

Antibiotics in third molar surgery, justifiable or not?

Mohammad S. Alrashdan, Jong-Chul Park, Ju-Hwan Lee,
Myung-Sook Yoo, Kang-Mi Pang, Soung-Min Kim, Jong-Ho Lee

Department of Oral and Maxillofacial Surgery, School of Dentistry, Seoul National University

For Correspondence

Jong-Ho Lee, DDS, PhD.

Department of Oral and Maxillofacial Surgery, School of Dentistry, Seoul National University
275-1 Yeongon-dong, Jongno-gu, Seoul, 110-768, Rep. of Korea
TEL : +82-2-2072-2630 FAX : +82-2766-4948 E-mail : leejongh@snu.ac.kr

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• Abstract

Objectives : The purpose of this study was to evaluate the significance of antibiotics in reducing postoperative infection rates and other complications following third molar surgery.

Patients and methods : Two groups of patients underwent surgical extraction of third molars. The antibiotics group, n=21, received a third generation cephalosporin antibiotic for 5 days, starting from the day of surgery. The non-antibiotics group, n=26, didn't receive any antibiotics and only received analgesics to control postoperative pain. Body temperature and hematologic findings including WBC, neutrophils, lymphocytes and monocytes counts were compared between the two groups at three intervals, preoperatively, 24 hours and 7-10 days postoperatively. Pain and swelling during the follow up period were also recorded in both groups and compared in the second part of the study.

Results : In the first part of the study, comparison of body temperature, CBC components (except WBCs) showed no significant difference between the two groups during the follow up period. All parameters were within the normal range at all intervals, which indicated absence of infection. In the second part, 38% of patients in the antibiotic group, compared to 54% of the non-antibiotics group, had one or more complications during the follow up period. However, three patients from the antibiotic group compared to one from the non-antibiotics group reported having a swelling of some degree.

Conclusion : Based on our objective parameters (body temperature and CBC components), both groups showed no signs of infection during the follow up period. However, the results related to pain and swelling were less conclusive, probably due to small number of patients included in the study. Accordingly, we are unable to provide definite recommendations on antibiotics use in third molar surgery.

• Key word : antibiotics, third molars, body temperature, CBC, pain, swelling.

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Introduction

Third molar surgery is one of the most widely performed procedures in the oral and maxillofacial surgery field. The administration of prophylactic antibiotics following third molar surgical removal in order to prevent or reduce postoperative complications has always been a debatable practice. Side effects of antibiotics administration include; increasing the chance of anaphylaxis, development of antibiotic-resistant bacteria or even unjustifiable financial costs on the patients side. Moreover, It is reported that 6-7% of patients receiving antibiotics experience one or more kinds of adverse reactions¹⁾. These limitations have brought up the antibiotics use in third molar surgery to become one of the most controversial topics in literature.

Reported infection rates following mandibular third molar surgeries are so variable, with most investigators reporting postoperative infection rates between 1-7%¹⁻⁶⁾. With such low rates of postoperative infections, it may seem reasonable to argue that routine use of antibiotics in third molar surgery is an overprotective measure.

While in some individuals such as medically compromised or elderly patients, or those with a pre-existing infection, it would be prudent to consider prescription of antibiotics for surgical extractions of third molars, it is far more difficult to recommend their use in all individuals.

Purpose of the study

The purpose of this study was to evaluate the significance of oral antibiotic administration in reducing postoperative infection rates following surgical extraction of third molars, assessed through monitoring of body temperature and levels of different types of leukocytes. In addition to recording postoperative complications, most importantly, swelling and pain.

Patients and Methods

All patients involved in this study were Asians. Two groups of patients were investigated. The antibiotics group included 21 patients (M=12, F=9) who visited our hospital, Seoul National University Dental Hospital (SNUDH), for third molar extraction in the period from August 2008 to March 2009. The age range was (17-66 years) with a mean of 26 years. (Table 1). Patients had either a single mandibular third molar extraction (n=7) or a mandibular and maxillary third molars extraction (n=14). This group of patients received a third generation cephalosporin (cephdinir[®]) for five days starting from the day of surgery, 1 hour preoperatively. Previous reports found this dosing protocol to be the most effective in reducing postoperative complications^{9,10)}.

The non-antibiotics group consisted of 26 patients, (M=10, F=16), who had also visited SNUDH for third molar extraction in the period from July to September 2007. Age range was (19-49 years) with a mean of 26 years. (Table 1). 20 patients had a single mandibular third molar extracted while 6 patients had both a mandibular and maxillary third molars extracted at the visit. Patients in this group didn't receive any antibiotics and only received analgesics to control postoperative pain when required. This group was kindly prepared by GSK research group.

All patients in both groups had no preoperative clinical signs of infection, and underwent surgical extraction of third molars at the Department of Oral and Maxillofacial Surgery, SNUDH, under local anesthesia. (2% lidocaine, 1:100,000 epinephrine).

Experimental parameters used to compare both groups were the body temperature and complete blood count (CBC) analysis. Both parameters were recorded at three time points; Preoperatively, 24 hours postoperatively and 7-10 days postoperatively, which concluded our follow up period. Our original plan was to include all vital signs

Table 1. Patients' details in both groups.

Group	Patients total number	Gender	Mean age (years)	Prophylactic antibiotics	Single mandibular third molar extracted	Two third molars extracted (1 mandibular, 1 maxillary)
Antibiotics	21	F=9 M=12	26	Yes	N=7	N=14
Non-antibiotics	26	F=16 M=10	26	No	N=20	N=6

Mohammad Alrashdan et al : Antibiotics in third molar surgery, justifiable or not?. J Kor Dent Sci 2009.

(including blood pressure, heart rate and body temperature) in the experimental parameters. However, we noticed that blood pressure and heart rate values obtained from the patients preoperatively were higher than normal because we used to measure these at the same day of the surgery and we found out higher than normal values, most probably due to patients anxiety and fear from the surgery. We tried to ask the patients to measure their own blood pressure and heart rate prior to the surgery day at home but this was proven to be impractical with most patients. Finally we decided to include only the body temperature and to exclude other vital signs that are influenced by patient's level of anxiety.

From the CBC findings, we have chosen several hematologic parameters that are usually used to assess the presence or absence of infections. Total white blood cell (WBC) count, segmented neutrophils count, lymphocytes count and monocytes count were selected and compared between the two groups.

All hematologic laboratory analysis procedures were performed at SNUDH laboratories.

Postoperative complications during the follow up period were also recorded and compared between the two groups. These included swelling, pain and discomfort (whether localized or generalized) that could not be completely controlled by simple analgesics (i.e Tylenol or Ibuprofen). Some patients in both groups reported complications that might not be directly related to third molar surgery such as headache, feeling cold, epistaxis or TMJ dysfunction. These complications were collectively referred to as "others" in the final results.

Results were analyzed using ANOVA and t-test, StatView software (SAS Institute Inc., copy right 1992-1998, version 5.0.1). All values were expressed as (Mean \pm SEM) and a value of $P < 0.05$ was considered statistically significant.

Results

A total of 47 patients were included in this study, distributed into two unequal groups: first group was the antibiotics group (n=21) and second group was the non-antibiotics group (n=26).

Four patients were excluded from the antibiotics group regarding the hematologic assessment because they failed to report to the final CBC test at 7-10 days postoperatively. However, their body temperature was obtained at three intervals as all other participants.

Body temperature monitoring in antibiotic group showed a decrease from the preoperative value ($36.7 \pm 0.09^\circ\text{C}$) both at 24 hours and 7-10 days postoperatively, ($36.6 \pm 0.32^\circ\text{C}$ and $36.4 \pm 0.36^\circ\text{C}$, respectively). While in the non-antibiotics group there was an increase in body temperature at 24 hours (from $36.5 \pm 0.07^\circ\text{C}$ preoperatively to $36.7 \pm 0.2^\circ\text{C}$) before decreasing at the final follow up ($36.6 \pm 0.48^\circ\text{C}$). However, no significant difference was found at any time interval between the 2 groups.(Fig.1)

WBC count followed the same pattern in both groups, increasing at 24 hours postoperatively (antibiotics from 6.94 ± 0.48 to $9.01 \pm 0.49 \times 10^3/\mu\text{l}$, non-antibiotics from 5.92 ± 0.26 to $7.85 \pm 0.35 \times 10^3/\mu\text{l}$) then decreasing at 7-10 days postoperatively (control 7.05 ± 0.47 , experimental $5.34 \pm 0.16 \times 10^3/\mu\text{l}$) (Fig.2).

Unexpectedly, the antibiotics group WBC count mean was significantly higher than the non-antibiotics group both at 24 hours postoperatively ($P = 0.04$) and 7-10 days postoperatively ($P < 0.001$). Yet, these WBC levels were still within the normal range ($4-10 \times 10^3/\mu\text{l}$)

The remaining three parameters (segmented neutrophils, lymphocytes and monocytes) followed the same pattern in both groups during the follow up period, without any significant difference at any time interval. (Fig.3-5). One

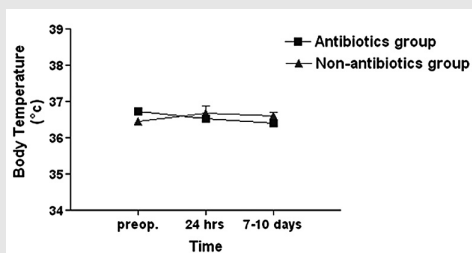


Fig. 1. Body temperature follow up.

Mohammad Alrashdan et al : Antibiotics in third molar surgery, justifiable or not?. J Kor Dent Sci 2009.

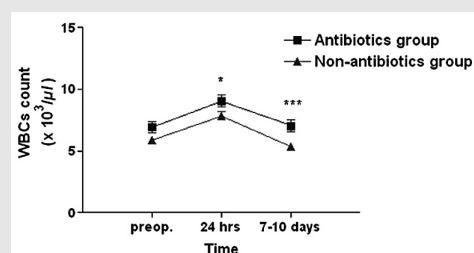


Fig. 2. WBCs count follow up. * $P < 0.05$, *** $P < 0.001$.

Mohammad Alrashdan et al : Antibiotics in third molar surgery, justifiable or not?. J Kor Dent Sci 2009.

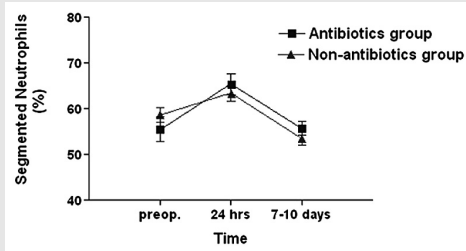


Fig. 3. Segmented Neutrophils percentage follow up.

Mohammad Alrashdan et al : Antibiotics in third molar surgery, justifiable or not?. J Kor Dent Sci 2009.

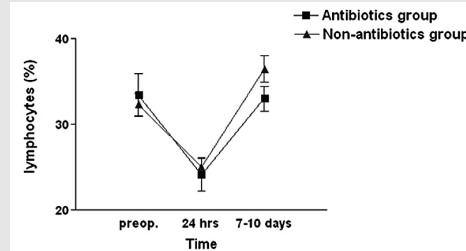


Fig. 4. Lymphocytes percentage follow up.

Mohammad Alrashdan et al : Antibiotics in third molar surgery, justifiable or not?. J Kor Dent Sci 2009.

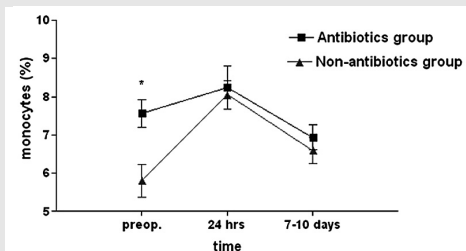


Fig. 5. Monocytes percentage follow up. *P < 0.05.

Mohammad Alrashdan et al : Antibiotics in third molar surgery, justifiable or not?. J Kor Dent Sci 2009.

exception was the monocyte count preoperatively which was higher in the antibiotics group ($7.57 \pm 0.36\%$) than the non-antibiotics group ($5.81 \pm 0.43\%$), ($P=0.02$). However, this was of no clinical significance to the study.

Regarding postoperative complications, in the antibiotics group three patients had a swelling following their third molar extraction; four patients had severe pain postoperatively, which was incompletely controlled by analgesics. One patient reported that he had TMJ dysfunction following the third molar surgery, the remaining patients didn't report any complications.(Fig.6) In the non-antibiotics group, one patient had a swelling; five

patients had severe pain or discomfort, two patients had fever, two had a feeling of headache and another two reported nasal congestion. The remaining patients had no complications. (Fig.7)

To facilitate comparison between the two groups, and due to the wide variability of complications reported by patients and the fact that most of these complications were subjective symptoms that might not be directly related to the third molar surgery, we have chosen to categorize the complications into four broad categories: 1.None, 2.Pain or discomfort, 3.Swelling and 4.Others.

Discussion

In the first part of this study, we have used a novel method for assessment of postoperative infections in patients following third molar surgery, that is monitoring of body temperature and CBC components as indicators for infection. We recruited these objective parameters to investigate the significance of antibiotics administration in reducing postoperative infection rates after third molar surgery in two groups of patients. In the second part of the study we used postoperative complications for comparison

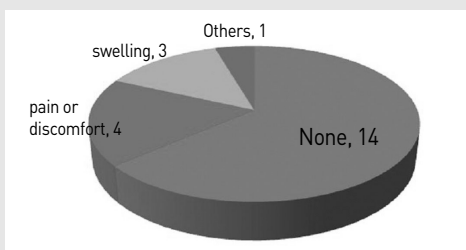


Fig. 6. Postoperative complications - antibiotics group.

Mohammad Alrashdan et al : Antibiotics in third molar surgery, justifiable or not?. J Kor Dent Sci 2009.

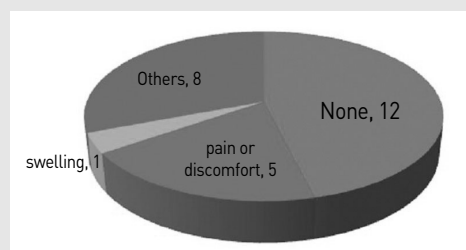


Fig. 7. Postoperative complications - non-antibiotics group

Mohammad Alrashdan et al : Antibiotics in third molar surgery, justifiable or not?. J Kor Dent Sci 2009.

between the two groups.

Although Peterson's principles¹²⁾ for antibiotics use in oral and maxillofacial surgery are widely accepted, there is a sense of overprescription regarding antibiotics use especially in third molar surgery^{1,19)}. The absence of an international consensus about their significance to reduce postoperative complications, has made this issue extremely controversial^{13,14)}.

In a literature review carried out by Zeitler D¹⁾, the rate of postoperative infections (1-6%) was found too low to justify the routine use of antibiotics in third molar surgery. Blondeau & Daniel⁶⁾, and Martin et al⁷⁾. reported a similar finding. Bulut et al²⁾. studied acute phase protein levels, C-Reactive Protein (CRP) and alpha 1- antitrypsin (AT), following third molar extraction and reported no changes in serum levels between the antibiotics and placebo groups. Many other investigators also found antibiotics of no benefit in reducing postoperative infection or complications rate^{13,15-20)}. On the other hand, other researchers came out with different findings and recommended antibiotics for use in third molar surgery^{8-11,14)}.

Several authors pointed out some factors that affect the postoperative healing process and the likelihood of complications, among them are patient's age, gender, medical history, smoking, alcohol consumption, surgeon's experience and type of impaction^{3-7,13,21-23)}.

Our results in the first part showed no significant difference between the two groups regarding the body temperature. It is well known that body temperature levels increase with infection, but neither of the two groups showed higher than normal levels during the follow up period.

An increase of WBCs count indicates several pathologic conditions including infections. Although there was no significant difference between the two groups WBCs counts preoperatively, the antibiotic group WBCs levels increased to significantly higher levels than the non-antibiotics group at both 24 hours and 7-10 days postoperatively. A finding that has gained our attention in an attempt to explain, because of the anticipated effect of antibiotics in reducing, not increasing, WBCs levels as in this case. The only possible explanation that we could give is the small number of individuals included in the antibiotics group which could have affected the outcome, but we still believe that such a finding requires more investigation in order to give a reasonable explanation.

However, it is worth noting that even the higher levels of

WBCs counts in the antibiotics group at both intervals postoperatively remained within normal range ($4-10 \times 10^3/\mu l$), so they only indicate higher than the non-antibiotics group levels, rather than abnormal ones.

Neutrophils and lymphocytes counts showed the same mode during the follow up period without any differences between the two groups, all values were also within the normal range in both groups at both postoperative intervals.

Monocytes levels, although were significantly higher in the antibiotic group preoperatively, followed the same path in the two groups, increasing at 24 hours postoperatively then decreasing at 7-10 days postoperatively, without any significant differences. Levels were within the normal range at all intervals.

It is evident that regardless of the differences of WBCs levels between the two groups, neither of them showed abnormal levels of any of the investigated hematologic features at any time interval during the follow up period. This indicates the absence of any hematologic evidence of infection in both groups at either 24 hours or 7-10 days postoperatively.

In our assessment of postoperative complications, we focused on swelling and pain as these are the most common postoperative events that are reported by patients in addition to that they are often exclusively investigated in third molar studies, being among the cardinal signs of infection.

Other complications were reported by the patients such as, feeling cold, headache, pharyngeal pain and TMJ discomfort. These complications were widely variable so we collectively referred to them as "others" in our assessment to provide a less complicated approach.

Postoperative complications follow up showed that 38% of the patients in the antibiotics group suffered from at least one complication, while 54% of the non-antibiotics group had the same experience. (Table 2). These values were less than those reported by Lacasa et al¹⁰⁾, where 69.3% of placebo group and 54.7% of antibiotics group reported postoperative complications, But more than those reported

Table 2. Postoperative complications, percentage- both groups.

complications	Antibiotics group	Non-antibiotics group
none	62%	46%
Pain or discomfort	19%	19%
Swelling	14%	4%
others	5%	31%

Mohammad Alrashdan : Antibiotics in third molar surgery, justifiable or not?. J Kor Dent Sci 2009.

by others^{4,5,7}.

This definitely indicates a higher incidence of complications in the non-antibiotics group.

Surprisingly, three patients (14%) in the antibiotic group had some degree of postoperative swelling while only one patient (4%) of the non-antibiotics group reported this unhappy event. These results are not consistent to what was reported in other studies¹³. Again we possibly attribute this to the small sizes of groups.

The same percent in both groups (19%) reported some degree of pain or discomfort postoperatively, that was not fully controlled by analgesics. Finally, 31% of the non-antibiotics group patients reported complications other than pain and swelling compared to only 5% of the antibiotics group.

Conclusion:

Our objective parameters showed no significant differences between the two groups at either 24 hours or 7-10 days postoperatively, with both groups showing “within the

normal range” results. This indicates absence of infection signs during the follow up period in both groups.

Postoperative complications follow up results were more difficult to interpret. 54% of patients in the non-antibiotics group compared to 38% of the antibiotics group had postoperative complications.

This in part shows a higher rate of postoperative complications in the non-antibiotics group. However, the specific event of swelling was reported in 14% of patients in the antibiotics group compared to only 4% in the non-antibiotics group.

Based on these results, we are unable to give definitive recommendations on antibiotics use in third molar surgery and we strongly believe that further investigation, with expansion of sample sizes in both groups is necessary to reach more precise outcomes in the future.

At this stage we can say that when antibiotics are not used in third molar surgery, there is no significant risk of higher infection rates and accordingly their use should be approached with caution and be considered only after careful assessment of each case.

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