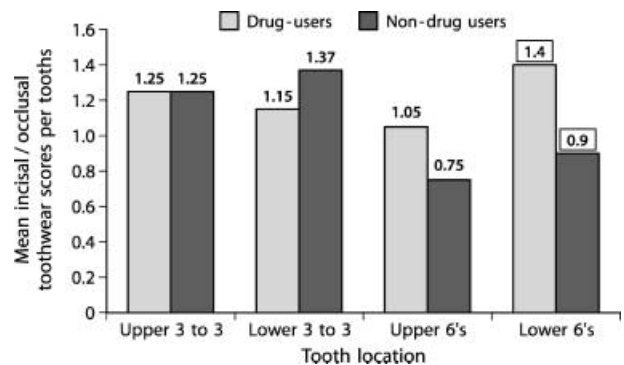
which may affect the wear of their teeth (including drug use) and via a standardised visual examination to assess the degree of tooth wear. Subjects were recruited from various advertisements around the university campus and in student publications.

Criteria for inclusion in the “user” group consisted of regular use of Ecstasy and/or amphetamines (regular being deemed as use on over ten occasions in their lives). Inclusion for the control group was based on being a good match for someone in the user group in terms of age and sex and having never used amphetamines, ecstasy, or cocaine. Exclusion criteria were subjects who had used the drugs on one to ten occasions in their lives. (This level of use was deemed to be a grey area prior to being defined as a regular user.)

Subjects were seen in a dental hospital setting and supplied with an appointment letter, information sheet, and consent form. The questionnaire was completed in a waiting room without assistance. The answers to the questionnaires were not inspected until after the dental examination.

The questionnaire was formulated to measure the degree of drug use and identify other variables that may affect tooth wear. Variables affecting tooth wear included in the questions were, frequency of acidic fruit eating and fizzy drink consumption, known bruxism, xerostomia, frequent regurgitation, and participation in competitive sport. After enquiring about these activities, the questionnaire went on to assess the degree of drug use, including tobacco, alcohol, cannabis, amphetamines, Ecstasy, and cocaine. Questions were asked in terms of weekly, monthly, and lifetime consumption to allow for lapses of memory and to aid recall. The questionnaire, comprising mainly closed response questions, was successfully piloted before the study was initiated. No changes were introduced as a result of this pilot.

Measurement of tooth wear was via the Smith and Knight tooth wear index [10] (Table 1). This index required only a visual examination of the teeth under good illumination. One examiner carried out all examinations.

**Fig. 1** Comparison of tooth wear scores in drug users and non-drug users

Results

Initial analysis of results was necessary to ensure the two test groups were comparable. The two groups were matched perfectly for age and sex, with five females and eight males in each group. All participants were between the ages of 18 and 23, with a mean age of 20.4 (SD 1.6).

Analysis of the questionnaires was performed using chi-squared analysis, as the data were categorical. There were no differences between the groups in terms of commonly recognised aetiological factors investigated in the questionnaire.

As the two groups were well matched, the tooth wear scores were then analysed. Since this was interval data, the statistical test used for the tooth wear scores was a one-way analysis of variance (F test). Scores were taken of occlusal surfaces only (as this was where most wear was noted), and values were grouped together as: upper canine to canine, lower canine to canine, upper first molars, and lower first molars.

Mean scores could be ascribed to groups of teeth by dividing the total tooth wear scores by the number of teeth within the groups (six in the case of canine to ca-

nine). Following analysis, the scores for upper 3 to 3 were found to be similar in both groups ($F\ 0.00$, $P=0.94$). Scores for lower 3 to 3 were also similar in both groups ($F\ 1.18$, $P=0.29$), with fractionally higher wear in the nonuser group. However, the scores for lower 6s were found to be statistically different ($F\ 5.32$, $P=0.03$), with significantly greater wear in the drug user group. The score for upper 6s also showed a trend in the same direction but lacked statistical significance ($F\ 3.66$, $P=0.07$). These data, including the mean values for each group, are summarised in Fig. 1.

Discussion

Despite the sample size being small, the two groups were well matched. The only obvious difference between the two groups in terms of behaviour that may have affected the wear of their teeth is the drug use, which was completely absent in the control group but ranged from around 10 to over 80 experiences in the user group.

The successful matching of the two study groups meant that differences in tooth wear could be attributed to drug use rather than other recognised causes investigated by the questionnaire. The tooth wear scores showed that the only statistically significant difference between the groups was the greater severity of wear of lower first molars in the drug user group (mean score 1.40) than in the controls (mean score 0.90). Scores for upper first molars showed a similar but weaker trend (mean scores of 1.05 compared to 0.75). The reason behind this difference in tooth wear between the arches is unclear. It is possible that a greater sample size would have shown the upper molar to exhibit similar wear to that of the lower molar in the drug user group.

It is interesting that no statistically significant differences were observed between the groups for anterior tooth wear. This would appear to suggest that drug users clench or grind mainly on their posterior teeth, as compared to nonusers. This corroborates the results of a similar recent investigation [11]. Additionally, it was observed that the pattern of wear was suggestive of attrition, with an erosive component in the more severe cases. Fine cracks in posterior teeth were also observed in two of the heavier users, suggesting that they may be exhibiting some clenching behaviour.

When evaluating the results of this study, it is important to recognise its limitations. An obvious major limitation

was the shortage of subjects for the drug user group ($n=13$). Recruitment may have been low due to fears over confidentiality and the potential consequences of such a breach. However, even with the small numbers recruited, statistically significant differences in tooth wear still emerged.

The clinical significance of this difference in terms of long-term dental health of these subjects is not yet known. This may depend upon how long the subjects continue to use these drugs and whether the wear continues to increase with time. It is important to note that it is inappropriate to label patients who exhibit posterior wear as drug users, as many aetiological factors should be considered, many of which can often remain undiscovered despite a careful history. Despite possible flaws in the study, the results suggest that further research with a larger study population is indicated.

Conclusions

Regular recreational users of Ecstasy, amphetamines, or cocaine appear to exhibit significantly greater tooth wear occlusally on their lower first molars than nondrug users.

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