

RELATIONSHIP BETWEEN PERIODONTAL DISEASE, TOOTH LOSS AND CANCER

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ABSTRACT

This review was undertaken to record the findings of various studies done on this topic in various countries.

Key words: Periodontal disease, relationship with oral cancer

INTRODUCTION

Various studies show the chronic infection and persistent inflammation are associated with increased risk of cancer.^{1,2} Smoking and various subgingival microorganisms are also proven to be the true risk factors.³ Periodontitis is associated with many systemic conditions such as cardiovascular disease, low birth weight complications in pregnancy, diabetes and pulmonary disease.^{2,4} There is noticeable increase in incidence of periodontal disease with advancing age and tooth loss at old age is mostly due to chronic periodontal infection.⁴ It is observed that between 30-35% tooth extractions are done due to periodontal disease, while only one half will result from dental caries. Chronic inflammation increases the chance of severe cancers and inflammation in some particulars results in the breakdown of connective tissue that surrounds the teeth.⁵ Variations in various markers of inflammation is seen with periodontitis for example there is increase in total number of leukocytes and C-reactive proteins and decreasing number of red blood cells and levels of haemoglobin.⁶ Periodontitis at a younger age is a higher disease vulnerability.⁷ Relationship of oral and systemic diseases has gained importance. Systemic vascular injury, bacterial endotoxins and metastatic infections are thought to be responsible for this relation.⁴ Poor glycemic control is also another predisposing factor to periodontal disease and advanced glycation products (AGEs) are formed as a result of hyperlipidemia or hyperglycaemia and

results in accumulation of collagen in periodontal capillary basement membrane which leads to membrane thickening and decrease in tissue perfusion and oxygenation. These changes may possibly accounts for increase in susceptibility to infections, vascular changes and impaired healing which is commonly related to diabetes mellitus.⁹ Type 2 diabetes mellitus is a greater risk for periodontal disease progression.¹⁰ Genetic risk factors may also be risk factors. Many viruses like Human cytomegalo virus (HCMV) and Epstein bar virus (EBV), two members of herpes viridae family may also mediate oncogenic growth. Herpes viruses are transmitted from person to person during initial stages of primary infection. HCMV is the most common life threatening infections in HIV patients, EBV is the causative agent of oncogenic growth. Saliva is the main source of its transmission and it resides in marginal and apical periodontitis. Periodontal therapy reduces the EBV.^{11,12} Evidence suggests that there is a significant genetic component that increases the risk of periodontal disease and cancer. Dizygotic twins with periodontal disease showed a 50% increase in total cancer risk as compared to monozygotic twins. These findings reveal shared genetic risk factors are involved in association of periodontal disease and cancer.^{5,13} The genetic factors in periodontal disease are well recognized and genetic susceptibility test is available.¹⁴ In summary extensive verifications support an association between chronic infections and increased risk of cancer and tooth loss.¹⁶

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STUDIES CONDUCTED TO INTERLINK PERIODONTAL DISEASE AND CARCINOGENESIS

Study by Mine Tezal represents an association between tongue cancer and periodontal diseases after adjusting other factors including effects of age, smoking status and the number of teeth. Study reveals 5.23-fold increase in the risk of tongue cancer with 1mm alveolar bone loss. This study excludes the association of tongue cancer with other oral diseases like caries, root canal filling etc.¹

A case-control study was conducted in Beijing for dentition and risk of oral cancer. The 404 matched cases and hospital-based controls completed a questionnaire and conducted an oral examination, which included recording of missing teeth and presence of gingivitis or periodontal disease. Analyses were stratified by gender, for males, a 2-3 fold increase in risk of oral cancer was observed for any tooth loss with and without tooth replacement and a 5-8 fold increase in risk for females (Table 1).⁴

Marshall et al has studied the relationship among tobacco, alcohol, dentition and dietary factors in a case-

control study of oral cancer conducted in Western New York State. All information was collected by an interview and only one control was matched to each of 290 cases of oral cancer. He found a significant 2.7 fold increase in risk of oral cancer for those who lost 11 or more teeth. (Table 1).⁴ Further research needs to be organized to understand the role of oral hygiene and cancer.⁴

Study conducted by Mine Tezal represented relation of head and neck squamous cell carcinoma with periodontal disease. This association was so much obvious that each millimeter alveolar bone loss was associated with greater than 4 fold increased risk of head and neck squamous cell carcinoma.¹⁶ Head and neck squamous cell carcinoma include oral cavity squamous cell carcinoma, oropharyngeal squamous cell carcinoma and laryngeal squamous cell carcinoma. Smoking is the risk factor which can modify this relation. The strength of association is much higher in older or never smoker when compared to current smokers.¹⁸ In an another study conducted by Mine Tezal found increased incidence of oral precancerous lesion or tumors with greater than 1.5mm CAL (Clinical attachment loss).²¹

TABLE 1: STUDIES LINKING CANCER RATES WITH PERIODONTITIS

Author	Year	Population	Criteria	Results	Type of studies
Carbera et al	1967-1969, follow-up until 1992-93	68 cancer deaths of 1462 women in Sweden	Loss of teeth	No significant association between cancer mortality and increased number of missing teeth	Cohort
Hujoel et al	1971-1975, follow-up until 1992	884 cancer deaths of 11,328 cohort in United States	Periodontal exam by Russell index	Increased risk of cancer deaths in patients with periodontitis	Cohort
Michaud et al	1986-2004	5720 cancer cases out of 48328 cohort in US	Patient reported history of periodontal disease along with radiographic measure of bone loss	Significantly increased risk of over all cancer for patients with a history of periodontal disease after controlling smoking	Cohort
Tu et al	1948-1968 and follow-up until 2005	549 cancer deaths of 12,223 patient cohort in Scotland	Loss of teeth	No significant increase in risk between cancer deaths and increased missing teeth	Cohort

TABLE 2: STUDIES LINKING PERIODONTAL DISEASE AND PANCREATIC CANCER

Author	Year	Population	Criteria	Results	Type of studies
Hiraki et al	2001-2005	178 cases of pancreatic cancer	Loss of teeth	No significant association found	Case control
Hujoel et al	1971-1975, follow-up until 1992	12 pancreatic cancer deaths from 11328 cohort in United States	Periodontal exam by Russell index	Increased risk of periodontal cancer in patients with periodontitis	Cohort
Michaud et al	1986-2004	253 cases in 48328	Patient reported history of periodontal disease and tooth loss	Significant increased risk of pancreatic cancer with history of periodontitis	Cohort

Abnet et al conducted a study which shows elevated risk of esophageal squamous cell carcinoma, gastric cardiac adenocarcinoma, or gastric non-cardia adenocarcinoma in relation to tooth loss.¹⁸⁻²² Hujoel et al, however found no association between stomach cancer and tooth loss.²

Current published study shows that over past 4 years risk of pancreatic cancer increased to a great extent with a ratio of 2.71 in individuals who never had a periodontal disease or current tooth loss.⁴ Hiraki et al, found no association with the risk of pancreatic cancer. In few cases tooth loss is reported at high risk, of gastric, esophageal and pancreatic cancers.²² Michaud et al reported an association between tooth loss and pancreatic cancer. In 16 years of follow-up he diagnosed 216 patients with pancreatic cancer.²³

Hujoel et al found association between breast cancer and periodontal disease. Hiraki has found no association between breast cancer and tooth loss. Michaud et al conducted a cohort study in large group of people and found no link between tooth loss and esophageal cancer.² Hiraki et al has shown an association with esophageal cancer, poor oral hygiene and increased loss of teeth. Swallowing of large food particles may lead to injuries to esophagus mucous membrane.²²⁻²⁵

CONCLUSION

This review has outlined recent researches pointing to a possible role for tooth loss and periodontal disease in progression of cancer, independent of other known risk factors. Further researches will be needed to clarify the exact mechanisms involved.

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