Original Research Article

Periodontitis Effects on Cardiovascular Occlusion: A Risk not to be Underestimated

Dr. Romil Sharma[1], Dr. Devaraj C.G[2]

[1]MDS 2nd year, [2]Head of Department,
Department of Periodontology & Implantology, Mahatma Gandhi Dental College, Jaipur.

Corresponding Author: Romil Sharma

ABSTRACT

This paper evaluates the current information on the relationship between oral disease (specifically, Periodontitis) and coronary artery disease (CAD) to determine whether the information is sufficient to conclude that Periodontitis is a risk factor for CAD. Oral infection models have emerged as useful tools to study the hypothesis that periodontal infection is a cardiovascular disease (CVD) risk factor. Periodontal infections are a leading culprit, with studies reporting associations between periodontal disease and CVD. The results however have varied and it often is unclear what conclusions can be drawn from these data. The aim of this study was to investigate the association between Coronary artery disease incidence and prevalence of periodontal disease in such patients.

Key Words: Periodontitis, Cardiovascular occlusion, coronary artery disease (CAD), CVD.

INTRODUCTION

Traditional risk factors for coronary heart disease (e.g., hypercholesterolemia, smoking, and diabetes mellitus) are absent in portion of CHD cases. Therefore, recent cardiovascular epidemiologic research has focused on less established risk factors, such as periodontal disease and other chronic infections (e.g., those from chlamydia pneumonia, cytomegalovirus, herpes simplex virus, and helicobacter pylori). Observational studies, includes prospective cohorts, have found a 25% to 50% [1] increase in risk of CHD for those with periodontitis, when compared to those with no/minimal periodontitis. [2]

Periodontitis is a chronic inflammatory infection of the tissues surrounding and supporting the teeth, which is associated with Gram-negative bacteria in many patients. [2] In addition to epidemiologic studies linking these bacteria to heart disease, clinical investigations showed that some of them have been found in 44% atheromas from human surgical specimens. [3] A proposed mechanism for the association between periodontitis and CAD is that periodontitis creates a burden of bacterial pathogens, endotoxins, and inflammatory cytokines, which in some causes greater expression of local systemic mediators that may contribute to the development of atherosclerosis or relate to rupture of atheromatous plaque and clinical events.

The etiology of CAD is multifactorial with recent evidenced suggesting a role for infectious agents in the pathogenesis of CAD. Viral and bacterial infections may contribute to both initiation and progression of CAD as acute cardiac events such as myocardial infarctions (MI). [4] Infectious agents associated with CAD include bacteria involved in dental infections, particularly periodontal disease. [5,6] Pathologic bacteria inoculated from the oral

environment into the bloodstream may translocate to athresclerotic lesions or may induce platelet aggregation leading to thrombogenic events.

While numerous studies have demonstrated an association between periodontal disease and CAD, [7] several recent studies have failed to identify an association between the two. One possible explanation for these conflicting findings is that periodontal disease may have different association with chronic CAD and acute coronary events.

To verify all the above facts, the aim of this study was to evaluate the association between coronary artery disease (occlusion) and chronic periodontitis.

MATERIALS AND METHODS

For the study, patients were enrolled from Mahatma Gandhi dental college and hospital and Mahatma Gandhi Medical Hospital, Sitapura, Jaipur. Patients with the age 40 years and above were included in the study population. All the patients were priorly informed about the study procedure and a signed consent form was received from them. All the patients were undergoing treatment for Cardiac problems.

The records of 50 consecutive patients who had a cardiac catheterization as part of their medical care were reviewed.

Dental examination:-

The dental examination included clinical attachment loss (CAL), bleeding on probing (BOP), oral hygiene index simplified (OHIS), periodontal index (PI). All probing was done with an UNC-15 periodontal probe. Periodontal sites were classified by percentage of sites with ≥ 3 mm clinical attachment level (CAL), ≥ 3.5 mm CAL, ≥ 5 mm CA, ≥ 6 mm CAL.

Classification of Coronary disease (CAD)

Subjects were classified based on the results of angiogram as CAD+ (cases) or CAD- (control), by a cardiologist. CAD+ was defined as the presence of greater than 50% diameter reduction in at least one major epicardial artery, and CAD- was defined as having less than 50% epicardial artery diameter reduction in all identified arteries. Severity of CAD was also measured by the number of vessels affected using the following categories: 1) no artery occluded $\geq 50\%$; 2) one artery occluded $\geq 50\%$; 3) two arteries occlude $\geq 50\%$; 4) three or more arteries occlude $\geq 50\%$.

Exclusion criteria

All the subjects under the following criteria were excluded:-
1. Smoking habits
2. Age < 40 years
3. Past medical or dental treatment within 1 year
4. Antibiotic therapy within 6 months
5. Diabetes Mellitus
6. Evidences of MI in last 6 months of the dental examination
7. Pregnant Women
8. Lactating mothers

STATISTICAL ANALYSIS

The chi-squared test and student's t-test were used for univariate comparison between CAD+ and CAD- patients. Logistic regression was used to analyze the association of CAD status and cardiovascular risk factors. Logistic regression analysis was used to analyse the association of periodontal disease with CAD, after adjusting for the cardiovascular risk factors. Models were assessed by residual analysis and goodness-of-fit test. Logistic regression analysis, assuming proportional odds, was used to analyse the association of periodontal disease with number of arteries occluded, measured using an ordinal 4-level classification, after adjusting for cardiovascular risk factors. Computations were carried out using a software program.

RESULTS

A total of 34 patients were CAD+ and 16 were CAD- among all the chronic periodontitis patients selected (fig 1).
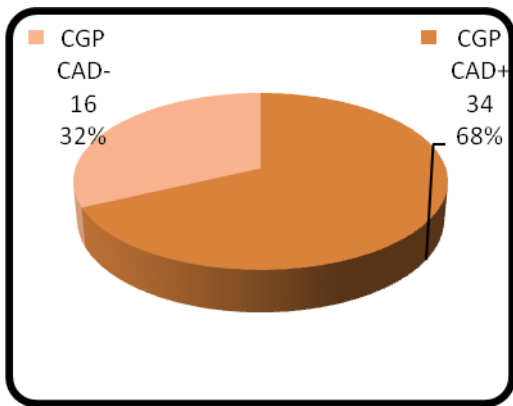
Fig 1.Distribution Chart showing CAD+ & CAD-

Coronary Artery Disease:

The results of the cardiac catheterization for those individuals enrolled in the study are presented in table 1. Among the CAD+ patients, 30.2% had 1 artery with ≥50% occlusion, 43.4% had 2 arteries with ≥50% occlusion, and 26.4% had 3 or 4 arteries with ≥50% occlusion. Among the CAD- patients, 4 patients had an occlusion of 30% in the most involved artery and 2 patients had an occlusion of 40% in the most involved artery.

Table 1: Mean of Variables of CAD+, CAD- with significance values

Variable	CAD+	CAD-	Significance
Number of coronary arteries occluded	2±0.1	0	0.0001
Most occluded coronary arteries	88.2±2	4.3±1.6	0.0001
Percent occlusion			
Left main artery	12.5±3.4	0.9±0.9	0.0015
Left anterior descending artery	73.6±3.3	3.2±1.8	0.0001
Left circumflex coronary artery	65.1±5.4	1.5±1	0.0001
Right coronary artery	64.4±5.4	0.8±0.8	0.0001

Periodontitis and CAD

As shown in table 2, CAD+ subjects had significantly greater mean CAL, number of sites with CAL ≥6mm, mean pocket depth than CAD- patients.

Table 2: Dental parameter changes between CAD+, CAD-

Variable	CAD+	CAD-	Significance
CAL	3.13±0.12	2.78±0.08	0.0227
CAL ≥6mm	6.8±1.4	33. ±0.6	0.0242
Bleeding on probing	13±1.4	15.4±1.8	0.2908
Mean probing depth	2.67±0.06	2.59±0.06	0.3833

DISCUSSION

This is the first study of the association between periodontal disease and chronic CAD that has used angiographic findings to define both CAD+ CAD- groups. Statistically significant associations between CAD and various indices of periodontitis were found in univariate analysis. Our findings demonstrate that a weak but valid relationship exists between angiographically significant CAD and periodontal disease.

The findings of this study are consistent with several investigations but are in contrast to various other studies failing to relate coronary artery disease and periodontal disease. [8] Various studies rely upon data such as patient histories and hospital records to establish CAD status. In the present study CAD+ patients represented a population of patients with angiographically significant CAD.

In the present study, patients with ≥50% stenosis in 1 or more major epicardial arteries were considered positive for CAD. This definition defines the patient with hemodynamically significant stenosis.

Limitations of the study

The selection criteria in this study excluded patients who had history of smoking as well as patients with diabetes mellitus. Smoking and diabetes are major risk factors for both CAD and periodontal disease. If periodontitis affects CAD only in presence of either smoking or diabetes, the current investigation would have not have identified such an association.

Several studies have found significant relationships between tooth loss and CAD. [9] In the present study all edentulous patients were excluded, thus creating a bias.

Future studies of periodontitis and cardiovascular disease

There is considerable variation in results regarding the relationship between periodontal disease and CAD. Future investigations of the relationship need to emphasize the definition of CAD so that potential association of periodontal disease with specific processes in the pathogenesis of CAD can be detected.

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