



Antibiotics in the Surgical Extraction of Third Molars: A Comparative Study

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Abstract

The removal of third molar teeth is one of the most frequently performed procedures in the OMFS outpatient clinic. The use of antibiotics in this procedure is a subject of conflict among the surgeons. Most clinicians use amoxicillin, metronidazole, amoxicillin with clavulanic acid, clindamycin, cephalosporin and other antibiotics, in order to prevent postoperative complications. The aims of this study were to determine current antibiotic prescribing patterns in our department, to compare the effectiveness of these three different antibiotics, cefuroxime, clindamycin and amoxicillin according to the postoperative symptoms of the patients, to find a correlation of antibiotic prophylaxis and difficulty of extraction with postoperative inflammatory complications and also to provide an evidence-based study on antibiotic prophylaxis for the extraction of third molars.

A total of 120 extractions in 100 patients, 70 males and 30 females with impacted and semi-impacted third molars were enrolled in the study. They separated in 3 groups randomly according to the antibiotic they got. Cefuroxime 500 mg P.O. was administered to 41 patients, Clindamycin 300 mg P.O. to 33 patients and Amoxicillin 500 mg P.O. to 26 patients. Antibiotics have been administered for 7 days. All surgical extractions were carried out by the same surgeons. The postoperative complications/clinical parameters which were examined on 7 and 15 days were swelling, pain, trismus, surgical wound dehiscence, pus extrusion and dry socket.

The difficulty of extraction, especially in case of ostectomy, was significantly associated with the postoperative complications. In conclusion, there are no statistically significant differences between the three groups of patients.

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Keywords: Dental; Implants; Antibiotics; Amoxicillin; Cefuroxime; Clindamycin; Third molars; Surgical extraction

Introduction

The removal of third molar teeth is one of the most frequently performed procedures by OMFS and it is accompanied by some postoperative complications such as swelling, pain, trismus, surgical wound dehiscence, pus extrusion and dry socket. Many surgeons tend to prescribe antibiotics to prevent postoperative complications, although it is somewhat controversial. In routine dentoalveolar surgery the infection rate is small, but in third molar surgery with bone drilling at the time of the operation a higher rate of postoperative wound infection has been shown to result in.

The organisms responsible for infections following third molar surgery are principally *Streptococci*, *Bacteroides* and *Fusobacteria* [1]. Although antiseptic mouthwashes have been shown to be partially effective in decreasing the rate of infection, systemic antibiotic administration remain the most common form of antibacterial prophylaxis followed in clinical practice [2]. There is currently no exact protocol regarding the need for a prophylactic administration of antibiotics in dentoalveolar surgery, the kind of antibiotic, the dose and the time of administration. There are some researchers who use prophylactic administration both preoperatively and postoperatively. Others point out the necessity of prophylactic antibiotic administration preoperatively in a single dose, instead of extending it for a prescribed postoperative period.

Most researchers use amoxicillin, metronidazole, amoxicillin with clavulanic acid, clindamycin, cephalosporin and other antibiotics. Amoxicillin has extended spectrum coverage with low toxicity and infrequent and well-known secondary effects. It is most effective against aerobic gram-negative bacteria but it is susceptible to beta-lactamase. Cefuroxime is an (enteral) second-generation

Table 1: Pederson's difficulty index of extraction of 3rd molars.

Criteria	Value
Spatial relation	
Mesioangular	1
Horizontal/Transverse	2
Vertical	3
Distoangular	4
Depth of occlusal level of 3rd molar	
A (same as occlusal plane of 2 nd molar)	1
B (between occlusal plane and cervical line of 2 nd molar)	2
C (below cervical line of 2 nd molar)	3
Space between the ramus and the distal part of the lower 2nd molar	
1 (sufficient space)	1
2 (reduced space)	2
3 (no space)	3
Difficulty index (=A+B+C)	
Easy (Class I)	3 to 4
Moderate (Class II)	5 to 6
Difficult (Class III)	7 to 10

cephalosporin antibiotic. As with the other cephalosporins, it is susceptible to beta-lactamase, although as a second-generation variety, it is less so. It has activity especially against gram-negative bacteria, but also against some aerobic gram-positive cocci. Clindamycin is most effective against aerobic gram-positive cocci, including some members of the *staphylococcus* and *streptococcus* but not against *enterococci*. It is also active against anaerobic gram-negative rod-shaped bacteria, including some *Bacteroides*, *Fusobacterium* and *Prevotella*, although resistance is increased in *Bacteroides fragilis* [1,2].

The aims of this study were to determine current antibiotic prescribing patterns in the Department, to compare the effectiveness of these three different antibiotics, cefuroxime, clindamycin and amoxicillin according to the postoperative symptoms of the patients, to find a correlation of antibiotic prophylaxis and difficulty of extraction with postoperative inflammatory complications and also to provide an evidence-based study on antibiotic prophylaxis for the extraction of third molars.

Materials and Methods

We made a retrospective study of surgical extraction of third molars which was carried out from October 2017 to May 2018 and conducted by the Oral and Maxillofacial Surgery Clinic at the Naval Hospital of Athens, Greece. A total of 120 extractions in 100 patients without medical problems, 70 males and 30 females with impacted and semi-impacted third molars were enrolled in the study (aged 17 years to 50 years, mean 33) (Table 1). The subjects were divided randomly into 3 groups: group 1 (41 patients), group 2 (33 patients) and group 3 (26 patients).

Cefuroxime 500 mg per os was administered two times a day for 2 days in preoperative period and for 5 days in postoperative period to group 1, Clindamycin 300 mg per os was administered three times a day for 2 days in preoperative period and for 5 days in postoperative period to group 2 and Amoxicillin 500 mg per os was administered three times a day for 2 days in preoperative period and for 5 days in

Table 2: Pederson's index of the patients included in the study.

Class I- Easy	n=20
Class II- Moderate	n=52
Class III- Difficult	n=48

postoperative period to group 3.

All the patients took lornoxicam (rapid) 8 mg per os two times a day at least for three days. Before all the extractions, panoramic radiographs were taken and if necessary a cone beam ct was demanded. The difficulty index described by Pederson was measured from panoramic radiographs (Figure 1 and 2) (Table 2 and 3) [3]. The patients were classified into three categories according to the difficulty of the extraction ("easy" group n=20, "moderate" group n=52 and "difficult" group n=48). The inferior-superior alveolar, lingual, and buccal nerves were locally anaesthetized with 4% articaine hydrochloride 1.7 ml containing 1:100.000 adrenaline. If removal of the 3rd molar was not possible with extraction forceps, a buccal flap was raised, combined with ostectomy, even resection of the tooth if necessary with a surgical round bur. The wound was sutured with 3/0 synthetic absorbable, polyglycolic acid suture. (Figures 3-6).

The following postoperative complications/clinical parameters were examined on 7 days and 15 days:

- Swelling
- Pain
- Trismus
- Surgical wound dehiscence
- Pus extrusion
- Dry socket

The diagnosis of infection was made if there was gingival swelling, persistent pain and discharge of pus from the extraction socket.

Results

All the groups responded well to the treatment, showing a normal post-operative course on average. Only 18 cases out of 100 showed postoperative complications. The percentages of the postoperative infections were calculated, as well as the contribution of the ostectomy

Table 3: Demographic and basal surgical characteristics.

	Cefuroxime N=41	Clindamycin N=33	Amoxicillin N=26
Gender			
Male	28	20	10
Female	13	13	16
Age (years)			
Mean (SD)	31	34.5	31
N (%) >30 years	0.4	0.4615	0.6
Range	17-45	19-50	27-35
Extracted teeth			
N=120	N=46	N=43	N=31
Right	24	21	15
Left	22	22	16
Upper	10	8	5
Lower	36	35	26

Table 4: Postoperative complications.

	Cefuroxime N=41	Clindamycin N=33	Amoxicillin N=26
Postoperative complications (%)			
Swelling	10,9	9,3	9,6
Pain	10,9	9,3	9,6
Trismus	2,2	2,3	-
Pus extrusion	6,5	4,7	3,2
Surgical Wound Dehiscence	10,9	9,3	6,5
Dry Socket	2,2	-	-
With ostectomy	18	7	10
Without ostectomy	28	36	21

Table 5: Infection, with ostectomy in 35 extractions.

	n/N	(%)
Cefuroxime	8/18	44,4
Clindamycin	4/7	57,1
Amoxicillin	3/10	30

Table 6: Infection, without ostectomy in 35 extractions.

	n/N	(%)
Cefuroxime	2/28	7,1
Clindamycin	0/36	
Amoxicillin	1/21	4,8

according to those infections (Tables 4-6). Of the 120 extractions of lower and upper 3rd molars that matched the inclusion criteria, 12 of them showed swelling, 12 referred pain, 2 of them showed trismus, 6 of them showed infection, 11 of them showed surgical wound dehiscence and 1 of them showed dry socket (Table 4).

Ostectomy was used in 35 cases and 15 of them showed postoperative complications, more specifically, 8 cases of first group, 4 cases of second group, 3 cases of third group (Table 5, 6). Overall, the difficulty of extraction and postoperative complications were significantly associated ($p=0.001 < p=0.05$). In cases grouped by similar class of difficulty, there was no significant correlation between antibiotic prophylaxis and postoperative complications. No significant statistical difference was found between the three groups of different antibiotics ($p=0.860 > p=0.05$).

Discussion

Literature shows no consensus about the effectiveness of an antibiotic therapy after the surgical extraction of third molar, but despite this, and based on the evidence that a five-day post-op therapy is helpful in reducing swelling after third molar surgery, several clinicians prescribe different kinds of antibiotics as routine. The aim of this study demonstrated that cefuroxime and clindamycin have no advantages compared to amoxicillin, according to the presence of postoperative complications. The results show clearly that the statistically most significant signs are the class of difficulty of the extraction as long as the need of ostectomy. Similar results were shown in many studies in literature.

Sisalli et al. [4], in a comparative study published in 2012, compared the effectiveness and the post operative complications of two different antibiotic drugs, amoxicillin and clavulanic acid vs. ceftazidime and demonstrated that the use of second choice antibiotic



Figure 1, 2: Panoramic radiographs which indicate the difficulty index of third molars' extractions.



Figure 3: Semi-impacted mandibular.



Figure 4: Buccal flap. Third molar.



Figure 5: Ostectomy and resection.

has no significant advantages in comparison with a first choice.

Another comparative study in which Lee et al. investigated the correlation among antibiotic prophylaxis, difficulty of extraction, and postoperative complications in the removal of lower third molars showed that the difficulty of extraction was significantly associated with postoperative complications ($p=0.03$). Furthermore there were no significant associations between antibiotic prophylaxis and postoperative complications in groups of equal difficulty. There was a small but insignificant increase in the number of dry sockets and infections in class III cases. In conclusion, this study provides further evidence that antibiotic prophylaxis for the prevention



Figure 6: The wound was sutured with 3/0 of the tooth with a suture. Surgical round bur.

of postoperative inflammatory complications is unnecessary for extraction of 3rd molars [5].

A systematic review and meta-analysis of Isiordia-Espinoza et al. [6] showed that there was no reduction of the risk of infection when amoxicillin was given before or after the surgical extraction of third molars in healthy patients compared with a placebo or untreated group.

Thomas and Hill [7] investigated antibiotic prescribing practices in the University Dental Hospital National Health Service Trust (Cardiff) and concluded that there is no significant clinical difference in antibiotic prescription. The results of this study suggest that preoperative antibiotic prophylaxis is unwarranted for routine third molar surgery in healthy patients and also this has a cost benefit.

Furthermore, a comparative, randomized, double-blind, placebo-controlled, clinical trial of Lacasa et al. [8] evaluated the efficacy of amoxicillin/clavulanic acid in the reduction of infection after the surgical extraction of third molar. The incidence of infection was higher in the placebo group than the pre-emptive treatment group and the presence of infection was also related to the difficulty of surgery, osteotomy. This study showed that 5 days therapy with two tablets of amoxicillin/clavulanic acid 1000/62.5 mg twice a day was effective in reducing episodes of local infection after extraction of a third mandibular molar. The study results indicate that pre-emptive therapy with amoxicillin/clavulanic acid 2000/125 mg, given twice daily for 5 days, was associated with a reduction of local infection episodes in patients subjected to osteotomy.

Figueiredo et al. [9] made a study in order to identify the bacteria involved in delayed-onset infections after lower third molar removal and to determine the most suitable antibiotic for such complication. *Fusobacterium* sp, *Prevotella* sp, and *Peptostreptococcus* sp, are frequently present in delayed-onset infections after lower third molar removal. Based on the results of the microbial susceptibility tests, clindamycin seems to be the most adequate antibiotic for the treatment of this complication.

Finally, we must interpret the results of this study with caution because there are some drawbacks in its design. Firstly, an antibiotic

regimen for 7 days as we used is considered to be excessive by most surgeons, and a shorter period should be recommended. In addition, the rate of postoperative complications in the antibiotic group might have been distorted by this overuse. Furthermore, there should be included a control group, without any antibiotic administration, in order to investigate the need of antibiotics in third molar extraction, which is still a controversial among clinicians.

Conclusion

In conclusion, there are no statistically significant differences between the three groups of patients, so other secondary factors such as the cost, allergies and side effects of different antibiotics should be taken into consideration instead of the kind of antibiotics. The difficulty of extraction and postoperative complications were significantly associated. There should be an expanded number of patients in order to have more accurate conclusions. Overall, further prospective, randomized, well-designed studies will be required to ascertain the results of this study with a high level of evidence.

References

1. Aggelopoulos A, Alexandridis A, Katsikeris N. Modern oral and maxillofacial surgery. Athens: Litsas Publications; 2010.
2. Abubaker AO, Kenneth JB. Oral and maxillofacial surgery secrets A. 2001.
3. Pederson GW. Surgical removal of tooth. In: Pederson GW, editor. Oral surgery. Philadelphia: WB Saunders; 1988.
4. Sisalli U, Lalli C, Cerone L, Maida S, Manzoli L, Serra E, et al. Amoxicillin and clavulanic acid vs. ceftazidime in the surgical extraction of impacted third molar: A comparative study. *Inte J Immunopathol Pharmacol*. 2012;25(3):771-4.
5. Lee JY, Do HS, Lim JH, Jang HS, Rim JS, Kwon JJ, et al. Correlation of antibiotic prophylaxis and difficulty of extraction with postoperative inflammatory complications in the lower third molar surgery. *Br J Oral Maxillofac Surg*. 2014;52(1):54-7.
6. Isiordia-Espinoza MA, Aragon-Martinez OH, Martínez-Morales JF, Zapata-Morales JR. Risk of wound infection and safety profile of amoxicillin in healthy patients which required third molar surgery: A systematic review and meta-analysis. *Br J Oral Maxillofac Surg*. 2015;53(9):796-804.
7. Thomas DW, Hill CM. An audit of antibiotic prescribing in third molar surgery. *Br J Oral Maxillofac Surg*. 1997;35(2):126-8.
8. Lacasa JM, Jiménez JA, Ferrás V, Bossom M, Sola-Morales O, García-Rey C, et al. Prophylaxis versus pre-emptive treatment for infective and inflammatory complications of surgical third molar removal: A randomized, double-blind, placebo-controlled, clinical trial with sustained release amoxicillin/clavulanic acid (1000/62.5 mg). *Int J Oral Maxillofac Surg*. 2007;36(4):321-7.
9. Figueiredo R, Valmaseda-Castellón E, Formoso-Senande MF, Berini-Aytés L, Gay-Escoda C. Delayed-onset infections after impacted lower third molar extraction: Involved bacteria and sensitivity profiles to commonly used antibiotics. *Int J Oral Maxillofac Surg*. 2012;114(1):43-8.