International Journal of Cardiovascular Sciences. 2019;32(1)35-40

ORIGINAL ARTICLE

Impact of Periodontal Disease on Late Morbimortality (10 Years) of Pacientes with Acute Coronary Syndrome

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Abstract

Background: It is known that predisposing factors for periodontal disease (PD) and cardiovascular diseases are similar, just as dissemination of oral flora pathogens can induce the development of cardiovascular diseases, which play a direct role on the morbimortality of patients.

Objective: To assess the impact of periodontal disease in the presence of acute coronary syndrome on late morbimortality after long-term follow-up of patients (10 years).

Methods: The historical prospective study of continuous assessment was based on the evaluation of 345 medical records of patients hospitalized for acute coronary syndrome, divided into 3 groups: edentulous, with periodontal disease and without periodontal disease. The patients studied were in the ICU, in 2006, with a clinical picture of acute coronary syndrome submitted to invasive stratification with coronary angiography on the basis of clinical indication and were reassessed over the next 10 years. The qualitative variables were compared using the Chi-square test. Long-term mortality was assessed using the Kaplan-Meier curves, quantified with the hazard ratio (HR) and a confidence interval of 95% and compared through Cox regression. P values of less than or equal to 0.05 were regarded as statistically significant.

Results: Of the 345 patients, 233 had at least one coronary obstruction greater than or equal to 50%, being the main group for comparison according to the different status of periodontal disease (without periodontal disease, with periodontal disease and edentulous). In this cardiovascular condition, we found a difference in mortality among edentulous patients compared to those free of periodontal disease, with a p = 0.004 and a hazard ratio of 10.496 (95% CI: 4.988-22.089). A significant difference was also noted between edentulous patients and patients with periodontal disease, with a p = 0.0017 and a hazard ratio of 2.512 (95% CI: 1.491-4.234).

Conclusion: A significant increase in mortality was found according with the progression of periodontal disease, which justifies its classification as an important risk factor for the development of cardiovascular diseases, as well as the need for prevention and treatment of oral diseases. (Int J Cardiovasc Sci. 2019;32(1)35-40)

Keywords: Periodontal Diseases / complications; Acute Coronary Syndrome / mortality; Dental Plaque; Gengivitis, Plaque Atherosclerotic.

Introduction

Cardiovascular diseases (CVD) are characterized as chronic or acute changes in the heart and blood vessels, such as angina, acute myocardial infarction and stroke, being responsible for 24.9% of the deaths registered in Brazil, according to data from the Health Ministry (MS, 2011).[1]

The main theory regarding the etiology of CVDs is the atherosclerotic plaque formation within arterial territory due to an inflammatory process associated with the deposition of toxins and organic materials. Thus, the direct presence of bacteria in the atheroma plaque and / or its toxins affect synergistically the integrity of the endothelium,[2] and diseases that cause bacteremia, such as the periodontal disease (PD), can promote this process.

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DOI: 10.5935/2359-4802.20180074

Manuscript received July 29, 2017; revised manuscript April 09, 2018; accepted May 14, 2018.

The groups of PD include periodontitis, whose main causal agent is the bacterial plaque, which causes a chronic inflammatory process that affects the tissues of tooth support, including the periodontal ligament and alveolar bone.[3]

It is worthy of note that both diseases share common risk factors, including obesity, smoking, diabetes mellitus and low educational level.[4] PD bacteria can disseminate hematogenously during dental procedures or as a result of inflammatory processes and dental loss in patients with low oral health.[5]

The proximity of the oral biofilm to the periodontal vasculature facilitates the spread of bacteria to different histological sites[6] promoting changes in the lungs, kidneys and in the cardiovascular system. In general, the presence of lipopolysaccharide (LPS) from anaerobic gram-negative bacteria, associated with the release of pro-inflammatory cytokines (IL-1, IL-6, TNF-α and prostaglandin E2), increased fibrinogen levels and C-reactive protein (CRP), promotes the activation of polymorphonuclear and macrophages with immunological response in the intima layer, which speeds the formation of foam cells, basic structures of the atherosclerotic plaque.[7] Furthermore, LPS can promote lipogenesis through direct action on the hepatocytes, also intensifying the formation of atheroma plaques.[8]

The aim of this study is to demonstrate and understand the relations established between PD and CVD in patients with acute coronary syndrome and proven diagnosis of PD, in terms of morbimortality, and who were followed during 10 years.

Methods

The research was designed as a historical prospective study of continuous evaluation of 361 patient medical files assessed for the first time around 10 years ago in Accarini's study, 20069. The access to the files was granted and monitored by the Research Ethics Committee (CAAE 44588915.9.0000.5415).

After the 10-year period, out of the 361 initial medical files, 345 (95,6%) were found for the current assessment. The lack of 16 medical files may be a result of the computerization process of the hospital management system, with a possible loss during the replacement of the paper medical records by the electronic medical records in the hospital.

The assessment and classification of the patients in 2006, in relation to periodontal disease, were performed by one single odontologist, specialized in periodontics, through clinical analysis carried out in the doctor's office or in hospital (patients in ICU). All six surfaces of the teeth were inspected, with assessment of the following parameters: level of pocket depth, level of clinical insertion, gingival index and plaque index. Out of the 345 medical files assessed, it was possible to keep the classification in relation to the PD: edentulous (182), with periodontal disease (113) and without periodontal disease (50).

In relation to CVD, in 2006, the diagnosis of unstable angina or acute myocardial infarction was established according to clinical, electrocardiographic and enzymatic criteria and coronary cineangiography. Therefore, the 345 patients were classified in relation to the CVDs into: without coronary disease (66), at least one coronary obstruction, always < 50% (12), at least one coronary obstruction, ≥ 50% (233) and those who did not undergo catheterization (34).

Statistical analysis

The qualitative variables were compared using the Chi-square test. Long-term mortality was assessed using the Kaplan-Meier curves, quantified with the hazard ratio (HR) and a confidence interval of 95% and compared through Cox regression. P values of less than or equal to 0.05 were regarded as statistically significant.

Results

Table 1 was structured based on the evaluation of the 345 medical records found, showing the number of patients according to the circumstances studied, both periodontal and cardiovascular, after ten-year evolution from the first analysis.[9]

Edentulous patients with at least one coronary obstruction ≥ 50% (Group A) were analyzed, with 125 elements in this intersection, and compared with the patients with no periodontal disease and no coronary disease (Group B), with 16 elements. During the 10-year-period of follow-up, the total death numbers observed in groups A and B were, respectively, 43 and 1. The Hazard Ratio for Group A versus Group B was equal to 6.853 (95% CI: 2.905-16.164). The chi-square test for equivalence of mortality rates indicated a p value of 0.0305. Thus, Chart 1 shows a comparison of patient survival in groups A and B during the follow-up period.

Another chart (Chart 2) was organized to compare Group A, with 125 elements, with the group of patients

Table 1 - Distribution of cases without coronary artery disease, with mild obstructive coronary disease (< 50%), with severe obstructive coronary disease (< 50%), and that did not undergo catheterization relative to the presence or not of periodontal disease or edentulous condition

	No periodontal disease [50]	Periodontal disease [113]	Edentulous [182]	Deaths / total
No coronary disease	16	19	31	11 / 66 (16.7%)
At least one coronary obstruction, always < 50%	3	5	4	2 / 12 (16.7%)
At least one coronary obstruction, ≥ 50%	28	80	125	58 / 233 (24.9%)
No catheterization	3	9	22	12 / 34 (35.3%)
Deaths / total	2/50 (4.0%)	17 / 113 (15.0%)	64 / 182 (35.2%)	83 / 345 (24.0%)

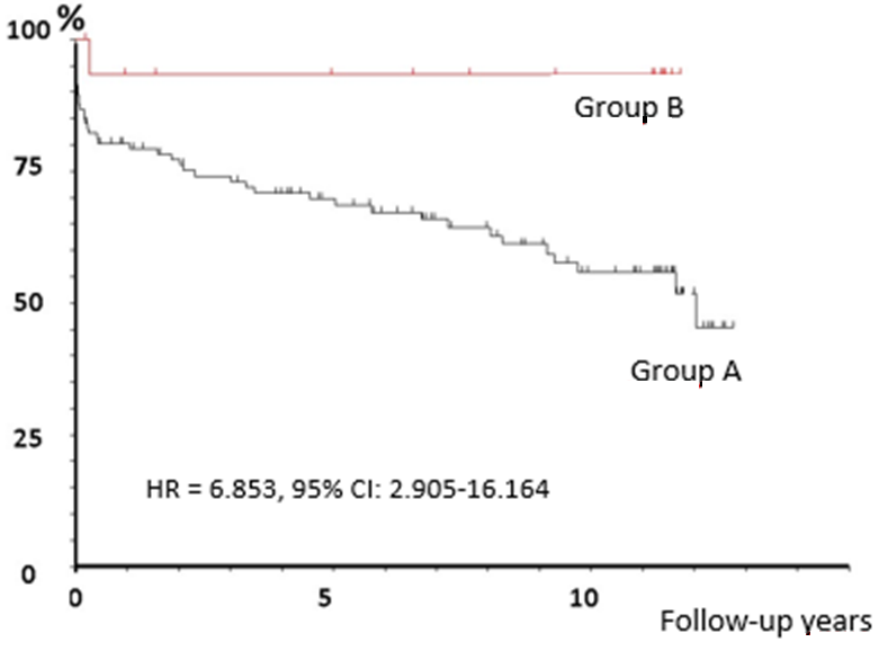

Chart 1 - Group A, formed by edentulous patients with at least one coronary obstruction ≥ 50%, compared with Group B, formed by patients with no periodontal disease and no coronary disease.

with active periodontal disease and at least one coronary obstruction, ≥ 50% (Group C), with 80 elements. During the time interval, the number of deaths in Group A was 43, while in Group C, only 14 deaths occurred. The Hazard Ratio Group A vs Group C was equal to 2.512 (95% CI: 1.491-4.234). The p-value found when comparing the curves was 0.0017.

Finally, it was possible to create Chart 3, by comparing Group A, with 125 elements, with the group of patients with no periodontal disease and at least one coronary obstruction ≥ 50% (Group D), with 28 elements. Within the 10-year-follow-up, 43 deaths occurred in Group A and only 1 death in Group D. In this comparison, the p value was 0.004 and the hazard ratio was 10.496 (4.988-22.089).

Discussion

This study, whose objective was to understand the relation, in terms of the morbimortality, between periodontal disease (PD) and acute coronary syndrome

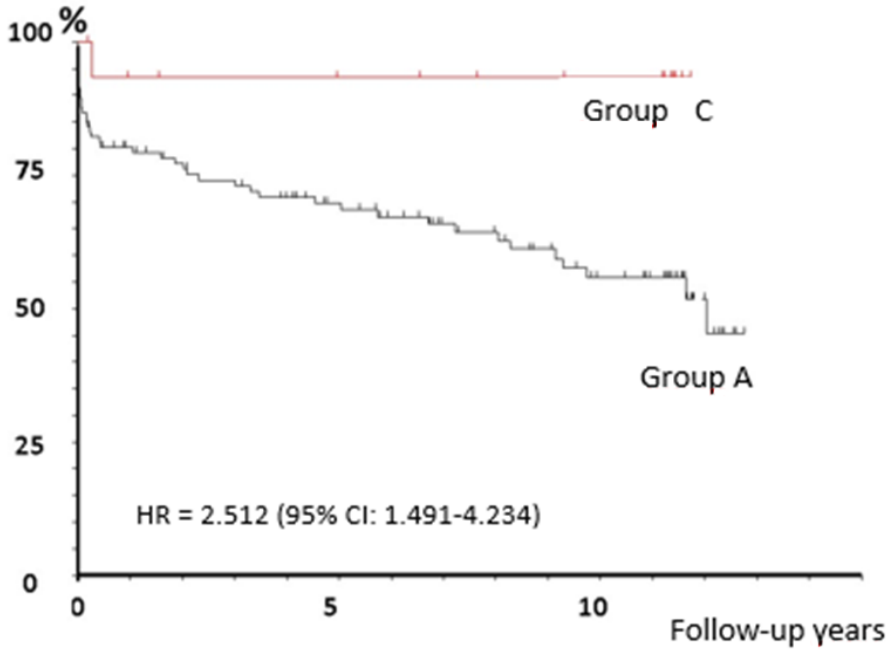

Chart 2 - Group A, formed by edentulous patients with at least one coronary obstruction ≥ 50%, compared with Group C, formed by patients with active periodontal disease and at least one coronary obstruction ≥ 50%.

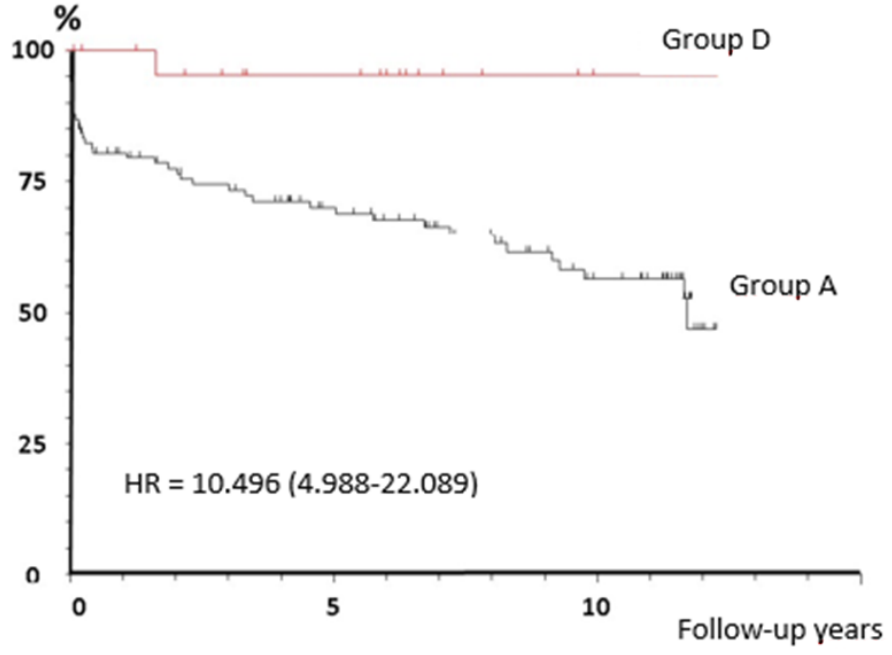

Chart 3 - Group A, formed by edentulous patients with at least one coronary obstruction ≥ 50%, compared with Group D, formed by patients with no periodontal disease and at least one coronary obstruction ≥ 50%.

(ACS) after long-term follow-up of patients (10 years), demonstrates that the presence of active periodontal disease or its sequel (edentulous patients) has a significant impact on late mortality over 10 years.

The most promising hypothesis to explain this association may lie in the analysis of inflammatory markers characteristic or predictive of cardiac ischemic events.[10] The inflamed and ulcerated periodontal pocket tissue acts as a route of entry for pathogens in the bloodstream, where it promotes bacteremia with dissemination throughout the host body. This pathway of infection is called transient metastatic bacteremia. The bacteremia caused by periodontal patogens interacts with the antibodies of the host and forms complexes that induce inflammatory reactions, a mechanism known as immunological metastatic lesion, responsible for the destructive process with the activation of defense cells, including macrophages and their precursors, monocytes, lymphocytes and polymorphonuclear leukocytes (PMNs).[11,12]

Monocytes respond to the bacterial endotoxin (LPS) with the liberation of inflammatory mediators, such as prostaglandin E2, and certain cytokines, including interleukin-1b and tumor necrosis factor-alpha (TNF-α).[13] These mediators promote vasodilation, increased vascular permeability, recruitment of inflammatory cells, connective tissue degradation and bone destruction.[14]

Data obtained in the extensive American study NHANES, with 32.000 participants, showed that the relative risk for CVD increased by 25% among patients with periodontitis. In addition to the pathophysiological process previously presented, it is worth mentioning that there is an indirect relation between periodontal and cardiovascular diseases.[15] Patients with poor hygiene habits present low consumption of low-GI foods, such as fruits and vegetables, which can result in obesity, hypertension and diabetes mellitus (precursors of CVD).[13] The statistically significant association between obstructive coronary disease and presence of periodontal disease strongly suggests that the latter should be inlcuded among the risk factors for the development of obstructive coronary disease and atherosclerotic plaque instability, culminating in an acute coronary syndrome.[9]

Conclusion

A significant increase was noted in the long-term mortality (10 years) according with the progression of periodontal disease, which justifies its classification as a major risk factor for the development of cardiovascular diseases, as well as the need for prevention and treatment of oral diseases.

Author contributions

Conception and design of the research: Godoy MF. Acquisition of data: Moras LL, Accarini R. Analysis and interpretation of the data: Carvalho TA. Statistical analysis: Godoy MF. Writing of the manuscript: Oliveira MB. Critical revision of the manuscript for intellectual content: Ricci GA.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Sources of Funding

There were no external funding sources for this study.

Study Association

This study is not associated with any thesis or dissertation work.

Ethics approval and consent to participate

This article does not contain any studies with human participants or animals performed by any of the authors.

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