

Influence of oral contraceptive/low-dose estrogen progestin discontinuation on the incidence of alveolar osteitis after third molar extraction: a retrospective study at a single center

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ABSTRACT

Oral contraceptive (OC)/low-dose estrogen progestin (LEP) affects both the coagulation and fibrinolytic systems and may cause alveolar osteitis (AO). However, whether OC/LEP discontinuation affects the incidence of AO has not been evaluated. The aim of this study was to investigate whether preoperative OC/LEP discontinuation influences the incidence of AO after wisdom tooth extraction in outpatients. A total of 130 women aged 18–47 years (median, 27 years) participated, and the total numbers of procedure days and teeth were 205 and 274, respectively. We compared the incidence of AOs between patients who discontinued OC/LEP before wisdom tooth extraction and those who did not. A total of 4/181 teeth (2.21%) in the discontinuation group and 7/93 (7.53%) in the continuation group exhibited AO, and Fisher's exact test revealed a significant difference between the two groups ($p=0.049$). No serious adverse events, such as thrombosis, were observed. In conclusion, OC/LEP discontinuation was associated with a lower observed incidence of AO after third molar extraction.

Keywords: alveolar osteitis, discontinuation, low-dose estrogen progestin, oral contraceptive, wisdom tooth extraction

Abbreviations:

AO: alveolar osteitis

LEP: low-dose estrogen progestin

OC: oral contraceptive

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INTRODUCTION

Alveolar osteitis (AO) or dry socket is defined as the complete or partial absence of clotted blood in the alveolar socket accompanied by pain at or near the tooth extraction site, with or without halitosis.¹ Oral contraceptives (OCs) promote coagulability by increasing serum estrogen levels and fibrinolytic factors such as plasminogen² at the same time. Low-dose estrogen progestin (LEP) is the same as OC; however, it is used for dysmenorrhea. A previous study reported that AO is caused by the fibrinolytic effect of OC at the extraction site.³ Other risk factors for AOs include mandibular wisdom tooth extraction,⁴ female sex,⁵ smoking,⁶ age,⁷ surgeon experience,⁸ and extraction difficulty.⁹ Although the possibility of a reduction in the incidence of AO by OC discontinuation has been suggested because the serum estrogen level might be related to AO, the influence of discontinuation on the incidence of AO has not been evaluated.¹⁰ OC/LEP are also known to increase the risk of thromboembolism due to increased coagulability, and patients whose surgery is expected to exceed 45 minutes are advised to discontinue OC/LEP according to the guidelines.¹¹⁻¹³ Moreover, most OCs/LEPs have package inserts that provide recommendations for their discontinuation, such as “within 4 weeks before surgery and within 2 weeks after surgery.” This information is provided to patients who are at high risk of surgical complications or may require prolonged postoperative bed rest.^{12,13} However, whether OC/LEP should be discontinued prior to outpatient surgery, which is relatively short and less invasive, varies from institution to institution. In our department, each surgeon decides whether OC/LEP should be discontinued before wisdom tooth extraction based on their prescribing physician’s comments. We recommended that patients discontinue OC/LEP until November 2023; however, after discussion with responsible staff members in the hospital, we decided that there was no need for OC/LEP discontinuation prior to outpatient extractions without sedation because patients are able to move their lower limbs independently during outpatient surgery. Therefore, from December 2023, we performed outpatient extractions without requiring patients to discontinue OC/LEP preoperatively. If the procedure was expected to last longer than 45 minutes, we instructed the patients to move their lower limbs. This change in policy made it possible to evaluate postoperative local and systemic adverse events in patients who underwent tooth extraction after the discontinuation of OC/LEP (discontinuation group) and in those who did not discontinue OC/LEP (continuation group). The aim of this study was to determine whether preoperative discontinuation of OC/LEP influences the incidence of AO after outpatient wisdom tooth extraction.

METHODS

A total of 148 patients who underwent OC/LEP via outpatient wisdom tooth extraction at Nagoya University Hospital between April 1, 2017 and March 31, 2025, were included. In total, 18 patients were excluded because they had no information on continuation or discontinuation (n=1), no follow-up (n=12), and no detailed information about OC/LEP (n=5; Figure 1). The primary outcome was the incidence of AO after wisdom tooth extraction. We adapted tooth number to evaluate the incidence of AO because the difference in the discontinuation period influences the rate in the same patient. AO was diagnosed by each attending surgeon on the basis of the definition provided in the introduction and was observed at the first visit after extraction. Surgeon experience was defined as the number of years since the dentist was licensed. Postoperative antibiotics, such as amoxicillin, were administered within 48 hours of surgery. We compared the incidence of AOs between patients who discontinued OC/LEP before wisdom tooth extraction and those who did not. We treated all types of OC/LEP in this study as equivalents.

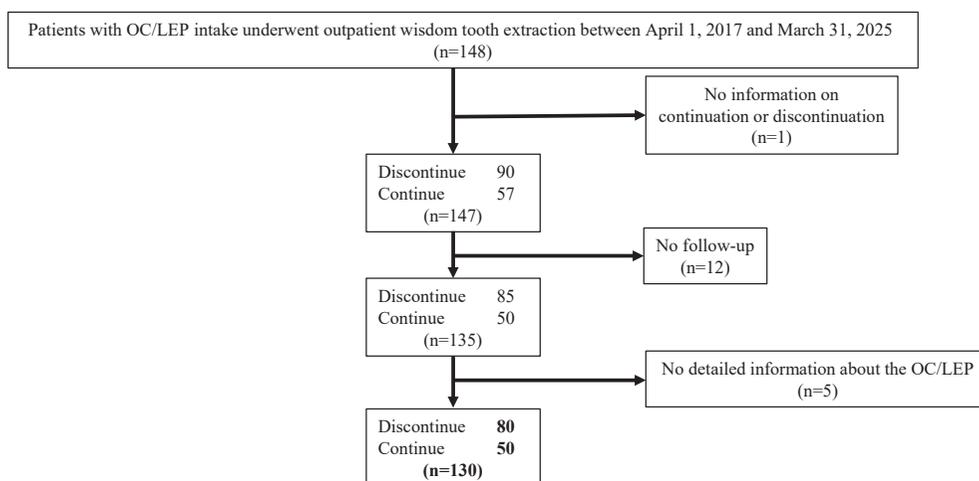


Fig. 1 Patient screening flowchart

OC: oral contraceptive

LEP: low-dose estrogen progestin

This study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by Ethics Committee of Nagoya University Graduate School of Medicine (no. 2024-0220-2).

Statistical analysis

Patient characteristics were summarized according to the continuation or discontinuation of OC/LEP before wisdom tooth extraction. Between-group comparisons were performed via the chi-square test. For intergroup comparisons of patient background, chi-square tests were used for categorical variables and Mann-Whitney U tests were used for continuous variables. Continuous variables are expressed as the means (standard deviations), and categorical variables are expressed as numbers (%). To examine the differences in the incidence of AO between the OC/LEP continuation and discontinuation groups, we performed Fisher's exact test on the basis of the expected frequencies to compare the primary outcome of AO. We included participants with a duration of over 4 weeks in the discontinuous group regardless of the period of discontinuation. All analyses were performed via IBM SPSS Statistics 29 (IBM Corporation, Armonk, NY, United States). $p < 0.05$ (two-tailed) was considered statistically significant.

RESULTS

The median age was 27 years (range 18–47 years). There were 50 patients in the continuation group (69 treatment days, 93 teeth) and 80 in the discontinuation group (136 treatment days, 181 teeth; Table 1). First visit after extraction ranged from 5 to 8 days. Smoking status, surgeon experience, and extraction site were similar between the two groups. All patients were administered antibiotics postoperatively. In terms of the period of discontinuation, 4 weeks was the most common period, and half of the patients in the group reported a duration of less than 5 weeks (Table 2). The types of OC/LEP used were Desogestrel Ethinylestradiol, Drospirenone Ethinylestradiol Betadex, Levonorgestrel Ethinylestradiol, and Norethisterone Ethinylestradiol,

and the distributions of OC/LEP were the same in both groups (Supplementary Table 1). No serious adverse events were observed, and the rate of thrombosis was 0/69 treatment days in the continuation group (Table 1).

Table 1 Clinical characteristics

	Continued group	Discontinued group	Total	
	Number of patients	Number of patients	Number of patients	
	50	80	130	
	Tooth number	Tooth number	Tooth number	
	93	181	274	<i>p</i> -value
	n (%)	n (%)	n (%)	
Age (median, 27)				*
18–27	41 (44.1)	129 (71.2)	170 (62.0)	
28–47	52 (55.9)	52 (28.7)	104 (38.0)	
Smoking				n.s.
+	10 (10.8)	11 (6.1)	21 (7.6)	
–	83 (89.2)	170 (93.9)	253 (92.3)	
Surgeon’s experience (years)				n.s.
1–5	23 (24.7)	28 (15.4)	51 (18.6)	
6–10	20 (21.5)	65 (35.9)	85 (31.0)	
11–15	35 (37.6)	71 (39.2)	106 (38.7)	
≥16	15 (16.1)	17 (9.3)	32 (11.7)	
Extraction site				n.s.
Mandible	63 (67.7)	130 (71.8)	193 (70.4)	
Maxilla	30 (32.2)	51 (28.1)	81 (29.6)	
Antibiotics				
+	93 (100)	181 (100)	274 (100)	
–	0 (0)	0 (0)	0 (0)	
Thrombosis	0	0	0	
Treatment day	69	136	205	

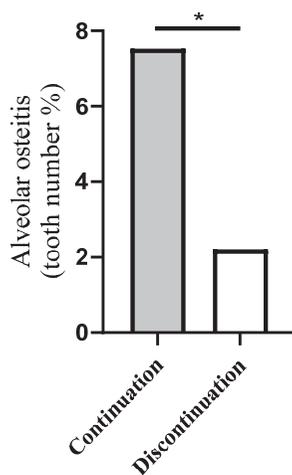
**p*<0.05

n.s.: not significant

Table 2 Periods of oral contraceptive/low-dose estrogen progestin discontinuation

Period of discontinuation (week)	Patient number n=80	
	Tooth number n=181	Treatment day n=136
4	79	56
5	12	9
6	15	12
7	8	6
8	24	17
9	6	4
10	5	5
11	2	2
12	7	6
13	2	2
14	5	4
15	2	2
16	3	2
17-40	11	9

AO occurred in 4/181 teeth (2.21%) in the discontinuation group and 7/93 teeth (7.53%) in the continuation group, and Fisher's exact test revealed a significant difference ($p=0.049$) between the two groups (Figure 2, Table 3). The results of the AO patients are shown in Table 4, along with those of patients who discontinued treatment for less than 5 weeks (Table 4).

**Fig. 2** Rates of alveolar osteitis in the oral contraceptive/low-dose estrogen progestin continuation and discontinuation groups

* $p<0.05$

Table 3 Rates of alveolar osteitis in the oral contraceptive/low-dose estrogen progestin continuation and discontinuation groups

	Continued group	Discontinued group	Total	<i>p</i> -value
Tooth number	93	181	274	*
	n (%)	n (%)	n (%)	
Alveolar osteitis	7 (7.53)	4 (2.21)	11 (4.0)	
No alveolar osteitis	86 (92.47)	177 (97.79)	263 (96.0)	

**p*<0.05

Table 4 Clinical cases of alveolar osteitis in the oral contraceptive/low-dose estrogen progestin continuation and discontinuation groups

Patient no.	Age	Smoking	Surgeon's experience (year)	Extraction site	Antibiotics	Oral contraceptive/low-dose estrogen progestin
Continued group						
1	31	-	3	Mandible (48)	+	Desogestrel Ethinylestradiol
2	46	-	14	Mandible (48)	+	Norethisterone Ethinylestradiol
3	28	+	3	Mandible (48)	+	Levonorgestrel Ethinylestradiol
4	33	+	19	Mandible (48)	+	Desogestrel Ethinylestradiol
5	37	-	4	Mandible (48)	+	Desogestrel Ethinylestradiol
6	29	-	15	Mandible (38)	+	Desogestrel Ethinylestradiol
7	26	-	10	Mandible (48)	+	Desogestrel Ethinylestradiol
	Average, 32.9	28.6%	Average, 9.7		100%	
Discontinued group						
1	29	-	17	Mandible (38)	+	Desogestrel Ethinylestradiol (discontinued for 4 weeks)
2	23	-	3	Mandible (48)	+	Norethisterone Ethinylestradiol (discontinued for 5 weeks)
3	36	+	12	Mandible (48)	+	Desogestrel Ethinylestradiol (discontinued for 4 weeks)
4	24	-	12	Mandible (48)	+	Levonorgestrel Ethinylestradiol (discontinued for 5 weeks)
	Average, 28	25.0%	Average, 11		100%	

DISCUSSION

The incidence of AO is 3.5 times greater in patients who use OCs than in those who do not,⁴ and a meta-analysis revealed that OC use increases the risk of AO regardless of the type of postoperative antibiotic or painkiller used.³ Although the possibility that discontinuation may reduce the incidence of AO has been suggested,¹⁰ an adequate period for discontinuation has not been established, and the possibility of adverse events associated with OC/LEP discontinuation makes comparisons difficult. Because the policy regarding OC/LEP has changed at our institution, we were able to analyze these differences despite the retrospective nature of the study. Therefore, to our knowledge, this study is the first to compare the OC/LEP continuation and discontinuation groups. In this study, the incidence of AO in the continuous group was almost 3.5 times greater than that in the discontinuation group, and there were no AO cases in the group with discontinuation for more than 6 weeks. Therefore, OC/LEP discontinuation was associated with a lower observed incidence of AO.

With respect to thrombosis prophylaxis, OC/LEP discontinuation for 4 weeks before surgery and 2 weeks after surgery is generally recommended because the risk of thrombosis associated with immobility is greater in patients under general anesthesia or prolonged bed rest.^{12,13} There are no guidelines regarding outpatient surgery,^{12,13} and recommendations for discontinuation vary between institutions and surgeons. Thrombosis is a serious adverse event associated with OC/LEP use. However, we were unable to obtain a report on thrombosis after outpatient wisdom tooth extraction in patients treated with OC/LEP. These are issues in our country, and the necessity should be clarified. Even though the number of patients was small, no cases of thrombosis were observed in the continuous group, which might be the first step in clarifying the necessity of OC/LEP discontinuation for preventing thrombosis in our field.

According to the United Nations' Contraceptive Use by Method 2019,¹⁴ the contraceptive pill use rate in Japan was 2.9% lower than that in other countries, such as the United States (13.7%), the United Kingdom (26.1%), and Germany (31.7%). This has been attributed to a lag in sex education in Japan. However, the importance of the pill has been recognized in recent years, and the number of patients taking the pill is expected to increase in the future.¹⁵ Many patients use LEP for abdominal pain associated with dysmenorrhea, and the emotional and physical pain associated with discontinuation is unfathomable. Therefore, we must consider patients' conditions in addition to their prescribing physicians' comments when determining whether they should discontinue OC/LEP. The timing of restarting OC/LEP intake is also important because the possibility of thrombosis increases for 3 months after restarting, and we must discuss the timing of discontinuation and restarting with prescribing physicians and provide that information to patients. In this study, there were not many cases of AO; therefore, we could not perform logistic regression analysis including other risk factors, such as extraction site,⁴ smoking status,⁶ age,⁷ surgeon experience,⁸ and extraction difficulty,⁹ which is our limitation. Furthermore, given that more cases are needed to review AO and thrombosis, multicenter studies are currently underway. Future studies should assess the need for both prospective studies and intravenous sedation during surgery.

In conclusion, OC/LEP discontinuation was associated with a lower observed incidence of AO after third molar extraction.

AUTHOR CONTRIBUTION

Drs Sato and Takenaka served as co-first authors and contributed equally to the work.

CONFLICTS OF INTEREST STATEMENT

There are no conflicts of interest to declare.

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SUPPLEMENTARY INFORMATION

Supplementary Table 1 Types of oral contraceptive (OC)/low-dose estrogen progestin (LEP)

Type of OC/LEP	Patient number		<i>p</i> -value
	80	50	
	Discontinuation	Continuation	n.s.
Desogestrel Ethinylestradiol	25	12	
Drospirenone Ethinylestradiol Betadex	17	21	
Levonorgestrel Ethinylestradiol	18	11	
Norethisterone Ethinylestradiol	20	6	

n.s.: not significant