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## The utilization of prophylactic antibiotics as part of the third molar extraction procedure

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### ABSTRACT

The extraction of the wisdom teeth may be a complicated surgical procedure due to the dependency on multiple factors such as the current state of the tooth, the state of the other teeth in the mouth and the state of the patient. The early extraction will be suggested in case of an impaction of a tooth, delayed and/or ectopic eruption of the tooth or adjacent teeth and threatening pathological cases. The possibility for post-surgical complications such as alveolar osteitis, pain, mandibular fracture, broken teeth, temporomandibular joint (TMJ) dislocation, bleeding, injury to nerves, trismus, infection, cellulitis, abscesses and even to hospitalization are not high but may still occur during or after the extraction.

In dentistry, antibiotics may be used to reduce the rate of some of those complications. The prophylactic usage of antibiotics in those cases is often administrated as part of the medical control which is provided alongside the extraction procedure. The usage of prophylactic antibiotics should be recommended for patients who are required to undergo broad and invasive dental procedures which may put them at risk and jeopardize their health. Unfortunately, the usage of antibiotics is quite often improper and may lead to adverse reactions from the medication itself such as the development of antibiotic resistance, gastrointestinal disorders and anaphylactic shock. The scientific literature contains an enormous amount of studies regarding the utilization of antibiotics and their adverse reactions. However, there is an inconsistency and a lack of consensus about the required type, dosage, way of administration and correct time of administration.

**Keywords:** third molar extraction, Prophylactic antibiotic, Prophylactic management, Oral surgery, Penicillin.

### Abbreviations

Centre for Disease Control and Prevention (NCDC), United States of America (USA), Scottish Dental Clinical Effectiveness Program (SDCEP), Temporomandibular Joint (TMJ), Clostridium Difficile Infection (CDI), Gastrointestinal (GI).

## Introduction

Since the random discovery of antibiotics by Sir Alexander Fleming in Scotland 1929, they have been a tremendous donation to the medical world of the 20th century. In the beginning, systemic antibiotics such as penicillin and sulfonamides were restricted for the exclusive use of the army during the 2nd world war due to the complex and expensive procedure of fabrication. As new techniques of production were invented, the fabrication and accessibility to antibiotics became easier and the distribution has spread globally. After this global distribution, the prevalence of illnesses and deaths from formerly dangerous diseases such as pneumonia, meningitis, diphtheria and many others were significantly decreased [2]. In the routine dental work nowadays, antibiotics may be prescribed as prophylactic or therapeutic management. Prophylactic management of antibiotics is prescribed to avoid diseases that may begin by the spread of oral flora bacteria to remote sites or proximal sites but in an enfeebled host. In the majority of the cases, prophylactic management is aimed to avoid the possibility of infective endocarditis, while therapeutic management is usually aimed to deal with diseases related to the hard and soft tissues of the oral cavity after the failure of local debridement [7].

The extraction of teeth is usually done by dentists due to various factors such as unfavorable impaction of teeth, caries, trauma, and periodontal diseases. It is important to remember that antibiotics are an important addition to the regular dental treatments in specific cases but it is no alternative to it. The prophylactic management with antibiotics may occur prior, during or after the process of diagnosis, therapy, and surgery with the one goal to avoid possible infections and the sequel complications of it. Even though it is very common among dentists from all over the world to prescribe antibiotics as part of the prophylactic management following the procedures which may involve bleeding from the mouth and eventually may lead to various complications such as dry alveolitis and

infections of the intraoral site, the prescription of antibiotics following the extraction of the wisdom tooth remains very debatable [2, 4].

This article aims to investigate the utilization of prophylactic antibiotics among dentists following the extraction of wisdom teeth.

## Epidemiology

Dentists prescribed approximately 10% of all the antibiotics which are provided to the population and as a result has been rated as the 4th most prescribing physicians after family doctors, pediatricians and general internists [1]. In dentistry, the prescription of prophylactic antibiotics should not be so easy provided due to the fact that most of the dental and/or periodontal diseases may usually be solved by surgical interventions and maintenance of good oral hygiene. Unfortunately, the National Centre for Disease Control and Prevention (NCDC) have shown that every 1 out of 3 outpatients, on average, have been provided with an unnecessary prescription [2]. According to few surveys which were conducted in the United States of America (USA), only 39% of dentists and 27% of the various physicians were following the guidelines for appropriate prescription of prophylactic [7]. The scientific literature has also shown the minimal occurrence rate of post-surgical infections in the oral cavity which stands for less than 5.8% [8]. One study has shown that out of 150 extractions of the wisdom teeth which were divided among 110 patients, there was no sign of infection at all. A different study has shown that out of 380 extractions of impacted wisdom teeth, only 2% of them had become infected [8]. The rate of infection which is usually expected after the extraction of an impacted wisdom tooth is less than 1% and accordingly, the rate of cellulitis and abscesses which may develop following the initial infection are not exceeding the rate of 1% as well [8].

## The most common antibiotics in dentistry

The most frequently prescribed and used group of antibiotics within the dental field is penicillin. The most notorious antibiotics are

amoxicillin, followed by penicillin V, metronidazole and the conjunction of amoxicillin and clavulanic acid together. Patients with a known allergy to the penicillin's group would be advised to use clindamycin, which is very effective against anaerobic and facultative bacteria of the oral cavity

and may penetrate the bone quite well. In general, the antibiotics which are known as productive against infections from an odontogenic origin include penicillin, clindamycin, metronidazole, cefadroxil, erythromycin and tetracyclines [7].

Table. Most common antibiotics which are been used to treat infections of an odontogenic origin [7].

Antibiotic	Administration route	Posology
Amoxicillin	p.o.	500 mg/8 hours 1000 mg/12 hours
Amoxicillin/ clavulanic acid	p.o. or i.v.	500–875 mg/8 hours* 2000 mg/12 hours* 1000–2000 mg/8 hours†
Clindamycin	p.o. or i.v.	300 mg/8 hours* 600 mg/8 hours†
Azithromycin	p.o.	500 mg/24 hours, three consecutive days
Ciprofloxacin	p.o.	500 mg/12 hours
Metronidazole	p.o.	500–750 mg/8 hours
Gentamycin	i.m. or i.v.	240 mg/24 hours
Penicillin	i.m. or i.v.	1.2–2.4 million IU/24 h‡ Up to 24 million IU/24 hours†
i.m., intramuscular; i.v., intravenous; p.o., per os (oral). *p.o. administration. †i.v. administration. ‡i.m. administration.		

It has already been proved that antibiotics that are prescribed after the extraction of wisdom teeth indeed reduce the possibility of infection and helps to prevent other complications such as alveolar osteitis. The most popular and effective groups of antibiotics are penicillin and nitroimidazoles. Nitroimidazoles is usually advised in case of a specific infection which is mostly composed of gram-negative anaerobic bacteria, but in case of a suspicious to a larger involvement of gram-positive bacteria such as cocci, it would be recommended to prescribe antibiotics from the penicillin family as well [5].

#### Indications for the administration of antibiotics

The prophylactic usage of antibiotics is often administrated as part of the medical control which is provided alongside the extraction procedure of wisdom teeth. The usage of antibiotics should be recommended for patients who are required to undergo invasive dental procedures such as retraction, cutting and perforation of the oral soft tissues. In addition, antibiotics should be advised for patients who are likely to be subjected to a possible risk such as

infectious endocarditis, implantation of foreign materials, immuno-suppression [1].

Furthermore, the Scottish Dental Clinical Effectiveness Program (SDCEP) had recommended that prophylactic antibiotics should be provided for any local infection of the mouth with a proof of a swelling, involvement of regional lymph nodes, cellulitis and of course any systemic manifestations such as general feeling of discomfort and fever [1].

### **Contraindications for the administration of antibiotics**

The utilization of systemic antibiotics to prevent the various complications that may occur following the extraction of wisdom teeth is a very controversial topic. This controversy may result from a couple of reasons. The first reason is the understanding that treatment with antibiotics should not be so easily indicated for generally healthy patients. The second reason is that improper usage of the medication may lead to adverse reactions from the drug itself. The third reason is the increasing possibility for the development of resistance to the medication [4]. In addition, the administration of these prophylactic antibiotics should be reconsidered in the case of a patient with a failure of an organ such as kidney and/or liver. In another case such as pregnancy, antibiotics should not be indicated due to the possibility of an accidental transfer of the medication to the infant and the major results it may cause to the infant [7].

### **Extraction of a wisdom tooth**

Early extraction of the wisdom teeth will be suggested in case of impaction of a tooth, delayed and/or ectopic eruption of adjacent teeth and threatening pathological cases such as dentigerous cyst [6]. The first stage of the extraction will always be to proper disinfection of the surgical area as the oral cavity constantly contains an enormous number of harmful bacteria and other contents which may lead to an inflammatory process. The following stage includes the administration of suitable local or regional anesthesia. The last stage of the procedure is the extraction of the tooth itself. The extraction of the wisdom teeth may be a complicated surgical procedure due to the dependency on multiple factors such as the current state of the tooth, state of the patient and of course the state of the other teeth in the mouth. The current state of the tooth will determine the necessity for any surgical interventions at the site such as the use of the different types of flaps, osteotomy, odontotomy

and the removal of any attached pathology such as an osteolytic lesion. In addition, the difficulty to extract a wisdom tooth depends on the level of the eruption. For example, the surgical extraction of a fully erupted tooth that is located at a proper position in the arch will be much easier compared to a fully impacted or partially erupted tooth. Another reason for the difficulty to extract a wisdom tooth may be related to anatomical factors of the tooth such as the length of the roots, curved anatomy of the roots and the proximity of them to the mandibular canal [4].

### **Irregular eruption of the wisdom teeth**

The eruption process of the wisdom teeth in a normal state will allow the full arch formation as each one of the permanent molars takes place as the last tooth in each quarter. However, due to various reasons, those teeth do not always break through the surrounding bone and soft tissues and may remain integrated underneath. One cause that may explain the lack of eruption is the developmental absence of one or more of these wisdom teeth. In other cases, even though the wisdom teeth have successfully erupted through the gingiva, they have not been completely breached due to a local lack of space and as a sequential to it, their level of eruption has stopped. Those cases of partial eruption may lead to various complications such as ankylosis of the tooth as it remains attached to the surrounding bone of the maxilla and/or mandibula. Another complication of those partial eruption cases may be the development of an inflammation center which will require surgical intervention in order to prevent the formation of an osteolytic lesion later on [4].

### **Post extraction complications**

The surgical extraction of wisdom teeth has become a frequent procedure among dentists [4] which usually ends with a nearly contaminated-free surgical site that may present a very low chance for postoperative complications [5]. However, complications such as dry socket, pain, mandibular fracture, broken teeth, temporomandibular joint (TMJ) dislocation, bleeding, injury to nerves, trismus and infection

may occur during the procedure or afterward [4, 5, 8]. In addition, an untreated infection may lead to cellulitis, abscesses and even to hospitalization due to deterioration of the infection [8]. The author Chaparro Avendano had investigated the prevalence of complications after the surgical extraction of those wisdom teeth among patients at the age of 12 to 18 years old. The investigation has shown the prevalence of complications which stands for 15.62%. Out of those percentages, 8.9% were related to constant pain and swelling, 2.3% were related to the difficulty to open the mouth, 2.1% were related to subcutaneous bleeding and 1.8% were related to the development of secondary infection [6].

#### **Adverse reactions to antibiotics**

The prescription of systemic antibiotics which has been used to manage the various complications is a very common but questionable practice [5]. The reasons for this questionability may emerge from the variety of protocols that maybe apply for each case [4]. In addition, the awareness to the frequent and unnecessary use of antibiotics and its possible severe adverse reactions such as clostridium difficile infection (CDI), the development of antibiotic resistance, gastrointestinal (GI) disorders and anaphylactic shock [1, 7]. A systematic review by the Cochrane Collaboration charity has explained how the utilization of prophylactic antibiotics following the extraction procedure of wisdom tooth has been beneficial to reduce the possible risk for an infection but has also increased the possibility for adverse reactions [1]. According to a clinical study which has been administrating amoxicillin together with clavulanic acid for 52 of their patients following the surgical extraction of wisdom tooth, 21 of them had been suffering from diarrhea and only 9 from nausea [8]. Overall, there is an agreement between the different authors regarding the possibility of adverse reactions following the utilization of prophylactic antibiotics after an extraction. Hence, the practitioners must carefully examine and assess the general state of their patients during and after the extraction procedure, especially those who are generally healthy and will not necessarily be indicated for the treatment with antibiotics. [1, 4].

#### **Misleading information from the scientific community**

The prophylactic management with antibiotics has been prescribed for the reduction of postoperative complications which may occur following the extraction procedure of wisdom teeth. However, this topic still considers a questionable and all the authors who were researching the topic have emphasized the important need for additional investigation of it [3].

The various reports regarding the utilization of antibiotics are very inconsistent regarding the required type, dosage, way of administration which may be oral or parenteral and the correct time of administration which may be before or after the operation. A systematic review from 2007 which was written by the author Ren, has shown how the usage of antibiotics after the surgical extraction of wisdom teeth may decrease the possibility for infections and alveolar osteitis at the surgical site. On comparison, another review by the author Lodi at the year 2012, has concluded that consumption of antibiotics before the extraction procedure of the wisdom teeth had the only moderate justification, while the consumption of antibiotics after the extraction had no justification at all. In the scientific literature, there was no conclusive evidence that could have indicated the specific time to provide prophylactic antibiotics. In addition, a report from 2005 by the author Lawler, did not find any evidence that could support the idea that complications such as alveolar osteitis and infection, which were developed after the extraction procedure of wisdom teeth, were decreased among healthy patients after the use of prophylactic antibiotics [3].

#### **Conclusion**

Although the administration of prophylactic antibiotics following the extraction of wisdom teeth is a very common practice among dentists worldwide, there is a lack of consensus and sufficient justification in the scientific literature that may support the utilization of it.

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### Conflict of interest statement

The authors declare that they have no conflicts of interests

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