ABSTRACT
Antibiotic prophylaxis in oral and maxillofacial surgery aims the prevention of the infection of the surgical wound, either due to the characteristics of the surgery or the general state of the patient. This risk increases with the contamination of the surgical operation area, making it necessary to imply a prophylactic treatment of the infection in clean-contaminated and contaminated surgeries and treatment of the infection in dirty surgeries. Moreover, a proper surgical technique helps to reduce the development of the postsurgical infection. The elective antibiotic chemotherapy ranges from penicillin-derivates with betalactamase inhibitors (amoxycillin-clavulanate, ampicilin-sulbactam) to second or third generation cephalosporins, quinolones or clindamycin. The indication for the use of these antibiotics depends on the type of surgery in oral and maxillofacial surgery, according to the degree of contamination. Thus in oral surgery and surgery of the salivary glands the literature demonstrates that there is not a better prognosis when using prophylactic antibiotherapy instead of not using it in healthy patients. In traumatology this prophylaxis is justified in compound fractures and those communicating with paranasal sinuses. In orthognatic surgery there is disagreement according to the criteria of using antibiotic prophylaxis, but short term treatment is preferred in case of using it. In oncological surgery it has been demonstrated the reduce in incidence of postsurgical infection using prophylactic peroperative antibiotherapy, mostly in those cases in which oral mucosa and cervical area contact.

Key words: Infection, oral cavity, antibiotic, maxillofacial surgery, prophylaxis.

RESUMEN
La profilaxis antibiótica en cirugía oral y maxilofacial tiene como fin la prevención de la infección en la herida quirúrgica, ya sea por las características de la cirugía o por el estado general del paciente. Este riesgo se incrementa cuanto más se contamine el campo quirúrgico, siendo necesario realizar tratamiento profiláctico de la infección en cirugías limpias-contaminadas y contaminadas y tratamiento de la infección en cirugías sucias. Además, una adecuada técnica quirúrgica colabora con la reducción de la aparición de infección postquirúrgica. La antibioterapia de elección varía entre derivados de la penicilina con inhibidores de las betalactamasas (amoxicilina-clavulanato, ampicilina-sulbactam), cefalosporinas de segunda o tercera generación, quinolonas o clindamicina. La indicación de su uso variará en función del tipo de cirugía en cada ámbito de la cirugía oral y maxilofacial, según el grado de contaminación de la misma. De este modo en cirugía oral y en patología de glándulas salivares la literatura parece demostrar que no hay mejor pronóstico en cuanto al uso de antibioterapia profiláctica respecto a no usarla en pacientes sanos. En traumatología se justifica en fracturas compuestas o con comunicación con senos paranasales. En cirugía ortognática hay discrepancia en cuanto al criterio de empleo de profilaxis antibiótica, si bien se prefiere ciclos cortos de tratamiento. En cuanto a la cirugía oncológica,
In case of long-lasting surgery, it could be necessary to repeat the antibiotic dose to keep therapeutic serum levels of the drug, according to the pharmacocynetics of each antibiotic. It is not well demonstrated that the use of antibiotics more than 24 hours after the surgery may reduce the risk of infection. Therefore, it is considered malpractice treating patients with these drugs over this period of time (5).

**CLASSIFICATION OF SURGICAL WOUNDS ACCORDING TO THE RISK OF CONTAMINATION- INFECTION (6-10)**

- **Type I:** clean wounds (no disruption of mucosa such as the oral cavity): infection rate 1-4%. No prophylaxis or prophylaxis no longer than 24 hours with amoxicillin-clavulanate as there is no benefit in using postoperative antibiotics.
- **Type II:** clean-contaminated wounds (disruption of mucosa such as the oral cavity or surgery in an inflamed area): infection rate 5-15%. Prophylaxis against gram + and anaerobic bacteria (11) (amoxicillin-clavulanate, cefazolin + anaerobicid (clindamycin or metronidazol) (12)).
- **Type III:** contaminated wounds (oncological surgery in which both oral cavity and neck contact): rate infection 16-25%. Prophylaxis against gram +, anaerobic bacteria and also gram –, which are not covered in clean and clean contaminated surgeries, using drugs such as ampicillin-sulbactam or piperacillin-tazobactam:
  - Amoxicillin-clavulanate 2 g, repeat dose if long term surgery 1g/4h (13).
  - Allergy to betalactamics. Clindamycin 600 mg + gentamycin 120 mg). repeat dose if long term surgery every 4h.
- **Type IV:** dirty and infected wounds. Rate infection 25%. Antibiotic treatment always, not prophylaxis.

The use of antiseptics in the oral cavity reduces the amount of the bacteria in the surgical area, but has not demonstrated to be effective in the prophylaxis of the bacterial colonization.

**CLASSIFICATION OF SURGICAL OPERATIONS**

Surgical operations can be classified into two groups, according to the presence or absence of microorganisms in the surgical area. Some examples in maxillofacial surgery are:
1. Surgical operations with absence of microorganisms: impacted teeth, exostosis, torus, odontogenic tumors, cysts (not infected), epulis, preprosthetic and preorthodontic

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**INTRODUCTION**

The aim in surgical antibiotic prophylaxis is to prevent the possibility of an infection in the surgical wound, creating an area of resistance to microorganisms by means of antibiotic serum concentrations that may avoid the multiplication and spread of bacteria through the surgical injury. The prophylaxis is always indicated when there is an important risk of infection, because of either the features of the operation or the local or general conditions of the patient. Among the factors that could be the cause for this infection, the ones that should be emphasized are the type and duration of the surgery and the surgical risk of the patient (ASA risk) due to its comorbidity: diabetes, nephropathies, hepatopathies (cirrhosis), cardiopathies, immunosuppressors (corticoids, radiotherapy, chemotherapy, previous infections untreated or mistreated with other antibiotics). Minor surgical procedures in healthy patients may not require prophylaxis.

When the surgical injury comes about with in the skin wound, the main physical barrier that stops the entrance of microorganisms into the body breaks down (1). Because of this event, these microorganisms penetrate and may colonize and cause infection of deep tissues (2). According to the amount of bacteria, the possibility of infection elevates, also depending on whether it is a clean, clean-contaminated, contaminated or dirty surgery. The more contamination in the wound, the more risk of postsurgical infection.

The risk of contamination of the surgical area reduces with an appropriate surgical technique, a good health of the patient, etc (3), (4), but the one that has been considered the most important factor is antibiotic prophylaxis. Antibiotics in surgery must be used just in those cases in which is indicated and the pharmacocynetics of the drug should be appropriate as well as the spectrum of bacteria.

Measures of control of the infection in the surgical technique in order to reduce the risk of infection are clean incisions, mucoperiosteal flaps avoiding tearing the mucosa, constant irrigation to cool the surgical area and clean the debris, constant aspiration, careful haemostasis, avoid injuries with the needle of the local anesthesia, slow entrance of the anesthetic agent, drainages and surgical dressings when required... It must be underlined the importance of the entrance in the postoperative period of liquids and remains of food through the surgical wound, therefore it should be recommended to make mouthwashes after 24 hour postoperative time onwards.

A good prophylaxis happens when there are effective serum concentrations of the drug since the opening of the skin of mucosa until its closure. Due to this fact, the antibiotic should be used in the hour previous to the incision. The best moment is during the anaesthetic induction via intravenous.

**Palabras clave:** Infección, cavidad oral, Antibioticos, cirugía oral, cirugía maxilofacial, profilaxis.
surgery, closed maxillary fractures, salivary glands diseases, osteotomies, grafts, flaps...

2. Surgical operations with presence of microorganisms: third molar pericoronitis, inflammatory cysts, teeth roots, granulomas, sialolithiasis, open fractures, traumatisms, contusions, infection inside a tumor, radionecrosis, etc.

ANTIBIOTIC PROPHYLAXIS IN DIFFERENT SURGICAL OPERATIONS IN ORAL AND MAXILLOFACIAL SURGERY

Literature data are contradictory as some issues conclude that the reduction in postoperative complications in oral and maxillofacial surgery is mostly because of the improvement in the surgical technique rather than antibiotic prophylaxis. Per and postoperative prophylaxis is recommended in those cases in which there is high risk of infection or clinical signs of infection.

The chosen antibiotic must be effective against the bacteria usually found in the oral cavity and cervicofacial skin, such as Staphylococcus, Streptococcus, enteric and anaerobic bacteria. Thus there is a good coverage using penicillin derivates combined with betalactamase inhibitors (amoxicillin-clavulanate, ampicillin-sulbactam), though other drugs can be used such as second or third generation cephalosporins (cefazolin, cefoxitin, ceftriaxone) (14), chinolones or clindamycin.

The use of preoperative antiseptics in the oral cavity (chlorhexidine, iodine) may reduce the complications caused by the surgical trauma in the oral cavity, mostly in patients with heart valve diseases, alloplastic implants, bone grafts, immunodepression, elderly people or patients with bad oral hygiene (15).

1.- Oral surgery

Infection rate is low and because of that, in healthy patients, most of the procedures in the oral cavity need no antibiotic prophylaxis. The use will be reduced to those cases in which there is active infection, patients with comorbidity or immunodepression (16).

- Impacted third molars: different issues demonstrate that the use of postoperative antibiotics doesn’t improve the prognosis in the possibility of infection after the surgery. However other authors seem to demonstrate the benefit of using prophylaxis antibiotic amoxicillin-clavulanate for those procedures requiring osteotomy (17)
- Implantology: it has not been demonstrated that using long term antibiotherapy in postoperative implantology surgery improves the prognosis dealing with postoperative infection.

2.- Traumatology

It is widely accepted the use of antibiotic prophylaxis in compound fractures (18).

- Mandible and dentoalveolar fractures: the algorithms of antibiotic treatment are the classical ones used in cervicofacial pathology (penicillin and its derivates, third generation cephalosporins). The treatment of non complicated fractures does not seem to improve versus not using antibiotherapy, though many professionals use them to take advantage to the possibility of infection so as to reduce their incidence (19-22). Antibiotic treatment in the first 72 hours is not necessary. Antibiotic treatment of the infective complications (abscesses, pseudoarthrosis, osteomyelitis…) is where there is more consensus, although in this case we talk about antibiotic treatment and not with prophylaxis (23-25).

- Orbital wall fractures: there is no consensus on whether using antibiotics or not (some authors defend it and others don’t) (26).

Third mid and upper fractures: third generation cephalosporins are used, treating those cases with liquorrrhea (27), though the majority of fractures in this region of the face are considered complex or compounded, communicating the oral mucosa with other parts such as the paranasal sinuses. In this sense, under our experience, we would rather use prophylactic antibiotics since the very beginning of these fractures.

3.- Orthognathic surgery and preprosthetic surgery

They are considered clean-contaminated surgeries. Some issues have demonstrated the benefit of using postoperative antibiotic prophylaxis (penicillin, cephalosporins, that in fact does not improve the prognosis and are more expensive) (28, 29). Other authors seem to demonstrate that there are no evidences in the improvement of the prognosis dealing with infection using postoperative antibiotics, specially if they are used via oral (30).

There is a higher incidence in infections in bimaxillary surgery without antibiotic treatment (31).

Some issues have used levofloxacin oral or cefazolin via intravenous in mandibular osteotomies, but in the latter is better to use amoxicillin-clavulanate due to the high amount of resistant bacteria to cefazolin (32).

The period of antibiotic prophylaxis was established in previous issues in five days, but the incidence of postoperative infection is the same comparing one day versus five days, though there is a certain improvement in the morbidity keeping the prophylaxis for five days (33).

4.- Salivary glands

In surgeries such as parotidectomy or submaxilectomy it has been clearly demonstrated that there is no effectiveness in using antibiotic prophylaxis (34).

5.- Oncological, reconstructive and cervical surgery

It has been demonstrated that the use of peroperative antibiotics reduces the incidence of postoperative infections. As in the previous examples, in cervical pathology and, overall, in oncological surgery, antibiotic prophylaxis that can be used are clindamycin combined with cefazolin, cephalosporins, aminoglycosides, chinolones or penicillin derivates combined with betalactamase inhibitors.
The risk of infection comes about when there is a chance to put a clean area in contact with a contaminated one such as the oral cavity, because the main source of contamination in these patients is the saliva, that carries an important amount of bacteria. Other factors that may contribute are the bad general state of the patient, immunodepression, preoperative radiotherapy or chemotherapy, reconstructive flaps or those procedures that may expose tissues to ischemia or necrosis. The sources of microorganisms in these diseases are the saliva, the skin, the teeth and the tumor itself. Therefore the chosen antibiotic must cover not only the common microorganisms of saliva, such as gram + and anaerobic ones, but also gram – commonly isolated in tumor (35). Most of the references in literature don’t take into account the coverage of gram – in head and neck oncological surgery, but recent issues associate a better prognosis when there is a prophylaxis against gram –.

The duration of the treatment is not well standarized, depending on the surgeon.

The postoperative antibiotherapy is kept till drainages are retired, though the drug is maintained in case of infection of the surgical wound, dehiscence or fistula.

**PROPHYLAXIS IN BACTERIAL ENDOCARDITIS**

It must be done in patients with high risk of endocarditis cardiopathies which may undergo a procedure with bacteraemia risk in oral and maxillofacial surgery. The elective antibiotic is amoxicillin-clavulanate. In allergic patients, the alternative is clindamycin, clarithromicina or azytromicine.

High risk of endocarditis cardiopathies:
1. High risk: endovascular prosthesis, previous endocarditis, complex congenital cyanotic cardiopathy or surgical systemic-pulmonary fistula.
2. Moderate risk: other congenital cardiopathies, acquired valvulopathies, mitral valve prolapse with regurgitation, hypertrophic miocardiopathy.
3. Low risk: ostium secundum interauricular communication, surgically repaired interauricular or interventricular communications, previous by-pass, mitral valve prolapse without regurgitation, pacemaker.

Those patients in high and moderate risk need prophylaxis whenever they undergo a procedure in the oral or maxillofacial area. The guidelines used recommend using the drug one hour via oral or thirty minutes via endovenous before the procedure.

### Table 1. Antibiotic prophylaxis in bacterial endocarditis

<table>
<thead>
<tr>
<th>Prophylaxis</th>
<th>Adults</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard</strong></td>
<td>Amoxicillin 2 g vo or iv</td>
<td>Amoxicillin 50 mg/kg vo.</td>
</tr>
<tr>
<td></td>
<td>Clindamycin 600 mg vo</td>
<td>Clindamycin 20 mg/kg vo</td>
</tr>
<tr>
<td></td>
<td>Azytromicine 500 mg vo</td>
<td>Azytromicine 15 mg/kg vo</td>
</tr>
<tr>
<td></td>
<td>Clarithromicina 500 mg vo</td>
<td>Clarithromicina 15 mg/kg vo</td>
</tr>
<tr>
<td><strong>Allergy to betalactamies</strong></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Ampicillin 600 mg im or iv</td>
<td>Ampicillin 50 mg/kg im or iv</td>
</tr>
<tr>
<td></td>
<td>Cefazolin 1 g im or iv</td>
<td>Cefazolin 25 mg/kg im or iv</td>
</tr>
</tbody>
</table>
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