Review

Are the antibiotics primary treatment methods for periodontal diseases?

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Nowadays it is accepted that bacteria play an important role in the etiology of periodontal diseases. It is known that many bacteria types lodge on the surface of the tooth inside a biofilm and that this structure which is defined as bacteria plaque is closely related to periodontal diseases. There are at least around 500 morphological and biochemically different bacteria groups or types that have been colonized in periodontal tissue. Periodontal diseases are generally related to specific bacterial pathogens. Although not seen frequently periodontal diseases necessitate systemic antimicrobial treatment. The diversity of oral flora, prevent the correct definition of the specific etiologic agent in many types of these diseases. However many of the periodontal diseases are formed by poly-microbial bacteria. Antibiotics that are usually started empirically and the application of periodontal treatment together with antibiotics, is seen as the most suitable method in decreasing periodontal diseases. With the correct usage of antibiotics in periodontal diseases, costs, resistance, and side effects related to antibiotic usage can be decreased. The aim of this study is to examine the indications and efficiencies of antibiotic usage during periodontal treatment and to determine the antibiotics that are necessary to be used specific to periodontal diseases.

Keywords: Antibiotics, periodontal disease, gingivitis, periodontitis, dental disease

INTRODUCTION

Nowadays antibiotics are the primary drugs that are most frequently and inappropriately used. It has been noted that in undeveloped countries the most consumed medicines were high amounts of antibiotics (Walsh, 2003). The usage of antibiotics in dentistry is at a limited framework in comparison to other medical branches. The usage of antibiotics during periodontal treatment is an important subject that needs to be taken into account. There are many bacteria groups or types colonized inside the mouth and in the dental area (Genco, 1981). As the flora is very complex it prevents the correct appointment of the etiologic agent in dental infections. With the inclusion of many gram positive, gram negative and anaerobic bacteria into the event, poly-microbial infections are formed (Baker et al., 1985). There is an average of 1.8x10^{11} anaerobe bacteria in the gingival sulcus (Evaldson et al., 1982; Mandell et al., 1987). The presence of dental plaque is a very important factor in the formation of many periodontal diseases. Local and systemic infections are developed with the settling of pathogen bacteria in periodontal tissue (Rylander and Lindhe, 2003). Systemic infections could progress as bacterial endocarditis, orthopaedic and other prosthesis infections, long infections, cavernous sinus infections, sinusitis, sepsis, mediastinitis, and brain abscess (Mandell et al., 1987). Two events lead to the development of periodontal disease. One of these events is the increasing in number of anaerobic gram negative bacteria, and the other is for bacteria having infection effect against harmless bacteria to become dominant. Generally the periodontal disease starts off as gingivitis and manifests as periodontitis. The development of periodontal diseases could change dependent on the type of bacteria, resistance status, and the person’s immune system (Mandell et al., 1987; Chow, 2000). The poly-microbial characteristics of periodontal diseases have been shown in many studies. For this reason, the decision to use antibiotics in order to manage periodontal diseases depends on a few factors. The periodontologist must first determine the reason for the disease and must decide on the most suitable periodontal treatment. The host defence mechanisms, the severity of the disease,
Choosing antibiotics for dental diseases

Penicillin is still gold standard regarding the treatment of dental infections. In severe odontogenic infections such as Ludwig angina and common orofacial cellulites Penicillin dramatically decrease the mortality rate (Owens and Schuman, 1993). Aerobic and anaerobic microorganisms are sensitive to penicillin. The most frequently seen side effect of penicillin is allergic reactions. Allergy against penicillin can be observed approximately in 3.5% of the population. Anaphylactic reactions are less frequently seen at approximately 0.05%. Bacteria can gain strength with β-lactamase enzymes that inactivate penicillin. The cases where a response cannot be obtained from penicillin treatment alone, as with the amoxicilline-clavulanic acid combination, treatment with and antibiotic such as β-lactamase inhibitor penicillin or clindamycin should be planned. First generation cephalosporins can provide a more extensive spectrum especially in gram positive infections. In many odontogenic infections there is no place for cephalosporins aside from the first generation cephalosporins (Chow, 2000; Swift and Gulden, 2002). After antibiotic treatment is started, if infection symptom and indications continue, additional intake of antibiotics may be necessary. When a positive response cannot be obtained in relation to penicillin treatment within 48 hours, metronidazole can be added to the treatment. Metronidazole is effective on mandatory anaerobic bacteria. This medicine however should not be used in pregnant people or people with a history of having seizures. If taken together with alcohol, it may lead to an effect similar to disulfiram and could cause nausea and vomiting. Another alternative medicine that can be used in cases where responses cannot obtained, is clindamycin. If it is thought that infection is more severe and it has spread to the bone, clindamycin can be used as the first option. However the issue of resistance should be taken into consideration; as it is known that in viridans streptococcus there is resistance to tetracycline, clindamycin, and new macrolides (Pallasch, 2000). Following the usage of penicillin in treating oral infections, it has been noted that tetracycline resistance could be developed in gram-negative rods or vice versa (Fosse et al., 1999). Following the necessary anamnesis and physical inspection, if it is deemed that antibiotic usage is necessary (besides very special cases), it can be said that usually a large part of dental infections can be treated with reliable and low cost antibiotics that have been used for years and which do not have too many side effects (Seymour et al., 2000).

Choosing antibiotics for periodontal diseases

Nowadays the aim of periodontal treatment is to repress periodontal pathogens related to the disease or to totally eliminate periodontal pathogens (Slots and Rams, 1996; Socransky and Haffajee, 2002). The present treatment options have different efficiencies in eliminating these pathogens. While Campylobacter rectus present in the subgingival flora can be completely eliminated from the medium by periodontal initial treatment (Rams et al., 1993), in the same treatment option, Bacteroides forsythus, staphilococci and enteric rods, Aggregatibacter actinomycetemcomitans (Renvert et al., 1998; Takamatsu et al., 1999) and Peptostreptococcus micros (Rams et al., 1993) cannot be completely eliminated (Rams et al., 1990; Petersilka et al., 2002). Systemic
antibiotics enter the periodontal tissue and pocket via serum, and they affect the organisms that cannot be reached by hand tools or topical antibiotics. Moreover, Systemic antibiotic treatment affects the pathogens at the back of the tongue and the pathogens on other oral surfaces and delays re-colonization (Li et al., 1999; Troil-Linden et al., 1997). Systemic antibiotics again could be necessary in eliminating Aggregatibacter actinomycetemcomitans and periodontal infections related to other pathogens.

A wrong choice of antibiotics can be made as periodontopathogen microflora contains many microorganisms that have different antibiotic sensitivities and as only in some certain event the clinical indicators give an indication regarding pathogen microflora. This situation may lead to the damage of healthy microbial ecology in humans and to the emergence of resistant species. For this reason ideally in order to choose the most suitable antibiotics microbiological analysis and antibiotics sensitivity tests need to be carried out beforehand (Barone et al., 1999; Edlund et al., 1996). Microbiological analysis is especially suggested in periodontal disease types which do not answer to traditional periodontal treatments and in which various microorganism complexes are seen together. Moreover the general health status of the patient and the probable side effects of antibiotics when choosing the most suitable antibiotic should be taken into consideration. Many antibiotics have been systemically applied until today in periodontal treatment and the effects of these have been evaluated on clinical, microbiological and radiographic parameters. Periodontitis lesions generally comprise complex bacteria compositions. For this reason the significance of combined antibiotic applications (metradinasole + amoxicillin and metradinasole + ciprofloxacain) in periodontal treatment increases day by day (Slots, 1996; Slots, 2000). The pharmacological features of the medicine are important, in determining antibiotic usage, medicine dosage and application route, and the frequency of the dose. The degree of absorption, metabolism rate and the protection of efficient antimicrobial level at the infection area can be counted as some of the significant pharmacological characteristics of the medicine. It is sufficient to take penicillin and clindamycin three times a day, metreonidazole, ciprofloxacain and erythromycin twice a day and doxycyclin, and azithromycins once a day in order to protect the efficient antimicrobial level. Metreonidazole can easily reach the efficient antibacterial concentrations in gingival tissue and gingival crevicular fluid (Britt and Pohlod, 1986; Liew et al., 1991). Azithromycin has good penetration qualities and it can penetrate both healthy and pathologically affected tissues (Blandizzi et al., 1999). Contrary to the previous views, in a study carried out by Sakkelari et al. (2000) it has been determined that when tetracycline was applied systemically, the concentration of the gingival crevicular fluid was lower than the plasma concentration and that quite different values (0-8 g/ml) were reached among patients (Sakellari et al., 2000). 1 g/ml concentration values could not be obtained from approximately 50% of the samples included in the study, thus it has been thought that this is an explanation to different clinical responses obtained following systemic tetracycline application. There are studies that state that the systemic antibiotic applications increase the alveol bone level which was being monitored radio graphically. In these studies investigators, pointed out that the usage of tetracycline for 12 days or metronidazole for 7-10 days decreased the rate of the areas having less than 25-30% alveol bone and increased the number of areas which had higher bone density.

The prophylactic aimed usage of systemic antibiotics in periodontal diseases

During periodontal treatment in order to protect patients against infections and sometimes aimed to have a prophylactic effect, antibiotic applications are necessary. The prophylaxis methods determined by the AHA (American Heart Association) which was determined initially in 1955 have been updated 5 times until today parallel with the empirical studies carried out and the improvements that have been generated in pharmaceutical chemistry (Nelson and Blaricum, 1989). Frequent prophylaxis applications in periodontal treatment is usually carried out on endocardiac patients, patients with joint prosthesis’s, patients with immune deficiency, transplantation and dialysis patients, and patients who are receiving radio therapy treatment to their jawbone (Kaye, 1986; Lockhart et al., 2007). Prior to periodontal procedures, it is asserted that good oral hygiene decreased the risks connected with bacteria formation and was more effective than prophylactic antibiotic treatment (Daly et al., 2001). In another study however, the effect of antibiotic prophylaxis against the bacteriaemia formed orally has been investigated and it has been stated that prophylaxis was necessary as the bacteria incidence in those who have not been using antibiotics following 5 minutes after the bacteria induction was measured to be 58-76% whereas in those using antibiotics this rate was 14-16% (Dajani et al., 1997). It has been determined that 19% of the bacterial endocarditis cases were related with the bacteremia formed following dental treatment (Lindeboom et al., 2005). Even though the frequency of bacterial endocarditis cases was low it is still an important life threatening disease. This has an important place among prophylaxis applications carried out in clinics during dental procedures (Brincat et al., 2006). In some cases, when the patient goes to the dentist, he could have already started using antibiotics. In such a case instead of increasing the dosage of the antibiotic used for
endocarditis prophylaxis it might be more suitable to choose an antibiotic from a different group. Especially antibiotics used to prevent the acute rheumatism fever recurrence may not be sufficient to treat bacterial endocarditis prophylaxis. In the mouths of patients who have been taking oral penicillin in order to be treated against rheumatism fever or for diseases, streptococcus viridians which is resistant to penicillin, amoxicillin or ampicillin may be present. In such cases, dentist must prefer to use antibiotics such as clindamycin, azithromycins and clarithromycins for endocarditis prophylaxis (Lindeboom et al., 2005; Wilson et al., 2008). The prophylaxis that has been accepted to be the latest for antibiotic prophylaxis has been mentioned in Table 1. As a result in the studies in literature all of the investigators have pointed out their views regarding the conscious and cautious usage of antibiotics.

**REFERENCES**


**CONCLUSION**

The correct determinations of the systemic antibiotic usage, the suitable and efficient dosage, in treating periodontal diseases are factors that increase the rate of success. The correct and rational usage of antibiotics started mostly empirically together with proper diagnosis and suitable periodontal treatment is a standard and correct treatment approach when managing periodontal diseases. In the case that antibiotics are not used rationally, there will be an increase in resistant bacterial infections, in the side effects of the medicine, the cost of the antibiotics and loss in labour and strength.

**Table 1. Regimens for a dental procedure (Wilson et al., 2008).**

<table>
<thead>
<tr>
<th>SITUATION</th>
<th>AGENT</th>
<th>REGIMEN: SINGLE DOSE 30-60 MINUTES BEFORE PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Adults</td>
</tr>
<tr>
<td>Oral</td>
<td>Amoxicillin</td>
<td>2 grams</td>
</tr>
<tr>
<td>Unable to Take Oral</td>
<td>Ampicillin</td>
<td>2 g IM* or IV†‡</td>
</tr>
<tr>
<td>Medication</td>
<td>Cefazolin or ceftriaxone</td>
<td>1 g IM or IV</td>
</tr>
<tr>
<td>Allergic to Penicillins or</td>
<td>Cephalexin§</td>
<td>2 g</td>
</tr>
<tr>
<td>Ampicillin Oral</td>
<td>Clindamycin</td>
<td>600 mg</td>
</tr>
<tr>
<td>Allergic to Penicillins or</td>
<td>Azithromycin or</td>
<td>500 mg</td>
</tr>
<tr>
<td>or Ampicillin and Unable to</td>
<td>clarithromycin</td>
<td></td>
</tr>
<tr>
<td>Take Oral Medication</td>
<td>Cefazolin or ceftriaxone§</td>
<td>1 g IM or IV</td>
</tr>
<tr>
<td></td>
<td>Clindamycin</td>
<td>600 mg IM or IV</td>
</tr>
</tbody>
</table>

* IM: Intramuscular.
† IV: Intravenous.
‡ Or other first- or second-generation oral cephalosporin in equivalent adult or pediatric dosage.
§ Cefalosporins should not be used in a person with a history of anaphylaxis, angioedema or urticaria with penicillins or ampicillin.
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