

Timing of dietary acid intake, brushing teeth and acid erosion

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PROTOCOL TITLE: Timing of dietary acid intake, brushing teeth and acid erosion

Questionnaire based study

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Title	Timing of dietary acid intake, brushing teeth and acid erosion
Protocol Short Title/Acronym	Brushing frequency and acid erosion
Protocol Version number and Date	Version 1 3/12/2013
Study Phase if not mentioned in title	Questionnaire study
Study Duration	<i>3 years</i>
Methodology	<i>Questionnaire based study.</i>
Sponsor name	KCL
Chief Investigator	Professor David Bartlett
REC number	
Medical condition or disease under investigation	Dental erosion
Purpose of clinical trial	<i>To determine if brushing teeth before or after consuming an acid drink causes the greatest wear</i>
Primary objective	<i>Current dietary and toothbrushing practice</i>
Secondary objective (s)	Attitudes to brushing behaviour
Number of Subjects/Patients	<i>600</i>
Trial Design	Questionnaire on a convenient sample compared to matched control group
Endpoints	Saturation of data from one to one studies and work from previous research shows 600 should create statistical differences
Main Inclusion Criteria	<i>Tooth wear</i>
Statistical Methodology and Analysis	<i>Frequencies, Multivariate and univariate analysis</i>

Protocol for Timing of dietary acid intake, brushing teeth and acid erosion

Background

Dental erosion is common with prevalence studies suggesting up to 30% of European adults showing signs and up to 10% of patients over 60 yrs justifying restorations.(1, 2) The impact of tooth wear means restorations are beyond the confidence and training of most general dentists. Our previous work has shown that monitoring tooth wear over time shows periods of activity and inactivity and the most important risk factor is the frequency of acidic food/drink intake(3). Influencing dietary intake is challenging but modifying the behaviour is potentially more successful. A known risk in erosive tooth wear is consumption of acids and there is possibly a relationship between timing of acid intake and brushing teeth. This project will assess if a simple process such as brushing teeth before breakfast or meals containing acid is effective in making the teeth more resistant to acids. The main active agent is fluoride and its interaction with the tooth. Hypothetically, brushing the teeth before an acid challenge should increase the availability of fluoride to harden the tooth surface making it more resistance to demineralisation. Therefore the intention of this application is to redirect the emphasis of care away from expensive restorations back onto the patient and deliver prevention with a simple but effective habit change.

Objectives

This is a preliminary study investigating the relationship between timing of brushing and erosion. This part will collect basic data on the dietary habits of patients with and without erosion, timing of brushing and their feelings about the impact of wear on their teeth. Further work will subsequently investigate clinically the wear of teeth following acid

exposure and then toothbrushing before or after. At that time a separate ethics application will be made.

Method

The study group will consist of two cohorts, those presenting with tooth wear and a matched control group. The patient group will be recruited from a specialized referral clinic for patients with tooth wear. These patients are referred to the hospital for advice on the management of tooth wear. Relatively few patients are offered care and the majority are returned to their general dental practitioner for continuing care. Potential participants will be approached on the clinic at the beginning of their appointment, which tends to last around 90 minutes. They will be given the patient information sheet and asked to consider participating. Those accepting the request will be offered the opportunity to complete the questionnaire at the end of their appointment so as to reduce any inconvenience. Alternatively, if they prefer they will be given a separate appointment to their convenience at another day. For a small proportion of patients who agree to participate in the 1 to 1 session they will be appointed at another time and their travel expenses provided. The control group will be recruited from open student or staff clinics where patient attend for their routine care. The same recruitment process will be followed but as this group may return to the hospital at a second visit the opportunity to complete the questionnaire will be at a future or their current visit and the decision reached at their convenience.

Inclusion criteria

1. Severe tooth wear with a BEWE score of 12 and at least one score of 3 in three quadrants

2. Adult 18 years or older
3. No missing anterior teeth
4. Minimum of at 10 teeth in the upper and 10 teeth in the lower jaw
5. No anterior crowns/ bridges or implants
6. Written consent to the study

Exclusion criteria

1. Pregnancy
2. Participation in other research within 30 days
3. Unable to speak or understand English
4. Presence of periodontal disease or caries on more than one tooth

The inclusion of patients is aimed at those who present with tooth wear and no other dental conditions such as missing teeth or periodontal disease or caries. The control participants will have the same inclusion and exclusion criteria apart from an absence of tooth wear.

Questionnaire

We will assess current habits using a proven dietary questionnaire(4). Unlike other questionnaires this computer programme provides an estimate of the dietary intake of fruit and Vitamin C within a week. Called the health and equality audit (HEA) the record has been used in dietary analysis by dentists and dieticians. The audit will provide an accurate record of the intake of acidic foods and drinks and their timing together with brushing habits which will then be compared to clinical findings of tooth wear. The questionnaire will be slightly modified to assess the timing of brushing teeth and the presence of any symptoms of reflux/heartburn

Clinical assessment

The clinical assessment of tooth wear is through a visual grading on a 4 point scale ranging, from 0 to 3 and published by our team, and then statistical comparison made to the intake of acid(2). The assessment will occur under good lighting, dry teeth and all teeth scored on all surfaces. The scoring system has been utilized in a number of previously published studies.

OHIP – modified oral health impact assessment

This questionnaire, which has been previously used in a number of studies, assesses the impact of tooth wear on behavioral attitudes. There are a series of related questions assessing personal views on how the tooth wear affects their feeling about their teeth.

Sample size

Previous work from our group has shown statistical relationships between acid intake and risk factors on a convenient sample of adults. This cohort of 1010 adults were recruited from University Students who were then dentally examined and completed a questionnaire. The Odds ratio calculated from this sample showed relationship with fruit and drinking method. The odds ratio's were both 1.4 and 5 respectively (5).

Based on this data we predict a cohort of 300 patients with tooth wear and 300 controls should show statistical differences. There are no previous data to show outcome of OHIP. Adults aged 18 and over will be recruited provided they give consent and satisfy the inclusion and exclusion criteria.

Analysis

The data will be compared within and between groups, using non parametric analysis. In our

experience with patient based research these groups of analyses work well.

Cases and controls will be compared in terms of their demographics, clinical characteristics and risk factors, using the Chi-square test for categorical variables and the t-test for continuous measures. Variables to be included in the logistic regression model will be manually selected based upon prior theory and the research hypothesis. Using the presence or absence of severe erosive wear (cases and controls) as the dependent variable, the unadjusted, sex-and-age- adjusted and fully adjusted associations of the included variables with erosive tooth wear will be estimated using unconditional binary logistic regression and reported using odds ratios (OR). As frequency matching does not require the use of conditional logistic regression during analysis, age (in the pre-defined groups), will be included as a potential confounder

One to one interviews

Approximately 10 participants from each group will be invited to a one to one interview to focus more completely on their feelings about tooth wear and its impact. The maximum of one hour interview will be conducted in an open style but with headings on (feelings about tooth wear, reasons why they sort care from their dentist, reasons for wanting the teeth restored, fears and concerns about dental care and any factors influencing care such as cost of care). The interview will be recorded on a digital tape and then transcribed by the clinical investigator at a later date. The data files will be stored on a encrypted computer.

Outcome

This study will hopefully improve our understanding of risk factors, which will then be possible to inform dentists and the public about the relationship between brushing and eating. Establishing dietary habits, their brushing habits and their level of tooth wear will

show current oral hygiene practices and show statistically the risk factors associated with when those with dental erosion brush their teeth.

The study will be conducted in the clinical research unit at Kings College London Dental Institute at Guy's Hospital. We have found that patients with erosion are very enthusiastic and dedicated to consider preventive approaches rather than restorative care which usually means a few years later the work needs to be replaced often to the personal expense of the patient.

Finance

The finance from this study will be provided by a grant held by the CI. We have also applied to the Shine Foundation but the study is not dependent upon this being successful. We anticipate that many of the possible participants will agree to have complete the questionnaire at their main NHS visit and will not need a subsequent one. However, if someone chooses to return or agrees to the one to one questionnaire travel expenses will be re-reimbursed.

Reference List

1. Smith BG, Bartlett DW, Robb ND. The prevalence, etiology and management of tooth wear in the United Kingdom. *J Prosthet Dent* 1997;**78**(4):367-72.
2. Bartlett DW, Lussi A, West NX, Bouchard P, Sanz M, Bourgeois D. Prevalence of tooth wear on buccal and lingual surfaces and possible risk factors in young European adults. *J Dent* 2013.
3. Rodriguez JM, Austin RS, Bartlett DW. In vivo measurements of tooth wear over 12 months. *Caries Res* 2012;**46**(1):9-15.
4. Bartlett DW, Maggio B, Targett D, Fenlon MR, Thomas J. A preliminary investigation into the use of denture adhesives combined with dietary advice to improve diets in complete denture wearers. *J Dent* 2013;**41**(2):143-7.

5. Bartlett D, Fares J, Shirodaria S, Chiu K, Ahmad N, Sherriff M. The association of tooth wear, diet and dietary habits in adults aged 18–30 years old. *J Dent* 2011;**39**(12):811-16.