

The Association between Current Low-Dose Oral Contraceptive Pills and Periodontal Health: A Matched-Case-Control Study

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Abstract

Aim: This study assessed the influence of current oral contraceptive pills on periodontal health in young females.

Methods and Materials: Seventy women ranging in age from 17 to 35 years (mean 24 years) had a comprehensive periodontal examination. Their current and previous oral contraceptive pill use was assessed by a questionnaire. A periodontal assessment was performed that included recording the following: plaque index, gingival index, probing depth, and attachment level at six sites per tooth. The periodontal health of women taking birth control pills for at least two years was compared to that of women not taking an oral contraceptive. The control and test groups were matched for socioeconomic status, age, oral habits, occupation, and educational levels.

Results: Although there was no difference in plaque index levels between the two groups, current oral contraceptive pill users had higher levels of gingival inflammation and bleeding on probing. However, no significant differences were found regarding mean probing depths and attachment loss between the two groups.

Conclusion: Women who were on oral contraceptive pills had more extensive gingivitis and gingival bleeding than their matched controls not taking them.



Clinical Significance: As birth control policies are advocated by most countries, and because oral contraceptives are the most widely used method for birth control, a need exists to assess the effects of oral contraceptives on the periodontal health of young women. Although additional studies are needed to better understand the mechanism of OC-induced gingivitis, female patients should be informed of the oral and periodontal side effects of OCs and the need for meticulous home care and compliance with periodontal maintenance.

Keywords: oral contraceptives, birth control

pills, periodontal disease, attachment loss, plaque index, gingival index, bleeding on probing

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Introduction

Oral contraceptives (OCs) are common and convenient forms of contraception and have been determined to be safe and efficacious.^{1,2} OCs utilize synthetic gestational hormones (estrogen and progestin) to block FSH and LH and prevent ovulation.¹ Basic and clinical studies have dramatically increased our knowledge regarding the role of sex steroid hormones in reproductive endocrinology as well as their role in the induction of gingival disease.

The advent of contraceptives created interest in their effect on oral and periodontal tissues in the late 1960s and early 1970s.³ The association between OC use and gingival disease was first described in relation to high concentrations of sex steroids by Lindhe and Björn in 1967.⁴ Similar investigations linked the use of OCs to increased gingival inflammation,⁵ and some studies suggested that periodontal attachment loss is likely to occur in women taking contraceptives.⁶ The mechanism of OC-induced gingivitis was deemed to be an altered local immune response, decreased capacity of gingival tissues for repair, and alteration in the gingival vasculature.⁷ OC users also were shown to have an increased prevalence of specific bacterial species in dental plaque.⁸

However, it should be noted that almost all data regarding the association between OCs and gingival disease is more than 25 years old, as current OCs contain significantly lower levels of progestins and estrogens. Although this new generation of OCs has been largely tested on other body organs,^{9,10} few clinical studies have investigated their effect on gingival health, and these studies did not provide a definitive answer to the question of whether current low-dose

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formulations of OCs intensify gingival disease in otherwise-healthy adult women. While a prospective 21-day experimental gingivitis study concluded that OCs did not intensify the gingival inflammation,¹¹ clinical case-control studies by Mullally et al.¹² and Tilakaratne et al.¹³ did not fully support this idea. Mullally et al.¹² found more severe mean probing depth and attachment loss as well as increased gingivitis in women taking contraceptives.

According to Tilakaratne et al.,¹³ who investigated this association in rural Sri Lankan females, women who were using hormonal contraceptives for less than two years' duration had significantly higher mean gingival index than the nonusers.¹³ Those who were using contraceptives for two to four years' duration also had increased periodontal breakdown. However, it must be noted that some subjects were receiving injectable contraceptives that contained a significantly higher dose of progestin compared to oral contraceptives.¹³

A recent survey by Taichman and Eklund¹⁴ based upon data from 4,930 premenopausal women who took part in the first National Health and Nutrition Examination (NHANES I) and 5,001 women in the third NHANES questioned the historically held view of the suggested association between OC use and periodontal disease. Data from this large-scale study showed that there was no statistically significant difference between the low-dose and high-dose OCs in regard to their effect on periodontal health. Additionally, a nonsignificant protective association between current OC use and gingivitis was suggested in NHANES I (high-

dose OCs). Current pill users also were found to have a lower prevalence of moderate periodontal disease. The authors called for the reexamination of the perceived association between OC use and gingival disease, and stated that further clinical studies are needed to clarify the role of OCs on gingival tissue.¹⁴

All in all, as controversy exists and clinical data are needed to confirm the association between OCs and gingival disease, a relatively homogenous group of women were chosen and entered to a matched-case-control study to further investigate the effect of current low-dose OCs on the periodontium of adult women.

Methods and Materials

Study Population

Seventy patients were selected from those referred to the periodontal clinic at Yazd Dental School, Yazd, Iran.

The patients were categorized into two groups: the study group consisted of 35 oral contraceptive users (on birth control pills for at least two years' duration). The women in the control group had no history of taking oral contraceptive pills. The study and control groups were matched for socioeconomic status, age, oral habits, occupation, and educational levels. Both groups consisted of women ranging in age from 17 to 35 years.

Females with the below conditions were excluded from the study:

1. Patients with systemic disease that could affect the healing or viability of periodontal tissues such as diabetes, neutrophil defects, and leukemia.¹⁵



2. Patients who used medications or hormones that could have predisposed them to gingival overgrowth such as immunosuppressive agents and calcium channel blockers.¹⁶
3. Patients who had used NSAIDS or steroids six months prior to the study.
4. Patients with acute disease presentation such as gingival ulceration, severe gingivitis, gingival overgrowth, periodontal abscesses, and rapid loss of attachment.
5. Patients who were nursing babies.
6. Patients with amenorrhea and irregular menstrual cycles.
7. Smokers, patients with alcoholism, and patients who reported or showed signs of mouth breathing.
8. Pregnant patients.

For matching purposes, patients who were only using Microgynon (a pill containing 0.15 mg progestin and 0.03 mg ethinyl-oestradiol) were included in this study. Patients who used other methods of medical contraception were excluded. As for the smoking criteria, females who reported to smoke more than two cigarettes per day were considered as smokers.

Each patient was given a detailed description of the procedure and was required to sign an informed consent form before participation. The ethical committee from Yazd University of Medical Sciences, Yazd, Iran, approved the study protocol, the patient information sheet, and the informed consent form.

Data Collection

This was a matched-case-control study. The data regarding the educational levels, income, and oral habits were collected through a questionnaire. In addition, a full medical history and detailed contraceptive experience of the patients were recorded. This included the details of the type of OC pill and duration over which the medication had been taken.

Investigator Calibration

Prior to the study, a period of calibration was undertaken during which the examiner was required to replicate probing depth and attachment level measurements. Reproducibility of 90% percent for probing depth and attachment level measurements to within 1 mm was achieved.

Clinical Measurements

Plaque levels and gingival inflammation were scored for each of the patients in the two groups using indices described by Silness and Loe¹⁷ and Loe and Silness.¹⁸ Bleeding on probing (BOP) was examined and recorded as described by Lenox.¹⁹ Probing depth (PD) was measured from the gingival margin to the depth of pocket. Attachment loss (AL) was measured from the CEJ to the depth of pocket.

All teeth were examined at six sites. The measurements were made by one blinded and previously calibrated investigator. The same probe (UNC 15, Hu-Friedy, Chicago, IL, USA) was used for taking the measurements.

Data Analysis

The statistical tests used were Mann-Whitney and *t*-test. In all stages of evaluation, values of $p<0.05$ were considered statistically significant. All data were analyzed with the use of SPSS software, version 11.0 (SPSS®, Chicago, IL, USA).

Results

Seventy females ranging from 17 to 35 years of age were entered into this study. Thirty-five were

included in each group, and as the subjects were matched, the average age in both groups was 24. None of the patients were smokers or reported to have smoked in the past five years. All patients in the study group were on oral contraceptive pills for up to three years.

Oral Hygiene Evaluation

The mean plaque indexes of the two groups were compared (Table 1). There were no statistically significant differences between the two groups for this variable ($p>0.05$).

Gingival Inflammation

The mean gingival index (GI) of the control and test groups is summarized in Table 1. The mean GIs for the OC users and non-OC users were 1.47 ± 0.23 and 1.07 ± 0.20 , respectively. According to *t*-test results, the difference between the groups was statistically significant ($p<0.0001$). As shown in Table 1, the OC users also had significantly higher BOP (bleeding on probing) compared to the control group ($p<0.0001$).

Pocket Depth and Loss of Attachment

The mean pocket depth and attachment loss data of the OC users and non-OC users are summarized in Table 2. Statistical analysis

Table 1. Plaque index, gingival index, and BOP.

Status	Plaque Index (Mean \pm SD)	Gingival Index (Mean \pm SD)	Bleeding on Probing (%)
On OC	2.1 ± 0.44	1.47 ± 0.23	63.85 ± 13.91
No OC	2.12 ± 0.42	1.07 ± 0.20	37.82 ± 12.81
	NS	$p<0.0001$	$p<0.0001$

NS = not statistically significant.

Table 2. Pocket depth and attachment loss in the control and test groups.

Status	Pocket Depth (Mean \pm SD)	Attachment Loss (Mean \pm SD)
On OC	2.06 ± 0.22	1.004 ± 0.23
No OC	2.1 ± 0.21	0.98 ± 0.24
	NS	NS

NS = not statistically significant.

showed no significant difference regarding these two variables between the two groups (Table 2).

Discussion

Throughout the 1960s and 1970s, a large amount of research was conducted to confirm the induction of gingival diseases by OCs. These clinical studies documented higher prevalence of gingivitis⁴ and periodontal attachment loss⁶ in women using oral contraceptives compared to those who were not. Some animal studies also lent support for this association, suggesting that OCs have pronounced effects on gingival microvasculature.²⁰

Several mechanisms have been suggested for this heightened response in gingival tissues. It has been shown that human gingiva contains receptors for progesterone and estrogen.³ Existence of these receptors might provide evidence that periodontal tissues are a target for the gestational hormones. Progesterone causes increased vascular permeability and an increased synthesis of prostaglandin. Prostaglandin E, a mediator of inflammation, appears to rise significantly with increasing levels of sex hormones.²¹

According to Mealey and Moritz,⁷ besides changes in the gingival vasculature, an altered immune response also has been ascribed to estrogen and progesterone. Neutrophil chemotaxis and phagocytosis, along with T-cell responses, are depressed in the presence of high levels of these hormones.

It should be noted that it is unlikely that OCs have a singular direct effect on periodontal health; however, there is strong evidence, which shows a modification of the inflammatory response to dental plaque and its contents. According to Jensen et al.,⁸ there was a 16-fold increase in the populations of the *Bacteroides* species in women taking oral contraceptives.

More recently, formulations of OCs are available that contain significantly lower levels of hormones (<50 µg estrogen and <1 mg progestin). Although some investigators concluded that modern OCs had no effect on periodontal health,¹¹ other studies demonstrated increased attachment loss related to the prolonged OC usage.^{12,22} According to Mullally et al.,¹² deeper pockets and more severe clinical attachment loss were observed in women

who were using oral contraceptives. The authors found a relationship between duration of pill use and the extent and severity of periodontal pocketing that was unrelated to smoking status and age.¹² According to Tilakaratne et al.,¹³ those women who had used contraceptives for more than two years had significantly higher levels of loss of attachment. However, as noted previously, some subjects in that study received contraceptive injections with significantly higher levels of progestin compared to an oral medication.¹³ Our investigation, on the other hand, did not focus on the duration of contraceptive usage and all the patients were on oral contraceptives for between two and three years with no significant loss of attachment noted between the two groups. Therefore, no correlation can be deduced from our data regarding attachment loss other than the outcomes between the two groups were not statistically significant. Also, an exact duration of time for modern OCs to produce detrimental effects on the periodontium cannot be established based on the results of this investigation. As a consequence, additional studies should be undertaken in this field to enable us to better understand the relationship between oral contraceptive duration and the initiation of adverse periodontal changes.

The present study investigated the effects of modern OCs on the periodontal health of a relatively homogeneous group of women. With a same level of plaque score, results showed that women who used OCs had significantly higher levels of gingival index and bleeding on probing compared to the matched control group. This result is in accordance with what Tilakaratne et al.¹³ and Mullally et al.¹² reported. In fact, according to Tilakaratne et al.,¹³ women who used contraceptives for up to a two-year period showed higher mean GI than matched nonusers. Patients who used contraceptives for more than two years showed significant periodontal attachment loss. However, there was no such difference for the women who used OCs for less than a two-year duration.¹³

OC users in our study were women who used contraceptives for at least two years. Differences in periodontal attachment loss and changes in pocket depth were not significantly different between the two groups in the specified timeframe. However there was a marked increase in gingivitis between the two groups. According to Mullally et al.,¹² who assessed the periodontal health of current OC

users cross-sectionally, women who used OCs had more sites with bleeding on probing (44.0 percent versus 31.1 percent).¹² Correspondingly, a significant difference between the BOP of the two groups was found in the present study (63.8 percent versus 37.82 percent). Thus, results from our study corroborate the reported findings of Tilakaratne et al.¹³ and Mullally et al.¹²

A report by Preshaw et al.¹¹ has suggested that the new generation of birth control pills with low levels of estrogens and progestin are less harmful to the periodontium compared to the previous studies.¹¹ This 21-day experimental gingivitis model found no difference in the inflammatory response of the gingiva in the healthy women who were taking oral contraceptives for a period of less than six months to matched controls. However data from the present study, although cross-sectional, indicated higher prevalence and severity of gingivitis in patients on OCs compared to the matched group. It may be relevant that patients in the current study were using OCs for a longer period. This finding warrants additional study, as Preshaw et al.¹¹ could find no clinical difference in gingivitis in oral contraceptive users over a shorter period of time.

Our data supported the finding that OC users have more gingival inflammation than their paired nonusers. As well, current thinking also suggests that the modern low-dose pills still potentiate gingival disease, as reflected in the workshop by the American Academy of Periodontology in 1999 that recommended the classification of "OC-induced gingivitis."²³ Routinely, clinicians should inform the patients of the possible periodontal side effects of the pills and the need for periodic periodontal examinations, as additional studies are needed to help us understand the mechanism of OC-induced gingivitis and potential benefits of frequent, periodic assessment of patients using OCs.

Conclusion

Women on low-dose oral contraceptive pills for at least two years had more extensive gingivitis and gingival bleeding than their matched controls. However, no significant difference was found in regard to periodontal pocketing and attachment loss between the two groups.

Clinical Significance

As birth control policies are advocated by most countries and because oral contraceptives are the most widely used method for birth control, a need exists for the assessment of their role in the periodontal health of young women. Although additional studies are needed to enable us to understand the mechanism of OC-induced gingivitis, women patients should be informed of the oral and periodontal side effects of OCs as well as the need for meticulous home care and compliance with a periodontal maintenance program.

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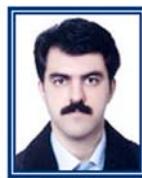
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