

Evaluation of Association of Periodontal Disease and Electrocardiographic (ECG) Changes - A Cross Sectional Study

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Abstract

Background: Periodontal diseases could be regarded as an independent risk factor for the onset of cardiovascular diseases. Evidence documents that periodontal diseases have an independent statistically significant association with cardiovascular diseases, although weak to moderate, after adjusting for potential confounding factors, such as advancing age, gender, race, smoking, hypertension, diabetes, indicators of socioeconomic status, stress, obesity, lipid rich diet and others. **Aim:** The aim of the study is to evaluate a correlation between periodontitis and ECG abnormalities. **Materials and Methods:** This is a cross-sectional study constituting 15 systemically healthy subjects with moderate to severe periodontitis and 15 systemically healthy subjects without periodontitis. Subjects were selected with proper inclusion and exclusion criteria. For each patient clinical parameters including PI, MGI, PD, CAL, BP and Electrocardiograph (ECG) are recorded. ECG changes like LVH, ST depression etc. are evaluated and the relation with periodontal condition is assessed. **Results:** No significant ECG abnormalities were detected in moderate-severe chronic generalised periodontitis patients. **Conclusion:** The present study did not find a relationship between periodontitis and ECG abnormalities. Further longitudinal studies with a larger sample size are required to associate the relationship.

Keywords: Periodontal diseases, gender, race, smoking, hypertension, diabetes.

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INTRODUCTION

Periodontal disease is a chronic microbial infection which triggers inflammation, affecting the immune system and resulting in alveolar bone destruction. Evidence documents that periodontal diseases have an independent statistically significant association with cardiovascular diseases (CVD) [1]. Electrocardiography (ECG) is a graphical representation of electrical activity of the heart muscles. ECG abnormalities are one of the most sensitive predictors of CVD [2]. As ECG examination takes only less time with minimal patient discomfort, these are widely employed to assess the risk of CVD. Therefore the present study is intended to evaluate a correlation between periodontitis and ECG abnormalities.

MATERIALS AND METHODS

The present study was cross-sectional in design consisting of 30 patients, attending the

Outpatient Department of Periodontics (Fig-1). Ethical clearance was obtained from the Institutional Ethics Committee. All the patients were explained about the study and written informed consent was obtained before the commencement from those who agreed to participate voluntarily in the study.

The subjects were recruited based on the following criteria:

Inclusion Criteria

Group A (Healthy group)–15 Systemically healthy subjects in the age group ranging from 25-60 years with clinically healthy periodontium and absence of clinical inflammation.

Group B (Chronic periodontitis group)–15 Systemically healthy subjects in the age group ranging from 25-60 years having at least a total of 14 teeth, diagnosed with severe, chronic generalized

periodontitis and having at least one site with a PPD ≥ 6 mm in each quadrant that bleed on probing.

Exclusion Criteria

Subjects with any systemic disease (diabetes, hypertension etc) which can alter the course of periodontal disease, smokers or subjects consuming alcohol, pregnancy/lactation, history of any recent infections, subjects on antibiotics and anti-inflammatory medications within the past 3 months. Subjects with history of periodontal treatment in past 6 months prior to the study and aggressive periodontitis. After recruitment in the study, patients were subjected to a detailed general and clinical examination and the

data pertaining to all the relevant parameters were recorded in a proforma specially designed for the study. Each subject completed a questionnaire which included the socioeconomic status, tobacco smoking and alcohol consumption. Clinical parameters like PI, MGI, PD, CAL were recorded using the periodontal probe. Blood pressure was measured using a standard mercury sphygmomanometer with the subjects in sitting position. ECG was recorded in the supine position for each subject using a standard electrocardiograph. The ECG parameters which were evaluated were LVH, P wave changes, QRS complex changes, ST segment changes, T wave changes and U wave changes.

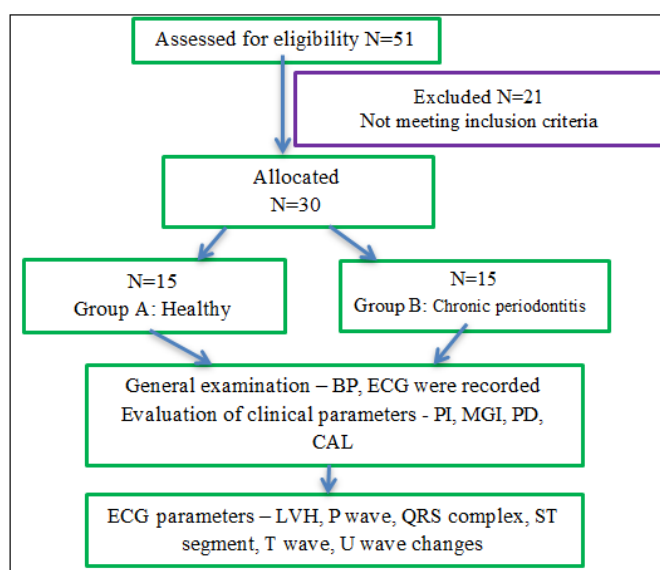


Fig-1: Consort diagram showing the patients allocation and recorded parameters

RESULTS

The clinical parameters of the group A are presented in Table-1 and group B in Table-2. The mean age in the group A is 40.8 and the mean age in group B is 44.0. The mean PD is 1.71 in group A and 6.72 in group B. The mean CAL is 6.74 in the group B. ECG abnormalities are charted in the Table-3. Non-specific T wave changes were seen in one of the patients in the group B. In the group A, LVH was seen in two of them.

One patient had ST segment depression and T inversion. These changes may be probably attributed to any other reason and needs further investigation on that. No correlation was seen with any changes in the ECG in the group B with the deep probing depths and CAL. Hence no significant ECG abnormalities were detected in group B that is moderate-severe chronic generalised periodontitis patients.

Table-1: Group A

PATIENT	AGE	SEX	PI	MGI	PD	CAL	BP	LVH	ST CHANGES	T CHANGES
C1	30	F	0.2	0	1.8	0	124/68	NO	NO	NO
C2	48	M	0.1	0	1.63	0	120/80	NO	NO	NO
C3	32	F	0.2	0	1.71	0	124/78	NO	NO	NO
C4	56	M	0.3	0	1.84	0	134/96	NO	NO	NO
C5	43	F	0.2	0	1.9	0	132/80	NO	NO	NO
C6	45	M	0.3	0	1.45	0	130/90	NO	NO	NO
C7	39	M	0.2	0	1.5	0	120/80	YES	NO	NO
C8	35	M	0.2	0	1.93	0	120/80	NO	NO	NO
C9	32	M	0.2	0	1.79	0	130/76	NO	NO	NO
C10	35	M	0.1	0	1.63	0	126/78	NO	NO	NO
C11	47	F	0.3	0	1.68	0	120/80	NO	DEPRESSION	INVERSION
C12	45	M	0.2	0	1.79	0	128/74	YES	NO	NO
C13	38	F	0.4	0	1.5	0	124/80	NO	NO	NO
C14	48	F	0.2	0	1.64	0	126/78	NO	NO	NO
C15	39	M	0.2	0	1.89	0	124/80	NO	NO	NO

Table-2: Group B

PATIENT	AGE	SEX	PI	MGI	PD	CAL	BP	LVH	ST CHANGES	T CHANGES
T1	60	M	1.9	1.23	6.2	6.76	130/90	NO	NO	NO
T2	40	M	2.1	1.54	6.4	6.53	126/84	NO	NO	NO
T3	42	F	2	1.96	6.5	6.34	128/80	NO	NO	NO
T4	35	F	1.7	2.42	7.3	6.87	126/76	NO	NO	NO
T5	40	M	1.9	1.96	6.9	7.12	128/80	NO	NO	NO
T6	45	F	2.4	1.93	6.9	6.54	132/78	NO	NO	NO
T7	34	M	1.9	1.59	6.1	6.76	130/78	NO	NO	NO
T8	50	F	2	1.96	7.34	6.53	132/90	NO	NO	NO
T9	42	F	1.8	2.34	7.1	6.34	126/82	NO	NO	NO
T10	38	M	2.3	1.96	7	6.87	128/76	NO	NO	NO
T11	45	M	2.2	1.67	6.4	6.67	132/80	NO	NO	NO
T12	35	F	2.6	1.21	6.3	7.24	126/80	NO	NO	NON SPECIFIC
T13	55	M	2.4	1.09	6.8	7.13	128/86	NO	NO	NO
T14	50	M	1.9	1.36	6.5	6.98	128/84	NO	NO	NO
T15	50	F	1.9	1.89	7.2	6.45	130/80	NO	NO	NO

Table-3: ECG Abnormalities

GROUP	P WAVE	QRS COMPLEX	ST	T WAVE	U WAVE	LVH
GROUP A (N=15)	0	0	0	1	0	0
GROUP B (N=15)	0	0	1	1	0	2

DISCUSSION

The idea that oral microorganisms were responsible for a wide range of systemic conditions that were not easily recognized as being infectious in nature was first conceived by British physician, William Hunter. He identified caries teeth, gingivitis and periodontitis as foci of infection and advocated extraction of these teeth to eliminate the source of sepsis.

Periodontitis is characterized by episodes of inflammation that result from gram-negative bacteria. These bacteria have lipopolysaccharides (LPS) in their cell walls which activate the production of inflammatory mediators such as TNF- α and IL-1 β [3, 4]. IL-1 β itself is a promoter of smooth muscle cell proliferation and can be responsible for thickening of blood vessels walls and increases the risk of cardiac or cerebrovascular events [5-7]. Resting ECG abnormalities were significant predictors of both total and fatal CHD independent of other confounding variables [8, 9]. Changes in the ECG like LVH, ST depression, T inversion suggest ischemia, MI and other CVD [10, 11]. Research documents the association between PD and cardiovascular disease. This was reported by a landmark cross sectional study which first pointed out the association between CVD and PD [12]. After this a number of studies implicating periodontitis for etiopathogenesis were published, however, few of the studies did not find any association. Beck et al established Periodontal disease as a risk factor for CVD, including atherosclerosis, MI and stroke. They concluded that patients with severe periodontitis were twice as likely to have fatal heart attack and three times

as likely to have a stroke compared to those without periodontitis [13]. Meta-analysis by Bahekar *et al.*, studied 5 prospective cohort studies indicated that patients with periodontal disease has 1.14% RR of developing CVD than healthy subjects [14]. Another meta-analyses by Mustafa et al and Humphrey *et al.*, found that periodontal disease may only slightly increase the risk of cardiovascular disease [15, 16]. The incidence of ACVD, as represented by incident CHD, cerebrovascular disease and peripheral arterial disease is higher in subjects with PD and/or worse periodontal status, compared to subjects without PD or with better periodontal status, independent of many established cardiovascular risk factors [17, 18]. Several studies have reported no relationship between periodontitis and CVD [19, 20]. Hujoel *et al.*, defined edentulous status as completely eliminating dental infections and showed that edentulous subjects did not have a lower CVD risk than subjects with periodontitis [21]. Both edentulous status and severe periodontitis are significant risks for CVD [22, 23]. Linkai *et al.*, in a systematic review evaluated the effects of periodontal therapy on CVD outcomes and concluded that periodontal treatment has good effects on controlling high-density lipoprotein cholesterol [24]. The findings from a systematic review by D Aiuto *et al.*, suggest that Periodontal therapy triggers a short-term inflammatory response followed by a progressive and consistent reduction of systemic inflammation and an improvement in endothelial function [25]. There is limited evidence that these acute and chronic changes will either increase or reduce CVD burden of individuals suffering from periodontitis in the long term [26, 27]. The association of periodontal disease and the risk of CVD can be evaluated by clinical intervention studies before and after treatment

of periodontal disease, if any reduces the risk of CVD or not.

CONCLUSION

The present study did not find a correlation between periodontitis and ECG abnormalities. Further longitudinal studies with a larger sample size are required to associate the relationship.

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