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Effects of Oral Contraceptives on The Prevalence of Alveolar Osteitis After Mandibular Third Molar Surgery: A Retrospective Study

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Abstract: The objective of this study was to investigate the influence of oral contraceptives on the incidence rate of alveolar osteitis (AO) following the surgical extraction of both impacted mandibular third molars. This retrospective study reviewed the clinical records of patients who presented to the oral surgery clinic of a university school of dentistry for the extraction of impacted mandibular third molars. Using a database search, all patients were categorized by sex, age, occurrence of AO, and whether the females were taking oral contraceptives at the time of surgery. The patient was considered positive for AO if either one or both sockets developed AO. The incidence of AO among women taking oral contraceptives at the time of impacted mandibular third molar extraction differed significantly from that in the other patient groups. AO occurred in 37.9% (11/29) of females taking oral contraceptives, while only 8.9% (16/179) of females who were not taking oral contraceptives at the time of extraction developed AO. The total incidence of AO among females was 13.0% (27/208). The total incidence of AO among the 363 males and females presenting for mandibular third molar extractions was 13.8%. Females who are taking oral contraceptives at the time of impacted mandibular third molar extraction are at a higher risk of developing AO following extraction.

Key words: wisdom teeth, osteitis, oral contraceptives, infection

The most common complication following the extraction of teeth is alveolar osteitis (AO).¹ 'Dry socket' is another term used to describe this complication. The term dry socket was first used by Crawford in 1896, and since that time it has been given several other names, including fibrinolytic alveolitis, postoperative alveolitis, localized osteomyelitis, fibrinolytic alveolitis, and delayed extraction wound healing.² AO is a complication seen in 0.5–5% of routine extractions. It has been reported to occur more often following the extraction of impacted mandibular third molars. Studies have reported incidence rates as high as 37.5% following the surgical extraction of impacted lower third molars.³

AO presents when the blood clot in the extraction site is prematurely disrupted and/or removed. This leaves the underlying bone unprotected and exposed to the oral environment.⁴ Bacterial contamination has been suggested as a major etiological factor.⁵ The fibrinolytic system can also cause fibrinolysis of the clot. Factors such as physical and mental stress, severity of the surgical procedure, and the type of tissue operated on can result in increased fibrinolytic activity.⁶ Other factors may also play a role in the development of AO. Intraoperative complications such as root fracture, alveolar bone fracture, or fragments from the tooth or alveolar bone remaining after the surgery may also result in AO.

There is no clear or proven aetiology for the development of AO, but many risk factors have been identified. These include the patient's sex,⁷ the use of oral contraceptives,⁸ smoking,⁹ patient age,¹⁰ difficulty of the extraction,¹¹ surgeon's experience,¹² preoperative infection,¹³ and the menstrual cycle.¹⁴ and ¹⁵ Signs and symptoms of AO often develop within 1–3 days following surgery. The signs and symptoms include but are not limited to pain, sensitivity to gentle probing, foul taste, halitosis, localized swelling, and lymph node involvement.¹⁶

The purpose of the present study was to investigate the influence of oral contraceptives on the incidence rate of AO following the surgical extraction of both impacted mandibular third molars. It was hypothesized that the incidence rate of AO would be higher among female patients taking oral contraceptives at the time of their surgery as compared to females not taking oral contraceptives. Comparisons were also made with all other patients presenting for the extraction of impacted mandibular third molars.

Materials and methods

A total of 363 patients aged 14–78 years presented to the oral surgery clinic of a university school of dentistry for the extraction of full bony impacted mandibular third molars. The mean \pm standard deviation age of all patients presenting for surgery was 26.7 ± 11.16 years. Of the total group of patients, 179 were females not taking oral contraceptives at the time of surgery (average age 24.5 ± 9.23 years) and 29 were females who reported using oral contraceptives at the time of surgery (average age 25.6 ± 7.18 years). All patients had both mandibular third molars extracted. The patients were considered positive for AO if they developed AO in either one or both extraction sockets.

Two oral surgeons performed all extractions. Every surgery was for the extraction of full bony impacted mandibular third molars. The surgeries varied in difficulty with regard to the full bony impaction. All surgeries required bone removal and tooth section, which were performed with an electric hand-piece. All patients received the same care; they were given the same postoperative medications and instructions. Standard postoperative instructions were provided and

the patients were instructed to return to the clinic if they experienced any irregular healing, swelling, and/or pain.

A search of the dental records database (axiUm; Exan Group, Coquitlam, BC, Canada) was conducted to identify patients who had returned to the clinic presenting with AO. A search using the following key words was performed in the treatment notes: "dry socket", "alveolar osteitis", "infection", "dressing", "pain", and "halitosis". All treatment notes that included any of the key words were reviewed to confirm that the patient had presented postoperatively with AO. "Infection" was included as a key word so that the patient's treatment notes could be read to determine if they had presented to the clinic with a postoperative infection or AO. Patient exclusion criteria included the use of immunosuppressive agents and/or antibiotics, an immunocompromised status, smoking habit, and diagnosis with a postoperative infection.

Results

The incidence of AO among females taking oral contraceptives at the time of impacted mandibular third molar extraction differed significantly from that in the other patient groups. As shown in [Table 1](#) and [Fig. 1](#), AO occurred in 37.9% (11/29) of the females taking oral contraceptives, while only 8.9% (16/179) of females who were not taking oral contraceptives at the time of extraction developed AO.

Table 1. Incidence of alveolar osteitis and use of oral contraceptives.

	Not taking oral contraceptives	Taking oral contraceptives	Total
No alveolar osteitis	163	18	181
Alveolar osteitis	16	11	27
Total	179	29	208

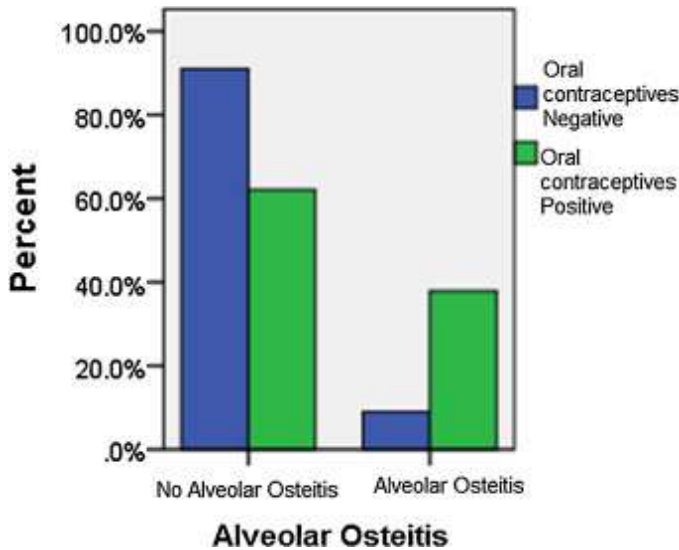


Fig. 1. Incidence of alveolar osteitis and use of oral contraceptives.

The total incidence of AO among females was 13.0% (27/208). A similar result was found among male patients, who presented an incidence of AO of 14.8% (23/155). The total incidence of AO among the 363 males and females presenting for mandibular third molar extractions was 13.8% ($n = 50$) (Table 2, Fig. 2).

Table 2. Incidence of alveolar osteitis in males compared to females.

	Male	Female	Total
No alveolar osteitis	132	181	313
Alveolar osteitis	23	27	50
Total	155	208	363

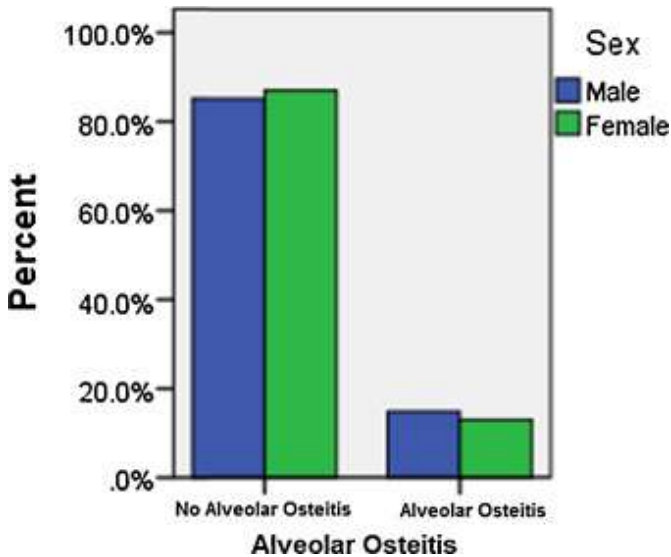


Fig. 2. Incidence of alveolar osteitis in males compared to females.

Pearson's χ^2 test was used to compare the data. The difference in incidence of AO between women taking oral contraceptives at the time of extractions and women not taking oral contraceptives was found to be statistically significant ($P < 0.01$). Furthermore, the difference in incidence of AO between women taking oral contraceptives at the time of extractions and men was also found to be statistically significant ($P < 0.001$).

Discussion

The most common postoperative complication of surgical removal of impacted mandibular third molars is AO, due to fibrinolysis of the clot. The incidence of AO among women began to increase in the 1960s as oral contraceptives came into more widespread use. In 1974, Schow found the incidence rate of AO to be 45% among women taking oral contraceptives, compared to only 17% among women not taking oral contraceptives.¹⁴ The higher incidence of AO can be attributed to the increased fibrinolysis caused by the use of oral contraceptives.

The majority of the more recent studies have supported the conclusions reached by earlier studies. These studies have concluded that oral contraceptive use is a risk factor for AO following the surgical removal of impacted mandibular third molars. There are a few studies that did not find a statistical difference between women taking and not taking oral contraceptives. It should be noted that many of these studies had a relatively small sample size.

The results from this study support previous findings; the use of oral contraceptives at the time of mandibular third molar extraction will increase the risk of developing AO following surgery. This study found that there was an approximately 3.5-times greater risk of developing AO if the female patient was taking oral contraceptives at the time of surgery. The incidence rates of AO in the oral contraceptive and non-oral contraceptive groups in the present study were similar to those reported in many other related studies.

Due to the retrospective nature of this study, the results are reliant on the accurate postoperative diagnosis of AO by the oral surgeons. The description of AO is diverse and it is sometimes difficult

to diagnose consistently. Therefore, this study was limited because it was not possible to establish specific criteria for the diagnosis of AO. Due to the nature of third molar impactions, there is great variability in the extraction procedure. To overcome this problem, all surgeries that had complications or were deemed unusually difficult were excluded. Additionally, mandatory follow-up of the patients was not required. Therefore, it is possible that some patients developed AO but did not report their symptoms to the dental school.

The majority of studies on the subject have found that oral contraceptive use increases the incidence rate of AO. Eshghpour et al. examined the menstrual cycle status of patients as a possible risk factor for AO. They found that the frequency of AO in women in the middle of their menstrual cycle was significantly greater than that in women during the menstrual period for both oral contraceptive users and non-users.¹⁵ Although there is significant evidence, more specific studies relating the incidence rates of AO to specific days of the female menstrual cycle are required to gain a better understanding of the role of oral contraceptives and oestrogen in the development of AO. Also, additional studies are needed to examine the different types of oral contraceptives and to determine the actual hormone levels at the time of surgery.

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Competing interests

None.

Ethical approval

Amanda Ahrndt, HR 2843 IRB.

Patient consent

Not required.

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