

Periodontal Disease in Pregnant Patients with Rheumatic Valvular Disease - Clinical and Microbiological Study

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Abstract

Background: The periodontal disease during pregnancy of women with rheumatic valve disease imply infective endocarditis risks and higher rate of preterm birth and low birth weight.

Objective: To study the periodontal disease rate of women with rheumatic valve disease during pregnancy.

Methods: We studied 140 pregnant women who included 70 patients with rheumatic valve disease and 70 healthy women. The periodontal examination included: 1) periodontal clinical exam regard the follow variables: a) probing depth; b) gingival margin; c) clinical attachment level; d) bleeding on probing; e) plaque index and f) gingival index; and 2) microbiological test was performed in samples serum and gingival crevicular fluid and considered positive controls to *Porphyromonas gingivalis*, *Tannerella forsythia* e *Aggregatibacter actinomycetemcomitans*.

Results: Age and parity were similar between groups; as single or combined the mitral valve disease was prevalent among the rheumatic valve lesion in 45 (32.1%) e 20 (28.5%) cases, respectively. Among the periodontal variables gingival margin ($p=0.01$) and plaque index ($p=0.04$) were different between groups. The periodontal disease was identified in 20 (14,3%) pregnant women, seven (10%) of them were patients with valve rheumatic disease and the remain 13 (18,6%) were healthy women, its percentual was not different between groups ($p=0,147$). Microbiological analyses of oral samples showed higher percentual of *P. gingivalis* in healthy pregnant women ($p=0.004$).

Conclusion: The clinical and microbiological study during pregnancy showed comparable incidence of periodontal disease between women with rheumatic valve disease and healthy women. (Arq Bras Cardiol 2011;96(4):307-311)

Keywords: Periodontitis; gengivitis; heart valve diseases; rheumatic disease; pregnancy.

Introduction

Periodontal disease comprehends a broad spectrum of alterations in periodontal tissue, which has an inflammatory and/or infectious origin. These alterations can take place during pregnancy, when physiological alterations in the oral cavity, attributed to hormonal mechanisms that occur during pregnancy, result in what is called pregnancy gingivitis¹, characterized by inflammation of the gingiva, cement and periodontal ligament and that predisposes the pregnant woman to periodontitis.

The periodontitis that affects around 15.0% of the Brazilian population^{2,3} is a more severe clinical situation, as it involves the alveolar bone and is also associated with microorganisms, in the majority of cases gram-negative anaerobic bacilli,

especially the bacteria *Porphyromonas gingivalis* (*P. gingivalis*), *Tannerella forsythia* (*T. forsythia*) and *Aggregatibacter actinomycetemcomitans* (*A. actinomycetemcomitans*)⁴.

During pregnancy, the permanent inflammatory and infectious state of the oral cavity⁵ represents a potential risk, either by favoring the occurrence of infectious endocarditis or by causing obstetric complications, such as miscarriage and prematurity⁶.

In this sense, the objective of the present study was to study the frequency of periodontal disease in women with rheumatic valvular disease during pregnancy.

Methods

From January 2005 to July 2008, a cross-sectional study was carried out, which selected 140 pregnant women aged 18 to 35 years, consecutively treated at the Brazilian Public Health System (SUS). The group of women with rheumatic valvular disease consisted of 70 pregnant women treated at the Cardiopathy and Pregnancy Outpatient Clinic of the Valvular Cardiopathy Unit of Instituto do Coração (InCor). The control group consisted of 70

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healthy pregnant women followed at the Prenatal Outpatient Clinic of *Centro de Saúde Geraldo de Paula Souza*, from the School of Public Health of the University of São Paulo (USP).

When included in the study, the groups of healthy and rheumatic pregnant women were paired for age, socioeconomic and cultural level and gestational age. All patients followed a protocol that included periodic clinical evaluation and dental clinical assessment, aiming at the identification of periodontal disease and the microbiological study of the oral cavity. In the group of rheumatic pregnant women, among the medications used for the cardiological treatment, the intramuscular injections of G benzathine (1,200,000 IU every 21 days) were maintained, for secondary prophylaxis of the rheumatic disease. Women with other comorbidities, such as arterial hypertension, diabetes mellitus, infectious diseases or those that had received antibiotic therapy during the previous three months, were excluded from the study.

The anamnesis included questions on oral hygiene habits. The patients were submitted to periodontal clinical assessment, which used the dental mirror and a probe with millimeter markings to record the following parameters: a) probing pocket depth (PPD), that corresponds to the distance (mm) between the gingival margin and the depth of the gingival sulcus or periodontal pocket; b) distance of the enamel-cement junction to gingival margin (ECJ/GM); c) clinical attachment level (CAL), which is the arithmetic difference of the values of PPD and ECJ/GM; d) the bleeding index (BI) on the four sides of each assessed tooth; e) bacterial plaque index (BPI); and f) furcation involvement.

The diagnosis of periodontal disease was based on the criteria by Tonetti and Claffey⁷. The microbiological analysis of saliva and cone samples used DNA extraction and polymerase chain reaction (PCR) techniques. The positive controls were cultivated strains of the bacteria *P. gingivalis*, *T. forsythia* and *A. actinomycetemcomitans*, according to Ashimoto's technique⁸.

The statistical analysis of the results used absolute and relative frequencies of data, central trend measurements (means and medians) and the dispersion of values (minimum and maximum values and standard deviations). The association tests (Pearson's Chi-square and Fisher's exact test) were calculated to assess the association between the presence of periodontal disease and the qualitative variables. The assessment of the periodontal disease took into account the clinical parameters: PPD, CAL, ECJ/GM, BI and BPI. The Mann-Whitney nonparametric and Pearson's

Chi-square tests were used to compare the rheumatic and the healthy pregnant women. The level of significance was set at 5.0% for the rejection of the null hypothesis.

The study was approved by the Committee of Ethics in Research of *Hospital das Clínicas* of the School of Medicine (CAPPesp - process # 199/05) and of InCor (process # 2557-04/177) of the University of São Paulo (USP) and by the Committee of Ethics in Research of *Instituto Dante Pazzanese de Cardiologia*. The patients were included in the protocol after signing the Free and Informed Consent Form, according to the norms established by Resolution # 196 of October 10, 1996, of the National Council of Health.

Results

A total of 61 patients (43.6%) were primiparas and the mean maternal age was not different ($p < 0.451$) between the groups, being 27 ± 4.6 years in rheumatic patients and 27 ± 5.1 in the healthy ones. The analysis of the distribution of valvular lesion in the rheumatic group showed that 45 (32.1%) of them presented mitral valve lesion, 5 (3.6%) presented aortic valve lesion and 20 (28.5%) presented a combination of aortic and mitral valve lesion. Fifteen of the 70 rheumatic patients had been submitted to cardiac surgery for biological valve replacement.

Clinical-odontological assessment

The analysis of the information on the oral hygiene showed that flossing was more common ($p = 0.02$) in the group of rheumatic pregnant women (48 = 68.5%) when compared to the healthy women (32 = 45.7%), whereas rinsing the mouth with mouthwash was 2.3-fold more common among the healthy pregnant women. The odontological and microbiological assessments were carried out at similar gestational ages ($p = 0.801$), generally at the $27.8^{\text{th}} \pm 6.6$ week of gestation in the rheumatic group and at the $29.8^{\text{th}} \pm 7.6$ week in the healthy group.

The mean number of preserved teeth was 24.1 teeth in the rheumatic group vs 24.0 in the healthy group. Periodontal disease was identified in 20 (14.3%) pregnant women, being 7 (10%) rheumatic and 13 (18.6%) healthy ones, with no statistical difference ($p = 0.147$) when comparing the two groups. The analysis of the periodontal parameters shown in Table 1 demonstrated differences between the groups regarding ECJ/GM and PI ($p = 0.04$).

Table 1 - Frequency of periodontal disease and measurements of odontological parameters

Groups	Rheumatic pregnant woman	Healthy pregnant woman	p value
Periodontal disease	7 (10.0%)	13 (18.6%)	0.147
Measurement of parameters	Range (mean - SD)	Range (mean - SD)	p value
PPD	0.94 - 2.67 (1.48 ± 0.33)	1.06 - 3.73 (1.45 ± 0.38)	0.166
CAL	0.17 - 0.97 (0.46 ± 0.5)	0.12 - 2.1 (1.06 ± 0.35)	0.164
ECJ/GM	-0.02 - 1.28 (0.5 ± 0.29)	-0.13 - 2.34 (0.36 ± 6.23)	0.01
BI	0.00 - 26.7 (5.73 ± 10.4)	0.00 - 25 (6.23 ± 5.07)	0.99
PI	0.00 - 53.7 (10.4 ± 11.67)	0.00 - 85 (13.48 ± 13.85)	0.048

PPD - probing pocket depth; CAL - clinical attachment level; ECJ/GM - distance of the enamel-cement junction to gingival margin; BI - bleeding index; PI - plaq

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Microbiological assessment

The comparative analysis between the groups showed that the proportion of *P. gingivalis* was significantly higher in the saliva of pregnant women, when compared to the rheumatic ones ($p = 0.004$), but there was no difference regarding the bacteria *T. forsythia* and *A. actinomycetemcomitans*, in both saliva and cone samples (Table 2). The analysis of the distribution of types of bacteria among the 20 pregnant women that presented periodontal disease showed that the proportion of *P. gingivalis* and *A. actinomycetemcomitans* was significantly higher in the saliva and cone samples, respectively (Table 3).

Obstetric data

There were no maternal obstetric complications during gestation and delivery. The gestational age at delivery, calculated as weeks of gestation, ranged from 36 to 42 (mean = 38.54 ± 6.65) weeks in the rheumatic and between 32 and 42 (mean = 39.28 ± 7.65) weeks in the healthy pregnant women. Newborn weight ranged between 3,017 and 4,488 g (mean = $3,069 \text{ g} \pm 455$) in the rheumatic group and between 3,290 and 4,260 g (mean = $3,286 \text{ g} \pm 455$) in the healthy group. The comparative analysis showed that the gestational age at delivery and newborn weight were lower in the rheumatic group, showing statistical significance (respectively, $p = 0.0036$ and $p = 0.034$).

Discussion

The present study provides original data on the effect of periodontal disease in two special situations: pregnancy and rheumatic valvular disease.

Hormonal alterations during gestation, changes in eating habits and poor oral hygiene habits are factors that favor the manifestation of gestational gingivitis, common during the pregnancy-puerperium cycle^{9,10}. That is further complicated by the lack of access to dental care and the myth about the safety of dental treatment, which predispose to periodontal disease during pregnancy¹¹.

Although the population considered in this study was exposed to all these factors, the incidence of 14.0% of periodontal disease was not different from the percentage found in the general population¹². Among the explanations for this finding are the sample's characteristics: young patients

Table 3 - Distribution of the bacteria *Porphyromonas gingivalis*, *Tannerella forsythia*, *Aggregatibacter actinomycetemcomitans* in saliva and cone samples of pregnant women with periodontal disease (* $p = 0.001$)

Bacteria	<i>P. gingivalis</i>	<i>T. forsythia</i>	<i>A. actinomycetemcomitans</i>
Saliva	11 (55.0%)*	4 (20.0%)	1 (5.0%)
Cone	7 (35.0%)	8 (40.0%)*	1 (5.0%)
Absent	2 (10.0%)	8 (40.0%)	18 (90.0%)

(mean of 27 years) who are known¹³ to present a lower risk of periodontal disease when compared to older patients and the exclusion of smokers and patients with diabetes mellitus, conditions known to elevate the risk for periodontal disease in the general population¹⁴⁻¹⁵. It is noteworthy, however, that studies on the incidence of periodontal disease in cardiopathic patients with rheumatic valvular disease are scarce.

The present study showed that the proportion of 13 (18.6%) cases of periodontal disease in the healthy group and 7 (10.0%) cases in the rheumatic group did not present statistical difference. However, at the clinical examination, parameters such as distance of the enamel-cement junction (ECJ) to gingival margin (GM) and the bacterial plaque index (PI) were different in the healthy pregnant women.

Such findings might be explained by the better oral hygiene performed by the rheumatic pregnant women, who flossed more regularly than the healthy ones. Although they presented similar socioeconomic levels, the women with valvular disease are probably better informed on the potential cardiac risks associated with poor oral hygiene, the result of the continuing education received throughout the cardiological follow-up.

In this sense, it has been reinforced in daily practice that the chronic inflammatory and infectious state of the mouth contributes to intermittent bacteremia and the risk of infectious endocarditis in patients with valvular disease. In fact, Hull¹⁶ and Holmstrup¹⁷ demonstrated that the oral cavity is the main route of entry of etiological agents in infectious endocarditis.

Regarding the types of microbial agents in periodontal disease, the difficulties in recognizing their specificity are based on the large number of species, with 300 to 400 of them being found in bacterial biofilm¹⁸. Of this spectrum, possibly 10 to 20 species participate in the pathogenicity

Table 2 - Proportion of bacteria identified in saliva and cone samples in the groups

Bacteria	Sample	Rheumatic pregnant woman	Healthy pregnant woman	Total	p value
		n (%)	n (%)	n (%)	
<i>Pg</i>	Saliva	21 (30.0)	38 (54.3)	56 (42.1)	0.004
	Cone	19 (27.1)	26 (37.1)	45 (32.1)	0.205
<i>Tf</i>	Saliva	24 (34.3)	19 (27.1)	43 (30.7)	0.36
	Cone	31 (44.3)	23 (32.9)	54 (38.6)	0.165
<i>Aa</i>	Saliva	8 (11.4)	5 (7.1)	13 (9.3)	0.382
	Cone	4 (5.7)	4 (5.7)	8 (5.7)	1

Pg - *P. gingivalis*; *Tf* - *T. forsythia*; *Aa* - *A. actinomycetemcomitans*.

and periodontal destruction in periodontal disease¹⁹, with a prevalence of gram-negative anaerobic bacilli and among them, *A. actinomycetemcomitans* (Hacek group), *P. gingivalis* and *P. intermedia*, with a predominance in gingival samples²⁰.

The identification of a higher proportion of *P. gingivalis* in the saliva of healthy pregnant women in comparison with the rheumatic ones (54.3% vs 29.20%; $p = 0.004$) reinforces the explanation of a better oral health status of the cardiopathic patients, when compared to the healthy ones.

However, the positive influence of benzathine penicillin in the rheumatic group should be considered. Thus, the recommendation for maintaining the administration of this antibiotic every 21 days throughout pregnancy with the objective of preventing new rheumatic episodes might represent an additional benefit for the improvement of oral health and the prevention of periodontal disease during pregnancy.

In the present study, the prevalence of *P. gingivalis* in the saliva samples of patients that had periodontal disease corroborates the reports by Dietrich and Takeuchi¹⁹, who demonstrated that *P. gingivalis* was a very virulent pathogen and that its detection must be used as a clinical indicator for periodontal disease.

As for the obstetric evolution, our results did not allow us to correlate periodontal disease with the adverse effects in pregnancy. Although the literature has called attention to the association between periodontal disease with low birth weight and prematurity, due to the systemic inflammatory state, there is not enough evidence to allow the correlation of the effects of periodontal disease with com adverse obstetric outcomes²¹.

On the other hand, the significant proportion of low-weight newborns and the younger gestational age at birth verified in the group of rheumatic pregnant women are explained by the maternal cardiac output restrictions and beta-blocker use by the rheumatic pregnant women.

Regarding the maternal scenario, the absence of complications during the pregnancy-puerperium cycle is attributed to the non-inclusion of patients with arterial hypertension, diabetes mellitus and other morbidities, associated with the rigorous prenatal care provided by the multidisciplinary team.

Conclusion

The clinical-microbiological study of the oral cavity during pregnancy showed that the frequency of periodontal disease in women with rheumatic valvular disease was not different when compared to healthy pregnant women.

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Potential Conflict of Interest

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

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Study Association

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