Erectile Dysfunction Might Be Associated With Chronic Periodontal Disease: Two Ends of the Cardiovascular Spectrum

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ABSTRACT

Introduction. Both chronic periodontal disease (CPD) and erectile dysfunction (ED) are associated with cardiovascular disease and its risk factors, including smoking and diabetes mellitus. However, the association between ED and CPD has never been studied.

Aim. To study the association between ED and CPD.

Main Outcome Measures. Prevalence of ED, prevalence of CPD, ED severity.

Methods: The study population consisted of 305 men who filled the Sexual Health Inventory for Men (SHIM) questionnaire in order to detect ED and assess its severity, and underwent a pair of standardized posterior dental bitewing radiographs in order to detect CPD. SHIM questionnaire scores 21 or less represented ED. Alveolar bone loss of ≥6 mm represented CPD.

Results. The mean age of included men was 39.5 ± 6.7 years. Overall, 70 (22.9%) men had ED and 13 (4.3%) had CPD. CPD was significantly more prevalent among men with mild ED ($P = 0.004$) and moderate to severe ED ($P = 0.007$) in comparison to men without ED.

Conclusions. ED might be associated with CPD. These preliminary findings are consistent with theories that associate these conditions with systemic inflammation, endothelial dysfunction, and atherosclerosis. **Zadik Y, Bechor R, Galor S, Justo D, and Heruti RJ. Erectile dysfunction might be associated with chronic periodontal disease: Two ends of the cardiovascular spectrum. J Sex Med 2009;6:1111–1116.**

Key Words. Erectile Dysfunction; Periodontal Disease; Atherosclerosis

Introduction

Chronic periodontal disease (CPD), also called *chronic periodontitis* or *chronic periodontal inflammation*, is a common bacterial-induced inflammatory disease, resulting in resorption of the tooth-bearing alveolar bone and eventually shedding of the involved teeth. "Periodontal Medicine" is an emerging concept in the dental literature of the last decade, which deals with the association between CPD and systemic diseases [1], such as coronary heart disease [2], cerebrovascular disease [3], diabetes mellitus [4], smoking, and chronic obstructive pulmonary disease [5].

Erectile dysfunction (ED) is the inability to attain and/or maintain an erection sufficient for satisfactory sexual performance [6]. Most men experience ED at some point in their lives, usually after the age of 40 years [7]. There are up to 30 million men in the United States alone who have some degree of ED [8]. In all, 52% of the participants of the Massachusetts Male Aging Study, who were between 40 and 70 years old, were found to have some degree of ED, with nearly 10% of them having complete ED [9].

ED and CPD share risk factors and associated systemic conditions such as smoking, diabetes mellitus, and coronary artery disease [9–15]. ED as well as CPD can be symptoms of these conditions and can act as markers of disease progression. For example, CPD might be associated with poor diabetic control [16], and ED might be associated

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with poor cardiovascular prognosis in diabetic men [17]. However, the association between ED and CPD has never been studied.

The aim of this study is to examine the association between CPD and ED in a population of young men.

Methods

Staff Periodic Examination Center (SPEC)

All Israel Defense Forces (IDF) personnel aged 25 years and older undergo medical screening examinations every 3–5 years at the SPEC. Each patient completes a detailed computerized questionnaire surveying his medical history and smoking habits. The Sexual Health Inventory for Men (SHIM) questionnaire comprises part of the above-mentioned questionnaire, aiming to detect ED and assess its severity, although its completion is not mandatory. A complete physical exam, including height and weight measurements, is also performed. A complete report is mailed to the patient as well as to his primary physician in order to assure further investigation, treatment, and follow-up. Finally, the results are recorded into a database, which is investigated by the medical corps both for medical and military purposes. This database was used in previous studies concerning ED [17–24]. IDF personnel have their annual teeth examination in a dental clinic adjacent to the SPEC.

Included and Excluded Men

Between the years 2004 and 2005, 815 men had posterior bitewing dental radiographs in the clinic adjacent to the SPEC dental clinic. Included were all men who filled the SHIM questionnaire during this time period as part of the SPEC examinations. Excluded were men who did not fill the SHIM questionnaire. The study was approved by the IDF medical corps.

SHIM Questionnaire

The SHIM questionnaire was used to detect ED and assess its severity. This questionnaire consists of five items, each rated on a 6-point scale from 0 to 5, except for one item which is rated on a 5-point scale from 1 to 5. The final score, ranging from 1 to 25, is calculated by summing up individual question scores. Scores above 21 represent normal erectile function and scores at or below this cutoff represent ED. ED severity is classified into four categories based on the SHIM scores, namely 1 to 7—severe ED, 8 to 11—moderate ED, 12 to 16—moderate to mild ED, 17 to 21—mild ED, 22 and above—no ED [25].

Assessment of Alveolar-Bone Loss

Bilateral pairs of standardized posterior bitewing dental radiographs were used to detect CPD. Measurements of the alveolar bone height were performed by two experienced dental practitioners (YZ and RB). The distance between the cement–enamel junction (CEJ) and the alveolar bone crest was measured at interproximal sites from the distal aspect of the first premolars to the mesial aspect of the second molars. Measurements were made with the aid of a viewing box and a magnifying lens. CPD was defined as alveolar bone loss at least one site in the jaw with distance of CEJ to alveolar bone crest of 6 mm or more [26,27]. The examiners were blinded to the SHIM questionnaire scores of included men at the time of radiographs evaluation.

ED and CPD Risk Factors

According to our previous experience with the SPEC population, ED is associated with age, diabetes mellitus, and low education level [21], while according to the literature, CPD is associated with diabetes mellitus and smoking [4,5]. Hence, we compared between men with CPD and men without CPD in terms of the mean age, prevalence of low education level ($\leq$12 school years), and the prevalence of current smoking. We did not compare the prevalence of diabetes mellitus between the groups, as diabetes mellitus is rare among IDF personnel, being an excluding condition for the service [21]. We did not compare the prevalence of hypertension between the groups, as hypertension is not associated with ED in young men [20].

Statistical Analysis

Continues variables were expressed by mean $\pm$ standard deviation. The Student's *t*-test was used to compare between mean parametric variables of men who filled the SHIM questionnaire and men who did not fill the SHIM questionnaire. The Student's *t*-test was also used to compare between mean parametric variables of men with CPD and men without CPD. The χ^2-test was used to compare the prevalence of nonparametric variables between men who filled the SHIM questionnaire and men who did not fill the SHIM questionnaire, and between men with CPD and men without CPD. The χ^2-test was also used to compare the prevalence of CPD between men

Table 1 Prevalence of current smoking and low education levels among men with and without chronic periodontal disease

		CPD (n = 13)	No CPD (n = 292)	*P* value
Current smoking	n (%)	6 (45.8%)	63 (21.6%)	0.07
Low education levels (≤12 years)	n (%)	2 (15.4%)	48 (16.4%)	0.93

CPD = chronic periodontal disease.

with different ED severity levels. Statistical significance was accepted at the probability level of $P < 0.05$. Data were analyzed by SPSS 15.0 (SPSS, Inc., Chicago, IL, USA).

Results

Overall, 305 men filled the SHIM questionnaire during health examination at the SPEC and had posterior bitewing dental radiographs in the adjacent dental clinic. There were no statistical differences between men who filled the SHIM questionnaire and men who did not fill the SHIM questionnaire in terms of the mean age (39.5 ± 6.7 vs. 37.3 ± 7.2 years, $P > 0.05$), the prevalence of smoking, and the prevalence of low education level (data not shown).

Overall, 70 (22.9%) men had ED according to the SHIM questionnaire scores: 51 (16.7%) men had mild ED, 18 (5.9%) had moderate ED, and one (0.3%) man had severe ED. According to the posterior bitewing dental radiographs, 13 (4.3%) men had CPD among included men, while 42 (8.2%) men had CPD among men who did not fill the SHIM questionnaire ($P = 0.03$). There were no statistical differences between men with CPD and men without CPD in terms of the mean age (40.4 ± 7.6 vs. 39.5 ± 6.7 years, $P > 0.05$) and the prevalence of low education level. The prevalence of smoking was higher among men with CPD relative to men without CPD, although this difference did not reach statistical significant ($P = 0.07$) (Table 1).

The alveolar bone loss according to ED status is presented in Figure 1 (with moderate and severe ED groups combined due to small numbers). CPD (alveolar bone loss of 6 mm or more) was significantly more prevalent among men with mild ED ($P = 0.004$) and moderate to severe ED ($P = 0.007$) in comparison to men without ED.

Discussion

We studied the association between CPD and ED in young men. We evaluated the existence of CPD by measuring the radiographic alveolar bone loss in standardized bitewing radiographs. According to Mol, bitewing radiograph is the modality of choice to detect CPD and assess the extent of alveolar bone loss [26]. Moreover, Merchant et al. demonstrated that, for epidemiological surveys, CPD can be reliably and efficiently measured even from nonstandardized bitewing radiographs [27]. ED evaluation was done using the SHIM index, which is a well-established, valid, and reliable questionnaire [25]. This index is an abridged 5-item version of the 15-item International Index of Erectile Function; thus, its simplicity makes it an easy method for large-scale ED studies as well [28], and we gained experience using this tool in previous studies concerning ED [17–24].

The association between ED and CPD has never been investigated until now. As mentioned above, the rationale for such association is based on the common risk factors and associated sys-

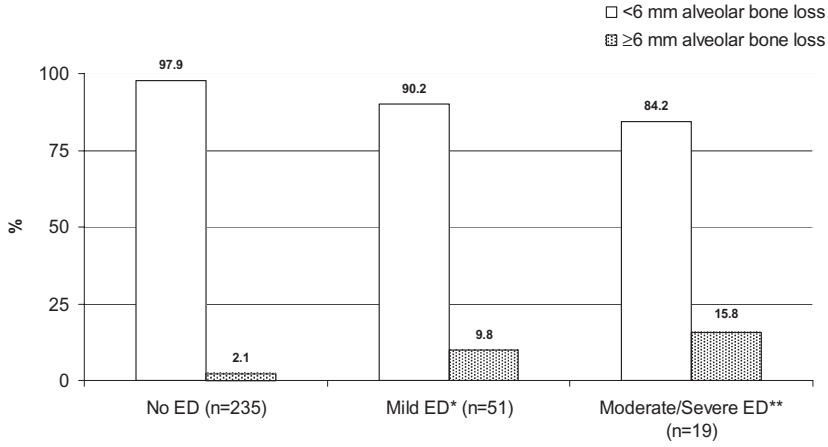

Figure 1 Prevalence of chronic periodontal disease (≥6 mm alveolar bone loss) by erectile dysfunction (ED) severity. *$P = 0.004$; **$P = 0.007$.

temic conditions of the two pathologies, namely smoking, diabetes mellitus, and coronary artery disease [9–15]. According to epidemiological studies as well as meta-analysis, CPD is associated with increased risk for coronary heart disease [29,30] probably because patients with CPD neglect their teeth just like they neglect their high weight, high blood pressure, and other aspects of health. However, according to Dietrich et al., CPD is associated with increased incidence of coronary heart disease in young men independent of established cardiovascular risk factors [31], and according to Higashi et al., CPD is associated with endothelial dysfunction [32]. This may be the linkage to ED, which is also associated with endothelial dysfunction and coronary heart disease independent of established cardiovascular risk factors [33]. In addition to clinical studies, the pro-atherogenic role of periodontal pathogens starts to emerge through sero-epidemiological studies [34]; DNA of periodontal pathogens has been detected in athermanous plaques [35]. Since ED is thought to be an early sign of coronary heart disease [36], it is reasonable to believe that systemic inflammation induced by periodontal pathogens might be associated with endothelial dysfunction and atherosclerosis first in the small vessels, such as the penile vasculature, and later in larger arteries such as the coronaries. Hence, CPD might be associated first with ED in young men, and later with coronary artery disease in middle-aged men.

According to the present results, an association exists between ED in young men and CPD, i.e., radiographic alveolar bone loss of 6 mm or more. Moreover, the high prevalence of CPD among men who did not fill the SHIM questionnaire implies that the true association between CPD and ED may be stronger. On the other hand, due to the small number of patients, it is not clear whether this association is independent of cardiovascular risk factors. Hence, a large-scale study with confounder analysis and a longitudinal follow-up is warranted, particularly among men in older age groups who are more likely to have associated cardiovascular diseases and cardiovascular risk factors, in order to assess the relationship between these two conditions that represent two ends of the cardiovascular spectrum.

Study Limitations

We assume that CPD is associated with ED just like it is associated with cardiovascular diseases and its risk factors. We believe chronic inflammation and endothelial dysfunction link CPD and ED. However, the SHIM questionnaire does not differentiate between vascular ED, psychogenic ED, and ED due to other causes. The assumption of vascular ED in this age group, however, would require Doppler ultrasound of the penis and other confirmatory tests.

Clinical Implications

It is too early to conclude that men with ED should have their teeth checked, and that men with CPD should consult a physician competent in sexual medicine. Still, it is reasonable to believe that patients, who neglect their high cholesterol and high sugar, also neglect their teeth and their sexual life. General practitioners, who focus on primary and secondary prevention of cardiovascular disease, should also ask their patients about their sexual life and oral hygiene, as it is only a matter of time until these aspects of well-being will be included in the growing list of cardiovascular risk factors, and as they might be the first sign of endothelial dysfunction and atherosclerosis.

Conclusions

ED might be associated with CPD in young men. These preliminary findings may encourage investigators to study these less-appreciated risk factors of the cardiovascular spectrum, and general practitioners to ask their patients about their sexual life and oral hygiene.

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