

## Antimicrobial Intervention in Periodontal Therapy

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### Abstract

Periodontal disease is an infectious disease caused by poor oral hygiene. It is initiated when there is an imbalance between the microorganisms and the host defense. It is an inflammation of the supporting tissues of the teeth. Some systemic diseases are also amongst contributing factors in causing Periodontitis. The management of Periodontitis comprises of proper scaling and elimination of plaque and calculus along with prescription of appropriate antibiotics as an adjunct therapy that would eliminate and arrest the microorganism from further damage of the periodontium. It was observed in many studies that different adjunctive antibiotics terminated the disease progression and improved the clinical signs and measures of periodontal pockets and improved clinical attachment level (CAL).

However, there are many factors that must be kept in mind before prescribing the antibiotic regimen to obtain expectable therapeutic results. These factors include antibiotic resistance, dose of drug, patient's systemic health, age, compliance, and maintenance of good oral hygiene.

There is great need for further research in determining the ideal drug that are potent and are effective, site specific, and safe for eliminating Periodontitis.

**Keywords:** Periodontitis; Anatomic Discrepancies; Root Planning; Pathogens

### Introduction

Periodontal disease is a chronic inflammatory disease that contributes to significant global burden of chronic disease. It has been prevalent throughout human history [1].

It is an infectious disease of bacterial origin. It is characterized by inflammation of the periodontium affecting soft tissues and alveolar bone that support the teeth [2].

This moderate to rapidly progressive disease is caused by a small population of bacteria found in the hundreds of species found in the oral cavity. These bacteria are known as periodontal pathogens constituting mainly gram negative and anaerobic bacteria that inhabit and cause the disease [3].

Local factors modify the rate of disease progression. Oral hygiene is a major contributing factor in causing Periodontitis [4,5]. Other factors include anatomic discrepancies that retain plaque next to a tooth such as overhanging restorations, open contacts and grooves leading to periodontal disease.

Some systemic diseases are also amongst predisposing factors in causing periodontal disease. These include diabetes, linear gingival erythema, viral primary herpetic gingivostomatitis, histoplasmosis fungal infections, HIV infection and conditions like immunosuppression and pregnancy. Extrinsic factors will include aging, gender, genetic predisposition, stress, nutrition and medications [6].

The pathogenesis of Chronic Periodontitis begins with colonization and irritation of pathogenic bacteria present in plaque [7]. Plaque consists of more gram negative compared to gram positive which is part of the normal flora of a healthy periodontium.

However small amounts pathogenic bacteria present in the plaque containing are resisted by the immune system of healthy individuals without developing Periodontitis [8,9].

Clinically Chronic Periodontitis is initiated with supragingival and subgingival plaque accumulation causing inflammation characterized by edema, erythema, gingival bleeding upon probing, and/or suppuration. The inflammation of the gingiva spreads into the adjacent attachment apparatus leading to loss of clinical attachment. This damage is caused due to destruction of the periodontal ligament and loss of the adjacent supporting bone [10].

Management of Periodontal disease involves a systematic treatment that would eliminate the disease and its progression and preserve the dentition in function, health and comfort. The treatment plan would comprise proper scaling and elimination of plaque and calculus along with prescription of appropriate antibiotics as an adjunct therapy that would eliminate and arrest the microorganism from further damage of periodontium [11].

Some studies also advocate that microorganisms involved in Periodontitis may show resistance against antibiotics commonly used in periodontal therapy [12]. The prescribed drug should reach the site of infection in adequate concentration and time and the efficacy should balance all contraindications and side effects [13].

The purpose of periodontal treatment is to cure and terminate the disease progression and to prevent further loss of the supporting tissue. The treatment involves Scaling and root planning in order to remove bacteria and calculus in the pocket and on the tooth surface with the help of numerous instruments and techniques. This is accompanied with effective adjunctive antimicrobials. The prescribed drug should reach the site of infection in adequate concentration and time to get desired results [14].

### Discussion

Antibiotics have been used for many decades. The clinical benefit of systemic antibiotics is to control and treat the disease and simultaneously minimize any adverse reactions caused by it [15].

The treatment is designed after reviewing the patient's medical and dental history, extra and intra-oral examination, continued scaling and root planing as needed along with the use of adjunctive antibiotics and maintenance of good oral hygiene. In this way progression of the disease is arrested and the dentition is preserved in a state of health, comfort, and function [16].

The strategy for prescribing antibiotics is based on the knowledge of microorganisms that are present in periodontal disease and that the antibiotic prescribed should be given at a concentration that can kill or inhibit the pathogens. However there have been many contradictory reports that discuss whether the antibiotics that are given provide therapeutic benefit or not. Some studies also suggest that the pathogens involved in Periodontitis may be resistant to the antibiotics that are commonly used in periodontal therapy [17].

The effect of periodontal antibiotic drug therapy depends on the antimicrobial spectrum and its pharmacokinetics. It also depends on certain factors like drug binding to tissues, protection of pathogens through binding, consumption or degradation of the drug, subgingival plaque, biofilm protecting the pathogens. The antibiotic concentration and its efficacy should be higher than the total pathogenic bacterial load [18,19].

The site of action for antibiotic treatment in periodontal disease is periodontal pocket. The mechanism of action differs depending on whether drug is bacteriostatic or bactericidal. Bactericidal antibiotics are first choice in treating infections provided the required amount of drug reaches the site of infection. There are many factors that must be kept in mind before prescribing the right antibiotics regimen to get predictable therapeutic results. These factors include the patient's systemic health, age, compliance, and maintenance of good oral hygiene.

The systemically administered antibiotics improve the clinical signs and measures of periodontal pockets and attachment level. Different systemic antibiotics proved beneficial in providing an improvement in clinical attachment level (CAL), when used along with scaling and root planning. When examining the effects of individual or combinations of antibiotics, it was observed that there were great improvements in attachment level for tetracycline, metronidazole, and the combination of amoxicillin plus metronidazole [20].

The selection of antibiotic is not as clear and is probably case-dependent. Positive responses have been reported with tetracycline, amoxicillin/clavulanic acid, clindamycin, metronidazole, and the combination therapy metronidazole plus amoxicillin [21].

A study was conducted where 12,630 persons with Periodontitis were given specific antibiotics for dental condition. It was seen that longer-term use of tetracycline was associated with reduced tooth loss among persons receiving periodontal care. Penicillin was associated with reduced tooth loss among persons with more severe disease. More long-term, larger randomized trials must be done and antibiotics use should be made common in the management of periodontal disease in order to decrease tooth loss [22].

Another study was conducted to compare the efficacy of the two combinations of drugs i.e. Amoxicillin with Metronidazole and Doxycycline with Metronidazole, the independent sample t-test was applied and means of pocket depth, bleeding index, and mobility index of teeth after treatment were compared and it was found that combination of Doxycycline with Metronidazole is significantly more effective than the combination of Amoxicillin with Metronidazole with the  $P < 0.05$  for all three measures i.e. pocket depth, bleeding index, and mobility index results [23].

In 2006 the effect of metronidazole plus amoxicillin on the subgingival microbiota of chronic periodontitis. Results showed PD was reduced from 2.80 +/- 0.45 at baseline to 1.95 +/- 0.05 at 12 months ( $P < 0.001$ ) and from 2.39 +/- 0.41 to 1.95 +/- 0.10 ( $P < 0.001$ ) in the M+A- and SRP-treated patients, respectively [24].

A study was conducted to determine the serum and gingival crevicular fluid concentration of ciprofloxacin, which is a common drug used effectively against *Actinobacillus actinomycetemcomitans* and to determine the effects of ciprofloxacin administration on clinical parameters. It showed gingival crevicular fluid concentrations of ciprofloxacin at the same hours were significantly high in subjects with periodontitis [25].

## Conclusion

Relevant papers were searched, critically analysed and their data were extracted.

It was observed that adjunctive antibiotics cease the disease progression and prevent further loss of the supporting tissue. But there is still a need for longitudinal study and research in order to assess the effects of various antibiotics used either separately or in combination and to discover the ideal drug that could cease and eliminate Periodontitis within clinical parameters.

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