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*What are the important risks for chronic,
adult periodontal disease?*

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Abstract:

Purpose: The purpose of the study was to evaluate the current literature in order to determine the risks for chronic adult periodontal disease.

Methods: Two main research strategies were carried out to obtain potentially relevant articles, pertaining to our area of interest. Using predetermined research criteria:

A search of Ovid Medline and PubMed of relevant publications, dating from 1966 to 2006 was performed in both databases. 59 articles were obtained by the search and additional 12 articles were obtained by other search methods. The 71 articles were reviewed according to our research criteria, and only 6 articles were found to be relevant.

Results: Risks associated with chronic periodontal disease are smoking (OR 3.58-14.51), age (OR 8.67), tooth brushing (OR 5.77), teeth mobility (OR 4.9), mental illness (OR 5.32), vitamin D receptor gene polymorphism (OR 2.73), alcohol (OR 1.36), irregular dental visits and low education.

Conclusion: There is evidence to support that smoking, age, tooth brushing teeth mobility, mental illness, vitamin D receptor gene polymorphism, alcohol, irregular dental visits and low education are risks for chronic adult periodontal disease.

Introduction

Periodontitis can be defined as “an inflammatory disease of the supporting tissues of the teeth caused by specific microorganisms , resulting in progressive destruction of the periodontal ligament and alveolar bone with pocket formation, recession or both”.

Chronic periodontitis is a sub-classification of periodontitis. It is prevalent in adults but can also occur in children. Apart from the general characteristics cited in the definition above, chronic periodontitis also has a few inherent characteristics:

1. The degree of destruction is consistent with local etiological and predisposing factors.
2. Sub-gingival calculus is present in the majority of the cases.
3. The rate of progression varies, with periods of rapid destruction interspaced with periods of quiescence.

The American Academy of Periodontology (AAP) further sub-classified chronic periodontitis into localized and generalized forms with varying degrees of severity into slight, moderate and severe for each sub-classification (1).

Chronic periodontitis is one of the most prevalent diseases throughout the world and is the chief cause of tooth loss in the elderly(2).

This disease adds a significant burden to oral disease and has been studied widely. However, only sparse epidemiological literature exists, citing some of the risk factors for chronic adult periodontitis

Smoking (3,4,5,6), stress(7,5), mental state (5), age (3), low education (7), alcohol (8), irregular or no use of dental health services (7) are factors associated with the high prevalence of chronic adult periodontal disease.

Purpose of the Study

The purpose of this study is to identify the risks of chronic adult periodontitis. This is achieved by reviewing the current available literature with the objective of finding good evidence that will identify these risks among those that are associated with the disease.

Methods

A systematic method was applied to identify, select and critically appraise relevant studies.

Search Strategy

Two main search strategies were used to obtain potentially relevant articles pertaining to our area of interest.

1. A search of Ovid Medline and Pubmed of relevant publications dating from January 1966 to January 2006 was performed both databases. The purpose was to identify as many articles as possible. The following keywords, and combinations of keywords, were used in the search:

- Chronic
- Risk
- Pyorrhea
- Periodontitis [Prevention & Control, Epidemiology, Etiology, Genetics, History]
- Periodontal Diseases [Prevention & Control, Epidemiology, Ethnology, Etiology, Genetics, History, Immunology]

Inclusion Criteria

The articles selected for this report had to meet the following specifications:

1. Articles published between January 1966 and January 2006.
2. Articles published in English.
3. Cohort, case control and cross sectional study designs.
4. Studies on human subjects.
5. Studies on adults.

Exclusion Criteria

1. Children under the age of 18.

This search obtained 59 articles

2. Articles obtained by other methods:

1. Consultation with the Department of Community Dentistry, Faculty of Dentistry, University of Toronto
2. Consultation with the Department of Periodontology, Faculty of Dentistry, University of Toronto
3. References from community dentistry lectures, Faculty of Dentistry, University of Toronto, 2006.
4. Carranza's Clinical Periodontology, 9th edition

This search resulted in an additional 12 articles.

All articles were readily accessible from the Dental Library, Faculty of Dentistry, University of Toronto and its online journal subscriptions.

The complete search resulted in 71 articles.

Determination of relevance

Specific criteria for the selection of articles were included in our research.

The relevant articles had to meet the following 5 criteria:

1. The study must be a primary study and not a review of other primary studies.
2. The means by which periodontal disease would be measured is the gold standard of Clinical Attachment Loss (CAL).
3. Study designs must be cohort, case-control, cross-sectional studies although cohort studies were considered the strongest design, and therefore, the most desirable.
4. The proposed study, must always declare Logistic Regression, Relative Risk or Odds Ratio.
5. A temporal relationship showing the risk causing periodontal disease.

Applying these inclusion / exclusion criteria resulted in 20 articles which were eliminated by title and 29 articles which were eliminated based on reading the abstracts.

This resulted in 22 relevant articles. 11 articles were rejected at first reading based on the determination of relevance criteria.

The other 11 articles were reviewed by two reviewers and were critically appraised and assigned based on The Checklist to Assess Causation (9,10).

Validity instrument:

The checklist for assessing causation was used to assess the 11 articles. A score of 7/13 was the cut-off. This resulted in 6 studies approved for inclusion in the present meta-analysis.

The Checklist to Assess Causation

- 1) Was the study ethical?
- 2) Was a strong design used to assess causation or risk?
- 3) Were cases defined validly and reliably measured?
- 4) Were the risks validly and reliably measured?
- 5) Were the risks assessed controlling for other factors and was the model's predictive power strong?
- 6) Did the cause precede the effect?
- 7) Was the estimate of risk beyond chance?
- 8) Was there a dose –response relationship?
- 9) Was reversibility demonstrated?
- 10) Is the cause observed in different times and places?
- 11) Is the cause biologically plausible?
- 12) Is the cause specific to that disease?
- 13) Is the cause analogous to another disease?

The highest attainable score was 13.

The resulting 6 acceptable studies were included in this report.

Results

The selected 6 articles scored between 7-11 out of 13 in the causation checklist (9,10).

The studies were grouped according to the type of study into 3 tables.

1. Cohort Studies (table 1)

Ismail et al (1989) (3) found that age (OR 8.67), smoking (OR 14.15) and teeth mobility (OR 4.9), are risks for chronic periodontitis. Causation checklist score: 10/13.

2. Case Control Studies (table 2)

Teng et al (2003)(11) found that tooth brushing (OR 5.77), smoking (OR 3.93) and mental illness (OR 5.32) are risks for chronic periodontitis. Causation checklist score 9/13.

Tachi et al (2003) (2) found that Vitamin D receptor (VDR) gene polymorphism (OR 2.73) is a risk for chronic periodontitis. Causation checklist score: 7/13.

3. Cross sectional (table 3)

Tomar et al (2000) (4) found that smoking (OR 3.58) is a risk for chronic periodontitis, and that the population attributable risk (PAR) is 74.8%. Causation checklist score 11/13.

Tezal et al (2001) (8) found that drinking alcohol more than 5 times a week (OR 1.36) are risks for chronic periodontitis. Causation checklist score: 10/13.

Krustrup and Peterson (2006) (7) found that low education and irregular dental visits are risks of chronic periodontitis. Causation checklist score: 9/13.

DISCUSSION

Many risks can be found in the literature to be associated with chronic periodontitis, many of which are well accepted risks (7). In our review we included only risks that were found to be valid after logistic regression.

The limitation to our review seems to lie within our search criteria. Many key articles with regards to chronic periodontitis did not surface during our search of electronic journals and as previously mentioned, many articles relating to genetics surfaced. This gives rise to the question whether articles are labelled correctly. It also puts into question the validity of the systematic review and what happens when the average practitioner is

looking for a review on any subject – whether the information is complete (though its still the best method we have for an overview of a subject).

The purpose of the systematic review of articles was to find the risks for chronic periodontitis. Age, smoking, mobility of teeth, tooth brushing mental illness, alcohol, genetic predisposition, low education and irregular dental visits were found to be risks for chronic periodontitis (2,3,4,5,6,7,8,11).

The strength of each of these risks is based on the strength of the study used to assess the risk and the causation checklist (9,10) score given to the study.

In a cohort study over a period of 28 years, Ismail A. I. et al (1989) found age, smoking and mobility of teeth to be risks for chronic periodontitis (3). Age, smoking and mobility of teeth had a good strength of evidence. Other studies (4,11) supported smoking to be a risk of chronic periodontitis which adds to the strength of evidence.

In a case control study of 500 Taiwanese, Teng HC et al (2003) found tooth brushing, smoking and mental illness to be risks of chronic periodontitis (11).

Tezal M et al (2001) found that alcohol consumption more than 5 times a week is a risk for chronic periodontitis (8). Tooth brushing and mental illness and alcohol had a fair-good level of evidence

Krustrup U and Peterson AP, 2006 found fair evidence that low education and irregular dental visits are risks for periodontal disease (7).

This search surfaced many articles related to genetic predisposition. Tachi Y. et al (2003) found polymorphism of the Vitamin D Receptor (VDR) gene to be of genetic predisposition for chronic periodontal disease (2). The level of evidence of this risk was fair (table 4).

Recommendations:

The purpose of our study was to find the risks for chronic periodontitis. Some of the risks such as age and genetic predisposition may be interesting but are purely academic. From a public health perspective, the risks that a person has control over (smoking, alcohol, tooth brushing etc.) are of interest when making public health policy and raising awareness for the public. Smoking was found to have a 74.8% PAR (4) with regards to chronic periodontitis and yet the public and probably a great majority of the dental profession is not aware how strong a risk it is.

Risks which were found to have a level of evidence lower than good (tooth brushing, mental illness, alcohol and genetic predisposition) require further investigation using more valid study models (preferably cohort studies).

Bibliography

1. Armitage G C. Development of a classification system for periodontal disease and conditions. *Ann Periodontol* 1999; 4:1.
2. Tachi, et al. Vitamin D receptor gene polymorphism is associated with chronic periodontitis. *73(26):3313-21, 2003 Nov 14.*
3. Ismail A I, et al. Natural history of periodontal disease in adults: findings from the Tecumseh Periodontal Disease Study, 1959-87. *Journal of Dental Research. 69(2):430-5, 1990 Feb.*
4. Tomar S L, Asma S. Smoking-attributable periodontitis in the United States: findings from NHANES III. National Health and Nutrition Examination Survey. *Journal of Periodontology. 71(5):743-51, 2000 May.*
5. Genco, et al. Relationship of stress, distress and inadequate coping behaviours to periodontal disease. *Journal of Periodontology. 70(7): 711-723, 1999 Jul.*
6. Gelskey S C, Young T K, Singer D L. Factors associated with adult periodontitis in a dental teaching clinic population. *Community Dentistry & Oral Epidemiology. 26(4): 226-232, 1998 Aug.*
7. Krustrup U. Petersen P E. Periodontal conditions in 35-44 and 65-74-year-old adults in Denmark. *Acta Odontologica Scandinavica. 64(2):65-73, 2006 Apr.*
8. Tezal M, et al. The effect of alcohol consumption on periodontal disease. *Journal of Periodontology. 72(2):183-9, 2001 Feb.*
9. Fletcher, Fletcher and Wagner. *Clinical epidemiology – the essentials- 3rd ed. 1996*
10. Sackett et al (10). *Evidence-based medicine: how to practice and teach EBM (1997)*
11. Teng H C, et al. Lifestyle and psychosocial factors associated with chronic periodontitis in Taiwanese adults. *Journal of Periodontology. 74(8):1169-75, 2003 Aug.*

Appendix

Table 1: Cohort Study:

Author, date	Population (Age sex, location)	Outcome	Critical appraisal comments / strength of study / conclusions
Ismail A. I. et al, 1989	1959: N = 526 1987: N =165 Age: 5 – 60 y Michigan, USA	13% CAL > 2mm 3% CAL > 3mm 1.2% CAL > 4mm Age OR: 8.67 Smoking OR:14.15 Teeth Mobility OR: 4.9	Logistic regression Dose response. Causation checklist score: 10/13

Table 2: Case Control Studies

Author, date	Population (Age sex, location)	Risk (number studied)	No Exposure (number studied)	Outcome	Critical appraisal comments / strength of study / conclusions
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Teng HC, et al, 2003	N = 500 Age: ≥ 18y Taiwan	250	250	CAL > 6 at 2 sites + PD > 5 at one site Tooth brushing OR: 5.77 CI (1.71-19.53) PAR 15.1% Smoking OR: 3.93 CI (1.13-13.68) PAR 12.3% Mental illness OR: 5.32 CI (1.34-21.03) PAR 13.2%	Multivariate analysis Logistic regression Dose Dependant Causation checklist score: 9/13
Tachi Y. et al, 2003	N = 168 Age: 35 – 65y Japan	74	94	VDR gene polymorphisms OR 2.73 CI (1.11-6.68)	Multivariate analysis Logistic regression Causation checklist score: 7/13

Table 3 : Cross sectional Studies

Author date	Population (Age sex, location)	Risk (number studied)	No Exposure (number studied)	Outcome	Critical appraisal comments / strength of study / conclusions
TomarC L et al, 2000	N = 12, 329 Age: ≥ 18y US	27.9% smokers	72.1% non smokers	Smoking OR: 3.58 CI: (2.94 –	Logistic regression Dose response Reversibility

				4.36) PAR: 74.8%	Causation checklist score: 11/13
Tezal M et al, 2001	N = 1371 Age: 25– 74y New York	235 ≥ 5 drinks per week	1136 < 5 drinks per week	≥ 5 drinks per week OR: 1.36 CI (1.02- 1.80)	Multivariable analysis Logistic Regression Dose Response Causation checklist score: 10/13

Author, date	Population (Age sex, location)	Risk (number studied)	No Exposure (number studied)	Outcome	Critical appraisal comments / strength of study / conclusions
Low Education Irregular Dental Visits Low Education Irregular Dental Visits	High Education 1 or More visits a year			Pockets: 4 -5 mm: 10.7% (p < 0.001) ≥ 6mm: 4.5% (p<0.01)	Multivariable analysis Logistic regression Causation Checklist score: 9/13
				Pockets: 4-5 mm: 33.5% (p < 0.05) ≥ 6mm: 10.3% (p<0.01)	
	High Education 1 or More			Pockets: ≥ 6mm: 11%	

visits a year			(p<0.001)
			Pockets: 4-5 mm: 31.9% (p < 0.001) ≥ 6mm: 14.2% (p<0.001)

Table 4: Strength of Study

	Risk	Strength	Type of Study
1.	Age	Good	Cohort
2.	Smoking	Good	Cohort, Case Control, Survey (NHANES)
3.	Mobility of Teeth	Good	Cohort
4.	Tooth Brushing	Good-Fair	Case Control
5.	Mental Illness	Good-Fair	Case Control
6.	Alcohol	Good - Fair	Cross Sectional
7.	Genetic Predisposition	Fair	Case Control
8.	Low Educaton	Fair	Cross Sectional
9.	Irregular Dentalvisits	Fair	Cross Sectional

