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# Effect of the menstrual cycle on pain experience associated with periodontal therapy Randomized, pilot study

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#### Abstract

**Objectives:** The aim of this pilot cross-over study was to compare preliminarily the pain perception of female patients undergoing periodontal debridement during menstrual or pre-menstrual phases (peri-menstrual period) with that observed during mid-menstrual phase (post-menstrual period).

**Materials and Methods:** Twenty women with moderate-to-advanced chronic periodontitis and regular menstrual cycles were asked to complete Corah's Dental Anxiety Scale (DAS) during the first debridement visit. Patients were randomly assigned to receive their first debridement visit during either their peri-menstrual or post-menstrual period. Debridement was performed in bilateral quadrants of patients during the periods. Pain levels for each quadrant were assessed with a Visual Analogue Scale (VAS), after each debridment visit.

**Results:** There was no significant correlation of order of treatment in the intensity of perceived pain during the periods (p < 0.05). The median VAS scores were 22.0 and 15.2 mm in the peri-menstrual and the post-menstrual period, respectively. Increase in pain perception among females during their peri-menstrual period was significantly greater than their post-menstrual period (p < 0.05).

**Conclusion:** No clinical conclusions can be drawn at this stage as this pilot study did not have a sufficiently broad population to generalize these observations to all female periodontal patients. Providing clinicians with information about patients' menstrual cycle during debridement can alter the pain experience.

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Visits for periodontal therapy generally include recordings of plaque and calculus scores, followed by supra- and subgingival debridement of areas with calculus deposits. Although the available literature is limited, many patients complain of the procedure being painful (Chung et al. 2003, Van Wijk et al. 2004).

An unpleasant emotion, pain is a biological response to a noxious stimulus. The reaction of an organism to this impulse is formed by transmission of endogenous and exogenous painful stimuli (Aydinli 2002).

Patients' subjective response to pain can also differ, and demonstrate gender differences as well. There are several studies indicating pain perception variations between males and females (Berkley 1997, Riley et al. 1998, Keogh & Herdenfeldt 2002). It has been suggested that these differences are caused by hormonal influences (Fillingim et al. 1999, Fillingim & Ness 2000). Related to varying levels of hormones such as progesterone, women often have different pain complaints during their menstrual cycles. In particular, the premenstrual syndrome (PMS), a common cyclic disorder of young and middleaged women, is characterized by emotional and physical symptoms that consistently occur during the luteal phase of the menstrual cycle. Apart from PMS, women may experience painful cramps in the abdominal and inguinal region just before and during their menstrual period (dysmenorrhoea) (Dickerson et al. 2003).

Regardless of whether the menstrual cycle was divided into four or five phases, Hellstrom & Anderberg (2003) determined that pain perception of women is significantly higher in the menstrual and pre-menstrual phases than in the mid-menstrual phase. During the menstrual cycle, clinically healthy females demonstrate different periodontal conditions. Over 50 years ago, Mühlemann described a case of "gingivitis intermedialis" consisting of bright red heamorrhagic lesions of the interproximal papillae prior to the menstrual period. Gingival manifestations of bleeding and swelling, an increase in gingival exudate and a minor increase in tooth mobility had been observed during the menstrual cycle (Mühlemann 1948).

The main goal in the treatment of patients with periodontitis is to establish and maintain adequate infection control in the dentogingival area (Wennström et al. 2005). A series of clinical trials consistently found that the one-stage fullmouth disinfection is more efficacious than consecutive sessions of quadrant root planing at 2-weekly intervals (Quirynen et al. 1995, Mongardini et al. 1999). Despite the fact that full-mouth scalling and root planing were well tolerated by patients, this treatment approach resulted in higher pain scores and greater intake of analgesics (Apatzidou & Kinane 2004a, Kinane 2005).

The aim of this pilot cross-over study was to compare preliminarily the pain perception of female patients undergoing periodontal debridement during the menstrual and pre-menstrual phases (peri-menstrual period) with that observed during the mid-menstrual phase (post-menstrual period).

## Materials and Methods Study population

A total of 20 volunteers between the ages of 27 and 49 (mean 38.85 years) were recruited from the Department of Periodontology, School of Dentistry, Ege University, Turkey. All patients exhibited moderate-to-advanced chronic periodontitis based on clinical findings. Patients reported to have regular menstrual cycles (i.e. the length of their cycle varied by no more than  $\pm 3$  days) for the last 12 months and were not on oral contraceptives (LeResche et al. 2003). Patients' smoking habits were also recorded.

In order to qualify for the study, patients had to have a minimum of five teeth in each quadrant and the degree of periodontal disease had to be homogenous. At least three teeth in each quadrant were required to have a probing pocket depth of 4 mm or greater. None of the subjects had received periodontal debridement within the preceding 12 months. Because of the fact that antidepressants and analgesics may have an affect on pain thresholds, patients taking any of these were excluded from the study (Chung et al. 2003).

#### Procedures

Supragingival and subgingival debridement was performed on one quadrant of the patients between 4 and 5 days prior to and the first 3 days of their menstrual cycle (peri-menstrual period). This cross-over study was performed with a split-mouth design, and another debridement took place during the first week after the menstruation (also known as the post-menstrual period) (Hellstrom & Anderberg 2003). The number and type of teeth to be debrided at each visit were equalized. In order to standardize the instrumentation periods, during at first visit, the debridement time needed for one quadrant was noted for each subject; at the following appointment, exactly the same duration of time was used.

As anxiety is thought to influence the affective component of pain (Woolgrove 1983), volunteers were asked to complete Corah's Dental Anxiety Scale (DAS) (Corah 1969), during their first debridement visit. This scale consists of four questions (Dougher et al. 1987). The timeline for these procedures is illustrated in Fig. 1.

This was a single-blinded study. The clinician was not informed abaut the menstrual status of the subjects. However, the patients were aware of the study. In this respect the subjects may have been biased in quantifying their current pain levels and might declared higher pain scores when they are expected to feel more pain.

The scheduling of the first treatment episode (during the peri-menstrual

or post-menstrual period) was determined randomly by a coin toss. Supragingival and subgingival debridement was carried out by the same clinician. The amount of local anaesthetic used was equal for each debridement visit. All patients received infiltrative anaesthesia containing 1-5 ml of prilocaine hydrochloride 3% (Malamed 1986). The local anesthetic was applied in equal quantities without patients' request for each quadrant in the particular woman. After the periodontal treatment, as the anaesthetic wore off and patients began to percieve pain (approximately 2h), they completed a Visual Analogue Scale (VAS). On the scale, the starting point indicates "no pain" and the end point indicates "intolerable pain". This allowed patients to quantify their current pain levels once they left the dental clinic. They were requested to bring the form with them during the following visit.

#### Data analysis

The possible effect of the order of treatment time (peri-menstural or postmenstural) was evaluated by the Mann-Whitney test. Taking this result into consideration, statistics were performed by paired non-parametric tests. Possible correlations between DAS and VAS scores were analysed using Spearman's coefficient of correlation. Peri-menstrual and post-menstrual VAS scores of females were analysed by the Wilcoxon signed rank test.

#### Results

Current smokers constituted 60% of the study population. On average, pocket depths greater than 4 mm were found in



A : Days for quadrant debrided during peri-menstrual period

**B** : Days for debridment of another quadrant during post-menstrual period

*Fig. 1.* Timeline for the debridement visits. (A) Days for quadrant debridement during the peri-menstrual period. (B) Days for debridment of another quadrant during the post-menstrual period.

60% of their periodontal pockets debrided during the peri-menstrual period and in 58.68% of pockets debrided during the post-menstrual period (Table 1).

The mean VAS pain score for patients in their peri-menstrual period was 22.0 mm on a maximum of 100 mm (range 1.1-68.7 mm), compared with 15.2 mm (range 0-40.9 mm) during their post-menstrual period. No statistically significant associations were observed between the order of groups (Mann-Whitney test p = 0.73). When the nonparametric tests were performed, higher pain scores were recorded during the peri-menstrual period than post-menstrual period. The increase in pain perception among females in their perimenstrual period was significantly greater than their post-menstrual period (Wilcoxon's signed ranks test p = 0.03), as shown in Table 2. In one of the women participating in this study, the pain perception score (VAS) was 68.7 mm during her menstrual period. Her DAS score of 15 was also the highest in the sample (Fig. 2).

No statistically significant associations were observed between age and pain perception. When comparing smokers *versus* non-smokers, pain perception was observed to be significantly higher among smokers in the post-menstrual period than during the peri-menstrual period (mean 14.0 *versus* 13.2, respectively, on the VAS, p = 0.03).

Using Corah's DAS to evaluate dental anxiety, the lowest anxiety score in this sample of women was 4, and the

Post-menstrual Period Peri-menstrual Period 10 Number of patients 8 6 4 2 0 20-29 30-39 40-49 50-59 60-69 70-79 80-89 90-100 10-19 0-9 Visual Analog Scale (mm)

Fig. 2. Frequency distribution of patients' Visual Analogue Scale pain responses to periodontal treatment.

highest was 20, representing a wide range of anxiety levels. The mean score for this sample was  $10.10 \pm 2.73$ , representing a relatively high anxiety level among these women, regardless of when they had their first debridement appointment. There was no statistically significant correlation between the DAS, which reflects the affective component of pain, and the VAS. Spearman's  $\rho$  was -0.12 (p = 0.59) between VAS and DAS scores during the peri-menstrual period, and that for the DAS scores obtained in the post-menstrual period was 0.18 (p = 0.44).

#### Discussion

The purpose of this study was to determine differences between females' pain levels during their peri-menstrual *versus* their post-menstrual phase by performing debridement under local anaesthesia.

Table 1. Demographic and clinical details of the study groups

Period	Peri-menstrual period	Post-menstrual period
Age*	$38.85 \pm 19.08$	$38.85 \pm 19.08$
Smoker/non-smoker (n)	12/8	12/8
Percentage of pocket with a PPD $\ge 4 \text{ mm}$	60	58.68

\*Mean  $\pm$  standard deviation.

PPD, probing pocket depth.

Table 2. DAS and VAS scores of the study samples

Measurements	Post-menstrual period	Peri-menstrual period
DAS	$10.1 \pm 2.7$	$10.1 \pm 2.7$
VAS (mm): <i>p</i> < 0.05	$15.2 \pm 11.3$	$22.0 \pm 15.6^{*}$

There was no significant correlation of the order of treatment in the intensity of the perceived pain (Mann–Whitney test p = 0.73, p < 0.05).

There was no significant correlation between DAS and VAS scores between the groups (Wilcoxon's signed rank test, peri-menstrual period p = 0.59 and post-menstrual period p = 0.44, p < 0.05). \*Significantly higher than post-menstrual period VAS scores (Wilcoxon's signed rank test p = 0.03, p < 0.05).

DAS, Dental Anxiety Scale; VAS, Visual Analogue Scale.

There was no significant correlation of the order of treatment in the intensity of the perceived pain during peri-menstrual and post-menstrual periods (Mann– Whitney test p = 0.73, p < 0.05). With respect to this result, as we hypothesized, we found that patients in their perimenstrual period demonstrated higher pain responses to supra- and subgingival debridement than they did in their postmenstrual period. This increase in the pain levels of women during their menstrual period was statistically significant.

It has been reported that general menstrual symptomatology increases during the menstrual cycle in smokers. This suggests that smokers may have a difficult time during their cycle (DeBon et al. 1995). In the current study, when we compared pain experienced between smokers and non-smokers, we found no differences in pain perception, but smokers reported higher pain levels during their post-menstrual period than during their peri-menstrual period. Our findings are different from the data reported by DeBones' (1995), and the relatively small number of patients in our study may have resulted in the difference. Differences may also have been caused by smoking-related substances, such as nicotine, carbon monoxide and hydrogen cyanide (Rivera-Hidalgo 1986).

The mean DAS scores were slightly greater than 10, representing high anxiety. On the other hand, no correlations were found between DAS and VAS scores. Splinting patients according to their anxiety scores would be more distinctive. As this is a preliminary study with a relatively small number of patients, the purpose of equal distribution into groups according to their anxiety scores could not be fulfilled.

In one of the women participating in this study, the pain perception score (VAS) was 68.7 mm during her menstrual period. Her DAS score of 15 was also the highest in the sample. It was realized that this patient had been given her first appointment when she was in her menstrual period.

Karadottir et al. (2002) aimed to determine pain perceptions during periodontal treatments and probing. They reported a higher pain sensation during treatment with 15% of their subjects when compared with the study population. Reporters stated that they could not determine the specific reason for this. It would be interesting to determine whether this 15% was composed mostly of females in their peri-menstrual periods.

In his study comparing differences between VAS and Numerical Rating Scale (NRS), Larroy (2002) found that both scales were useful in the evaluation of pain, and there was a positive correlation between them. Wijk et al. (2004) used the McGill Pain Questionnaire and NRS to determine patients' pain perception during periodontal probing. The McGill Pain Ouestionnaire is efficient and assesses pain from both a qualitative and quantitative perspective. However, it contains too many words and if the patient's vocabulary is not rich enough, it might be difficult to apply (Chapman et al. 1985). As it has no Turkish version, it would be difficult to find the suitable terms when translated into Turkish, so we preferred the VAS, which requires minimal linguistic skills and is therefore easier for patients to use in describing their pain. VAS can be quantified and allows for comparison of patients on a scale of 0–100 mm.

Apatzidou & Kinane (2004a, b) noted that partial periodontal therapy, which occurred in the course of quadrant root planing at 2-weekly intervals, resulted in improved clinical conditions in the remaining untreated quadrants. Koshy et al. (2005) noted that full-mouth ultrasonic debridement may have limited additional benefits over conventional quadrant-wise mechanical therapy, in terms of reduction of bleeding and number of pocket sites. Despite the fact that full-mouth scaling and root planing were well tolerated by patients and induced an increased antibody response, this treatment approach resulted in higher pain scores and greater intake of analgesics (Apatzidou & Kinane. 2004a, b, Kinane 2005). In this study, we applied quadrant-wise mechanical therapy to compare the pain perception of patients during their peri-menstrual period and post-menstrual period.

These novel observations need to be confirmed in a future study designed to assess definitively the impact of the menstrual cycle on pain perception and patient-centred outcomes in patients requiring scaling and root planing for the treatment of periodontitis. Although the pilot study population was too small generalize conclusions beyond to this study, clinicians may wish to consider the menstrual cycles of their while female patients scheduling mechanical periodontal therapy. Appropriately scheduled visits or additional medication may improve the comfort of patients scheduled for periodontal procedures.

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#### **Clinical Relevance**

Patients' response to pain can differ, and even demonstrate gender differences. It has been suggested that some of these differences are associated with hormonal changes. Women often have lowered pain thresholds during their menstrual debridement versus quadrant scalling and root planing as an initial approach in the treatment of chronic periodontitis, **32**, 851–859.

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cycles. The aim of this pilot study was to evaluate the pain perception differences between the peri-menstrual and post-menstrual periods of female patients during non-surgical debridement. An increase in pain perception among females treated in their peri-menstrual period was Address: Özgün Özçaka Department of Periodontology Faculty of Dentistry University of Ege Bornova 35100 İzmir Turkey E-mail: ozgunozcaka@yahoo.com

observed. Further studies need to be conducted to confirm these findings in a broader population. If confirmed, this information may be useful in improving female patients' perception of periodontal therapy. This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.