

REVIEW ARTICLE

Systemic antibiotics and periodontitis: An overview

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ABSTRACT

Periodontal pathogens frequently colonize oral mucosa, tongue dorsum, tonsils and other domains and may translocate from non-periodontal sites to periodontal crevices. Systemic antibiotic therapy is administered to reinforce mechanical periodontal treatment and support the host defense system in overcoming the infection by killing subgingival pathogens that remain after conventional mechanical periodontal therapy. Combination antibiotic therapy may help broaden the antimicrobial range of the therapeutic regimen beyond that attained by any single antibiotic.

Key words: Antibiotics, pathogen, host

INTRODUCTION

Periodontal disease is a multifactorial disease in which the etiological role of bacteria is an essential fact. Elevated numbers of subgingival microbial species have been associated with destructive periodontal disease activity. Conventional scaling and root planing in conjunction with plaque control results in alteration of the subgingival environment that is sufficient, in most instances, to improve periodontal health and to arrest further loss of attachment. Certain patients, for various reasons, do not respond favorably to mechanical therapy alone. Periodontal pathogens frequently colonize oral mucosa, tongue dorsum, tonsils and other domains and may translocate from non-periodontal sites to periodontal crevices⁶. Therefore, antibiotic treatment should be reserved for these specific subsets of periodontal patients.

Systemic antibiotic therapy is administered to reinforce mechanical periodontal treatment and support the host defense system in overcoming the infection by killing subgingival pathogens that remain after conventional mechanical periodontal therapy. They are considered to enter the periodontal tissues and periodontal pocket through transduction from the blood stream. The antibiotics within the periodontal connective tissues then cross the crevicular and junctional epithelium into the crevicular region around the tooth and thus find a way into the gingival crevicular fluid (GCF), which is associated with subgingival plaque. The antimicrobial concentration in the GCF will be inadequate without the disruption of the microbial biofilm adherent to the tooth, i.e. subgingival plaque and calculus. In addition to its effects within the periodontal crevice/ pocket, systemic antibiotic therapy might also suppress periodontal pathogens in other parts of the mouth including tongue and mucosal surfaces. This additional effect on the oral environment is considered beneficial because it may delay subgingival recolonization of pathogens. A number of periodontal benefits have been associated with systemic medications including reductions in probing depth, gain in

attachment levels, long term reduction of periodontal pathogens, elimination of invasive pathogens in periodontal tissues and a decrease in extent and severity of periodontal surgery¹. Single antibiotic therapies with penicillins, tetracyclines, metronidazole/ clindamycin have been used frequently in periodontal practice as they suppress the number of subgingival and supragingival pathogens. Combination therapies, however, enlarge the antimicrobial spectrum, often involve synergism and can affect the mixed subgingival infection⁶. Knowledge of the efficacy and safety of periodontal antibiotic therapy is growing rapidly, but many important aspects of the choice of medication, mode of delivery, dosage and length of therapy remains to be determined.

GUIDELINES AND RECOMMENDATIONS FOR THE USE OF SYSTEMIC ANTIBIOTICS IN PERIODONTICS

1. The clinical diagnosis and situations dictate the need for possible antibiotic therapy as an adjunct in controlling active periodontal disease. The patient's diagnosis can change over time. For example, a patient who presents with generalized mild chronic periodontitis can return to a diagnosis of periodontal health after initial therapy. However, if this patient has been treated appropriately and continues to have active disease, the diagnosis can change to refractory periodontitis.
2. Continuing disease activity, as measured by continuing attachment loss (probing pocket depth plus recession), purulent exudates, and continuing periodontal pockets of 5mm or greater that bleed on probing, is an indication for periodontal intervention and possible microbial analysis through plaque sampling. Also, case of refractory or aggressive periodontitis may indicate the need for antimicrobial therapy.
3. When used to treat periodontal disease, antibiotics are selected based on patient's medical or dental status, current medications, and result of microbial analysis, if performed.
4. Microbiological plaque sampling may be performed according to the instructions of the reference laboratory. The samples usually are taken at the beginning of the appointment before instrumentation of the pocket. Supragingival plaque is removed, and an endodontic paper point is inserted subgingivally into the deepest pocket present to absorb bacteria into loosely associated plaque. This endodontic point is placed in reduced transfer fluid and sent overnight to laboratory that will then send the referring dentist a report that includes the pathogens present and any appropriate antibiotic regimen.
5. Plaque sampling can be performed at the initial examination, root planing, re-evaluation or supportive periodontal therapy appointment. Clinical indications for microbial plaque testing includes, aggressive forms of periodontal disease, diseases refractory to standard mechanical therapy, and periodontitis associated with systemic conditions.
6. Antibiotics have also been shown to have value in reducing the need for periodontal surgery in patients with chronic periodontitis.
7. Systemic antimicrobial therapy should be an adjunct to a comprehensive periodontal treatment plan than monotherapy. Debridement of root surfaces, optional oral hygiene and frequent supportive periodontal therapy are important parts of comprehensive periodontal therapy. Antibiotic strength 500 times greater than systemic therapeutic dose may be required to be effective against the bacteria arranged in biofilms. It, therefore, is important to disrupt this biofilm physically so that the antibiotic agents can have access to periodontal pathogens.
8. Slats et al described a series of steps using anti-infective agents for enhancing regenerative healing. They recommended starting antibiotics 1 to 2 days before surgery and continuing for a total of at least 8 days. However, the value of this regimen has not been well documented and further studies are encouraged.

9. Using evidence based techniques, meta-analysis as shown statistically significant improvements in attachment loss when tetracycline plus metronidazole, and clindamycin plus amoxicillin are used as adjuncts to scaling and root planing. There was borderline significance using amoxicillin plus metronidazole because of smaller numbers of pooled subjects in meta-analysis. Improvements in attachment levels were more evident in aggressive than chronic periodontitis when antibiotics were used. So, selection of an antibiotic must be based on other factors.
10. The clinician must integrate patient's history, clinical signs and symptoms, and results of radiographic examinations, and possibly microbiologic sampling to determine the course of periodontal therapy. Risks and benefit of antibiotics as adjuncts to periodontal therapy must be discussed with the patient before antibiotics are used⁴.

ANTIBIOTICS USED IN PERIODONTITIS

Single agent antibiotic therapy in current periodontics include metronidazole 500mg TDS for 8 days, clindamycin 300mg TDS for 8 days, doxycycline 100mg once daily for 7-14 days and ciprofloxacin 500 mg 2 times for 8 days⁵. In many cases, microbiological testing is unavailable. In these situations, the current view is that combinations of antimicrobials may have positive clinical effect. The rationale is based on the diversity of putative pathogens and no single antibiotic being bactericidal for all known pathogens. Combination antibiotic therapy may help broaden the antimicrobial range of the therapeutic regimen beyond that attained by any single antibiotic. Other advantages include lowering the dose of individual antibiotic by exploiting possible synergy between two drugs against targeted organisms. In addition, combination antibiotic therapy may prevent or forestall the emergence of bacterial resistance. The below table shows common antibiotic regimens used to treat periodontal diseases.

Cases of periodontitis (refractory) in which the associated microflora consists primarily of gram-positive microorganisms have been successfully treated with amoxicillin-clavulanate potassium (250 mg of amoxicillin and 125 mg of clavulanate potassium tid for 14 days). A regimen of 1 capsule containing the same amount of drug every 6 hrs for 2 weeks, with intrasulcular full-mouth lavage using a 10% povidine-iodine solution and chlorhexidine oral rinses twice daily, resulted in a reduction in attachment loss that persisted at approximately 34 months². A regimen of 500 mg of metronidazole tid for 7 days was shown to be effective in treating periodontitis (refractory) in patients who were culture positive for *T.forsythia* in the absence of *A.actinomycetemcomitans*⁷. A regimen of clindamycin hydrochloride 150 mg qid for 7 days combined with scaling and root planing produced a decrease in the incidence of disease activity from an annual rate of 8% to an annual rate of 0.05% of sites per patient³. A single dose of 250 mg/day of azithromycin for 5 days may be effective in periodontitis that is refractory to treatment, especially in patients infected with *P.gingivalis*. Many combinations of antibiotics have demonstrated significant improvement in clinical aspects of disease for e.g. amoxicillin-clavulanate or metronidazole-amoxicillin for the treatment of *A.actinomycetemcomitans* associated periodontitis, metronidazole- doxycycline for the prevention of recurrent periodontitis; metronidazole-ciprofloxacin for the treatment of recurrent cases containing a microflora associated with enteric rods and pseudomonads; amoxicillin-doxycycline in treatment of periodontitis associated with *A.actinomycetemcomitans* and *P.gingivalis*. Some commonly used systemic antibiotics in periodontal diseases are tabulated in table 1 and 2.

Table 1.

<u>COMMON ANTIBIOTIC REGIMENS USED TO TREAT PERIODONTAL DISEASES</u>		
<u>SINGLE AGENTS</u>	<u>REGIMENS</u>	
<u>DOSAGE/DURATION</u>		
Amoxicillin 3 times daily for 8 days		500mg
Azithromycin once daily for 4-7 days		500mg
Ciprofloxacin 2 times daily for 8 days		500mg
Clindamycin 3 times daily for 10 days		300mg
Doxycycline or minocycline once daily for 21 days		100-200mg
Metronidazole times daily for 8 days	500mg	3
<u>COMBINATION THERAPY</u>		
Metronidazole + amoxicillin times daily for 8 days	250mg of each	3
Metronidazole + ciprofloxacin times daily for 8 days	500mg of each	2

Table 2.

<u>ANTIBIOTIC THERAPY FOR AGGRESSIVE PERIODONTITIS</u>	
<u>Associated</u>	<u>Microflora</u>
<u>Antibiotic of choice</u>	
Gram-positive organisms	Amoxicillin-
clavulanate potassium (Augmentin)	
Gram-negative organisms	Clindamycin
Non-oral gram-negative, facultative rods,	Ciprofloxacin
Pseudomonas, staphylococci	
Black-pigmented bacteria and spirochetes	Metronidazole
Prevotella intermedia, Porphyromonas gingivalis	Tetracycline
Actinobacillus actinomycetemcomitans	Metronidazole-
amoxicillin, metronidazole-tetracycline	
Porphyromonas gingivalis	Azithromycin

SUMMARY AND CONCLUSION

Systemic antibiotic therapy in periodontics is based on the premise that specific microorganisms initiate destructive periodontal disease and that the antibiotic agent in vivo can exceed concentrations necessary to kill or inhibit the pathogen. Systemic antibiotic therapy may benefit periodontitis patients who are refractory to conventional mechanical periodontal treatment. However, management of severe types of periodontitis should not rely

solely on systemic antibiotics but upon a combination of mechanical debridement possibly in conjunction with surgery, subgingival administration of antiseptics by dental professionals and patients, patient's oral hygiene efforts and effective and safe systemic antibiotics. Recommendations for periodontal anti-infective therapy will undoubtedly be continually revised along with the development of even better understanding of the pathogenic periodontal microbiota and the availability of new and more effective drugs to control or possibly cure periodontal infections⁶.

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