

INFLUENCE OF HORMONAL VARIATION ON PERIODONTAL TISSUES DURING PREMENSTRUAL AND PREOVULATORY PERIODS

ABSTRACT

The aim of this work was to evaluate the hormonal influence on periodontal tissues in two moments: premenstrual and preovulatory, in women whose are in the reproductive phase between 18 and 45 years. The sample is composed by 30 women, who were analyzed following the inclusion criteria as: not pregnant women, who are not using contraceptive or other means of hormonal replacement, who were not in the menopause and who did not present systemic diseases. The periodontal exams were accomplished in two periods: premenstrual and preovulatory, when it was verified bleeding on probing (BOP) and probing depth (PD) indexes. The premenstrual period obtained greater bleeding on probing index when compared with preovulatory period, showing a statistically significant difference. However, in spite of the probing depth measurements have been greater in the premenstrual period (1.684 ± 0.4728) than in the preovulatory one (1.679 ± 0.4749); the differences were not statistically significant. Basing on the results and according to the methodology used, it was possible conclude that the hormonal variation influences on periodontal tissues.

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KEYWORDS

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INTRODUCTION

The main function of periodontal tissues is inserting the tooth within the maxillary bone tissue and maintains the surface integrity of masticatory mucosa in the oral cavity. Periodontal tissues can suffer changes with age and, besides, can also suffer changes in their shapes related to the functional changes and in the oral environment.¹

Inflammatory processes which can attack the tissues that involve the teeth are most common diseases caused by microbial infections, which can be associated to the plaque accumulation, pathogenic microorganisms and calculus.²

According to Sooriyamoorthy and Gower³ (1988), these changes caused by the increase in the serum level of female sex hormones - estrogen and progesterone, they are also related to the plaque on the tooth surface, because on the hormone elevation periods, periodontal tissue respond to the presence of plaque with more pronounced inflammation than in periods of low hormone levels.

Changes in hormone levels occur when the anterior pituitary secretes follicle-stimulating hormone (FSH) and luteinizing hormone (LH), which result in mature ovary and in the production of estrogen and progesterone. During these changes which occur in the normal menstrual cycle,

periodontal tissues are considered susceptible to changes, as clinical attachment loss, extent of probing depth and gingival bleeding. Interaction between estrogen and progesterone as chemical mediator of inflammation may help to explain increased levels of periodontal inflammation observed during the periods of hormonal fluctuation.¹

These hormonal peak periods are more intense in the premenstrual periods, because there are two hormones present, estrogen and progesterone, and it is expected a more evident response in the gingival tissue, as the inflammation and bleeding increases, that can also change the probing depth.⁴

Various oral changes may be associated to the menstrual cycle, like ulcerated mucosa, vesicular lesions, aphthous ulcers, bleeding, edema and redness in the gums, become more pronounced in premenstrual period. In the menstrual phase, patients may notice bleeding or swollen gums due to the fragility of blood vessel by hormonal concentration.⁵

By hormonal unbalance that occur in women during the menstrual cycle, there is more susceptibility in the periodontal tissues in the arisen of gingival and periodontal inflammatory diseases. Therefore, the aim of this study was evaluate the hormonal influence in periodontal tissues during two periods: both premenstrual and preovulatory of women in the reproductive phase through clinical

evaluation using bleeding on probing (BOP) and probing depth (PD) indexes.

According to Ferris⁶ (1993), the focus on women health by dentists and the increase of understanding of periodontal problems which affect them may help on differential treatment, because comprehend at least half the patients attended in the dentistry clinics.

Dentist's knowledge about this matter is of paramount importance to identify hormonal change periods in women and the influence of these changes in periodontal tissues. Therefore, it helps the dentist to diagnose properly and treat female patients according with systemic changes. Thereat, after the appropriate diagnose, he can orient the oral hygiene, because a tissue changed by plaque can has more consequences, like diseases related to the tissues which involves the dental element.

The hypothesis in this study is that hormonal changes which occur in the women's reproductive period influence periodontal tissues, and in the premenstrual period, there is more susceptibility to gingival inflammation.

MATERIAL AND METHODS

The sample was composed by 30 women in the reproductive period with age from 18 to 45 years old, following inclusion criteria like: not pregnant women who are not using contraceptive or other means of hormonal replacement, who were not in the

menopause and who did not present systemic diseases. The participants were informed about the aim of this study and have signed the Statement of Informed Consent. In order to carry out this study, it was submitted to the Ethics Committee of the University of Southern Santa Catarina, and approved. In this sense, evaluation of the periodontal tissues was performed using measurement methods, like bleeding on probing (BOP) and probing depth (PD) indexes.

Data collection for periodontal tests was carried out in the Dentistry Clinic of UNISUL, using millimeter periodontal probe (Duflex), clinical mirror (Duflex), clinical tweezers (Duflex) and periodontal file utilized by the subject periodontics of UNISUL, to register the data.

These evaluations were performed in two periods: premenstrual, 4 to 5 days before menstruation - maximum peak of progesterone and estrogen; and preovulatory, 1 to 2 days before ovulation - maximum peak of estrogen; the ovulation occurs in the fourteenth day after the first day of menstruation. Days of collection data were determined based on tables of menstrual control for each patient, according to her own menstrual cycle.⁷

The Bleeding on Probing (BOP), developed by Mühlemann and Son (1971), was used to evaluate the presence of inflammation in periodontal tissues; it was registered 0 for

bleeding absent on dental surface, and 1 for cases in which occur bleeding in any tooth face, evaluating 15 seconds after introducing the millimeter periodontal probe.⁸ For measurement, a millimeter periodontal probe was introduced inside the gingival sulcus, traversing all of teeth surface (vestibular, palatal/lingual, mesial and distal). The values were registered on the periogram utilized by the subject of Dentistry of UNISUL.

The probing depth (PD) was also performed with millimeter periodontal probe. The depth measure was the distance between the gingival margins until the position in which the probe has presented resistance. Measures were taken in six points of dental surface (distobuccal, vestibular, mesiovestibular and distolingual, lingual, mesiolingual).² Next, the measures were registered in millimeters on the same periogram than P O B.

From this, several forms of clinical manifestation of periodontal tissues were compared in relation to the hormone levels in premenstrual and preovulatory periods. Data were analyzed statistically through *t-student* test and presented as graphs and tables.

RESULTS

The results were analyzed through *t-student* test and have shown statistically significant differences in relation to the bleeding on probing of different groups; premenstrual period have had higher bleeding

on probing index (0.24 ± 0.26) when compared to the preovulatory period (0.14 ± 0.20) Tables 1, Graph 1. However, related to the probing depth, there were no significant differences between the period preovulatório (1.67 ± 0.47) and premenstrual (1.68 ± 0.47) Table 2, Graph 2.

DISCUSSION

Researches have shown that female sex hormones estrogen and progesterone change the inflammatory response on periodontal tissues, mainly in the premenstrual period, which presents higher peak of estrogen and progesterone.

Although most severe manifestations on gingival or periodontal tissues in women result from hormonal changes by oral contraceptive, pregnancy, menopause and post menopause, some changes may occur during moments of reproductive cycle (menstrual). Hormones influence significantly women, mainly in changes on periodontum related to changes of hormonal peak. Knowing how to recognize changes which may occur in the oral cavity will help the dentist to understand the effect of female sex hormones in buccal tissues inflammation, mainly on gingival tissues.^{6,8}

According to Mariotti⁹ (1994) and Tilakaratne et al¹⁰ (2000), women who use oral contraceptive ingest high doses of estrogen and progesterone, what result in changes on the periodontal tissues, similar to

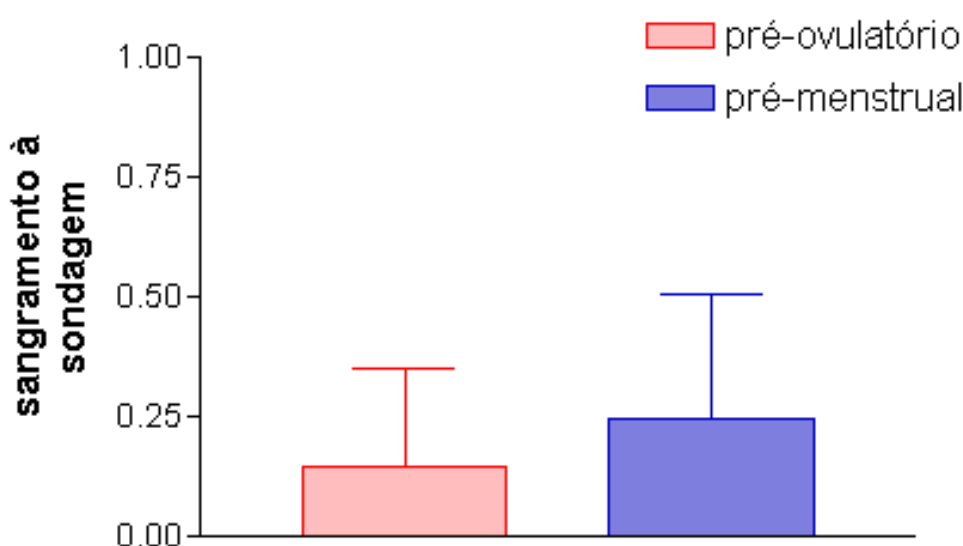
women who are in premenstrual period, and also pregnant women, because in these periods there are higher levels of estrogen and

progesterone. Wherefore, these groups are associated to the presence of gingivitis.

Table 1. Evaluation of probing on bleeding on periodontal tissues in preovulatory and premenstrual periods ($p < 0.0001$).

PERIOD	N	M \pm DP	P
Preovulatory	807	0.1462 \pm 0.2042	$p < 0.0001$
Premenstrual	807	0.2441 \pm 0.2628	

Graph 1. Evaluation of gingival bleeding index in preovulatory and premenstrual periods ($p < 0.0001$).



Some female patients are not aware to changes in the gum, while others fall ill by gingival bleeding and edemas, days before the menstruation. These oral manifestations are common when there are higher female sex hormone levels due to an increase of gingival inflammation and presence of gingival exudate.

11

Plaque count may remain with no changes when there are hormonal changes, mainly when occurs the peak of estrogen and progesterone. However, in this period of female sex hormones' peak, the answer of

periodontal tissues may be different, like the severity of inflammatory response of gingival tissues; in other words, it results in an increase of gingival response before the plaque.⁶

There are several kinds of gingival diseases in which the sex hormone changes may be considered a beginner factor, or even complicating. These kinds of gingival changes are characterized by their hormonal-physiological associations, by a severe bleeding tendency and by non-specific inflammatory changes; in other words, these differences observed in gingival tissues during the

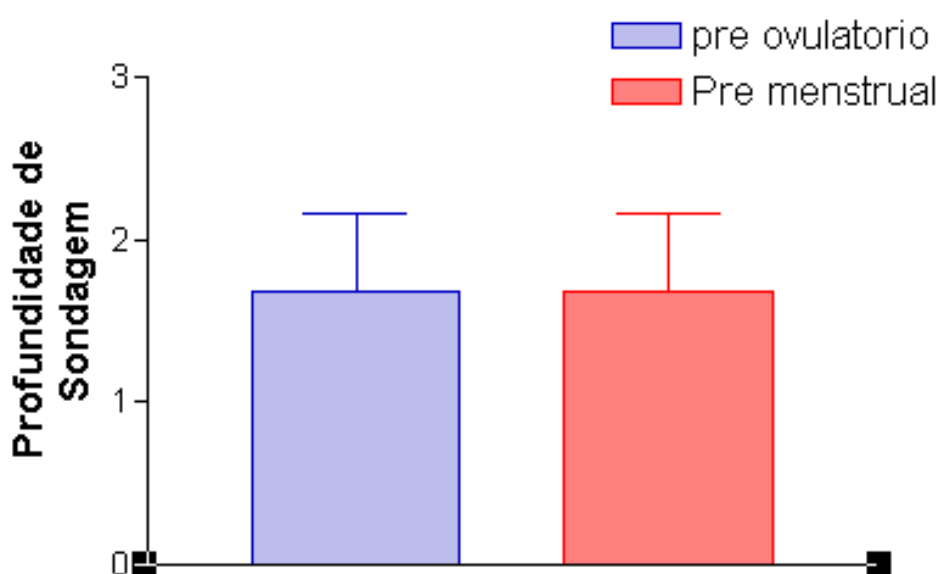
menstrual cycle may be attributed to the interaction among female sex hormones and

specific cells of periodontum inflammation.^{12,13}

Table 2. Evaluation of probing depth in periodontal tissues in preovulatory and premenstrual periods ($\rho = 0.7324$).

PERIOD	N	M \pm DP	P
Preovulatory	807	1.679 \pm 0.4749	$\rho = 0.7324$
Premenstrual	807	1.684 \pm 0.4728	

Graph 2. Evaluation of probing depth in periodontal tissues in preovulatory and premenstrual periods ($\rho = 0.7324$).



As Lindhe, Karring and Lang¹ (2005) assert, hormonal changes experienced by women during physiological and non-physiological conditions result in significant changes in periodontum, particularly in the presence of gingival inflammation pre-existent and induced mainly by plaque. Changes in the level of hormones occur when the anterior pituitary secretes follicle-stimulating hormone (FSH) and luteinizing hormone (LH), what results in the ovary maturation and in the cyclical production of estrogen and

progesterone, and these changes are identified during the hormonal fluctuation periods. The interaction of estrogen and progesterone with inflammatory mediators can help to explain the increased levels of inflammation observed during the hormonal fluctuation periods.

According to Carranza and Newman¹⁴ (2007), the period of higher quantity of progesterone have been associated to the increase of permeability of micro gingival vascularization, what increases the susceptibility for injuries and exudation,

changing the immune response. In other words, gingival tissues may present erythema before menstrual periods.

During the menstrual cycle, the progesterone achieves its higher elevated concentration degree and appears in the oral cavity some aphthous ulcers, and herpes labialis lesions and Candidiasis infections may also occur in women.⁴

The first phase of a women's normal menstrual cycle, considering 28 days of cycle, correspond to the preovulatory period – 1 to 2 days before ovulation, occurring the estrogen hormone peak. In the same menstrual cycle, there is the premenstrual cycle – between 4 and 5 days before menstruation, which correspond to the estrogen and progesterone peaks.⁷

According to Sooriyamoorthy and Gower³ (1988), only from 2 to 10% of each steroid hormone in the circulatory system is free or biologically active. Only free hormones in the circulatory system penetrate easily in tissues and saliva; what indicates that oral tissues are more exposed to these concentrations when compared with other tissues and are more vulnerable to hormonal changes.

According to the graph 1 and the table 1 of this study, after the evaluation of bleeding on probing index on periodontal tissues in the premenstrual and preovulatory periods, it was verified that the inflammation degree on

tissues which involves dental elements in the premenstrual period, with higher levels of estrogen and progesterone, was significantly higher than in the preovulatory period. Güncü et al⁴ (2005) assert the increase of vascular permeability, the reduction of mediators of inflammation cells and reduction of tissue repair result in increase of gingival inflammation, because receptors of estrogen and progesterone are present in the gingival tissues.

According to Cordeiro and Costa⁵ (1999), hormonal changes themselves do not initiate periodontal diseases, it must be also the presence of plaque, but higher concentrations of female sex hormones may accentuate the clinical frame of inflammation due to the vascular changes that these hormones provide.

Ferris⁶ (1993) assert that plaques are the main factors for inflammatory periodontal diseases, but they can be changed by systemic factors, like changes in the circulatory levels of female sex hormones, what worsen the gingival inflammatory response; in other words, steroid hormones become the gingival tissue more sensitive to microbial changes.

Clinical changes show in induced plaque that gingivitis are attenuated by the sex hormones concentrations in the circulatory system, resulting in the increase of fluids exudation and bleeding on probing. There is relation between the production of changed

steroid hormone and the increase of periodontal pathologies.³

Cordeiro and Costa⁵ (1999) reported some manifestations more evidenced in the oral cavity during the premenstrual period, like ulcers in the oral mucosa, gingival bleeding, edema and redness.

According to the graph 2 and the table 2, the probing depth does not show significant difference between preovulatory and premenstrual periods. According to the methodology established, periodontal tests were carried out in the same menstrual cycle, and it is probable that due this the difference were not significant between premenstrual and preovulatory periods, because the time between the evaluations were about 15 days, and it would not have time for an expressive response in periodontal tissues to occur increase in the probing depth. As approached by Carranza and Newman¹² (1997), administration of progesterone produce dilatation and increase of permeability of gingival micro vascularization, increases the susceptibility for injuries and exudation, but with no affect the morphology of gingival epithelium.

In this work, clinical changes more detached, due to the hormonal changes caused in women, mainly in premenstrual period, with estrogen and progesterone in high levels, teeth with higher gingival bleeding were observed, as well as swollen gum and report by patients

evaluated in this research the occurrence of sore gums during the probing depth test.

Dentists' knowledge about the effects of hormonal changes that occur in oral tissues is essential for the clinical routine; this understanding about changes in the systemic hormonal conditions of women can help the dentist in diagnose and treatment of these patients, treating early and teaching them to prevent major problems in the future through clarification of daily care which are extremely important in the phases of estrogen and progesterone peak, related to the premenstrual period.

CONCLUSION

Premenstrual period, related with bleeding on probing obtained higher statistically significance in relation to the preovulatory period in a same reproductive cycle. Related with probing depth, this study shows there was no statistical difference between the same periods previously mentioned.

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