

# Current Concepts in Periodontics

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## Review of Systemic and Local Antibiotics in Periodontal Therapy

Within the few past decades, a multitude of systemic and locally applied chemotherapeutic agents have been introduced to the field of dentistry to aid in the treatment of periodontal disease. This has been largely attributed to a greater understanding of the etiology and pathogenesis of the disease process, as well as an increased demand for a more effective and less invasive means of reestablishing health in a diseased periodontium. Significant advances have been made in developing FDA approved chemotherapeutic agents that are effective, safe, and have lasting beneficial effects. The objective of this newsletter is to update you, the dental professional, on the latest systemic and locally applied agents available to aid in the non-surgical treatment of periodontal disease. The comparisons made as well as the conclusions on the effectiveness and limitations of these agents are derived from a thorough review of current scientific studies.

### Systemic Antibiotic Therapy

Because of the growing understanding of the role of periodontal disease in other systemic health problems, systemic antibiotics as an adjunct to mechanical instrumentation is becoming increasingly popular. The fact is, adjunctive systemic antimicrobial therapy has been used for many years, mostly by clinicians treating localized aggressive periodontitis and refractory disease with a combination of antibiotic and surgical therapy. Although antimicrobial sensitivity testing is the most effective means in selecting an appropriate drug, the following agents have been shown to be effective adjuncts to mechanical therapy in patients with moderate to severe periodontitis.

#### Metronidazole

Several studies have shown more reduction in pocket depth and more gain in clinical attachment when 250 mg Metronidazole (tid for 7 days) is administered in combination with scaling and root planing. This drug has a propensity for achieving significant

concentrations in gingival tissues and crevicular fluid. Patients taking warfarin can have an increased anticoagulation effect, and adverse reactions with alcohol are probable.

### **Metronidazole + Amoxicillin**

The combination of 375 mg Amoxicillin plus 250 mg Metronidazole tid for 7 days has been shown to have significant positive outcomes when used in combination with non surgical and surgical therapy. A review of existing literature shows that this combination therapy is most effective in refractory disease patients, or patients demonstrating continued periodontal breakdown despite adequate surgical therapy.

### **Penicillins/Amoxicillin**

Most studies show that using the Penicillin family of antibiotics in combination with scaling and root planing or surgery has limited added benefit to the outcome of periodontal therapy. However, combining 250 mg Amoxicillin with 125 mg Clavulanic acid (Augmentin®) in conjunction with mechanical treatment has been shown to significantly improve clinical parameters, especially in patients with aggressive or refractory periodontitis.

### **Doxycycline**

Low dose, long term administration of Doxycycline is a very common systemic antibiotic used by clinicians in combination with nonsurgical and surgical therapy to treat moderate to severe periodontitis. The rationale for using a sub-antimicrobial dose of doxycycline hyclate (20mg bid) lies in its effect as an anti-inflammatory agent and a collagenase inhibitor. At this dose, there is no significant antimicrobial effect, but this regimen has been shown in controlled, multi-center studies to significantly improve clinical parameters when used as an adjunct to scaling and root planing. This beneficial effect is mostly due to its anti-collagenase properties which counters the breakdown of bone and tissue.

## **Local Antibiotic Therapy**

Applying a local antibiotic to a periodontal site exhibiting active periodontal breakdown has the potential for achieving more potent bacteriostatic concentrations that may not be possible with systemic administration. This idea has sparked much interest and a lot of research in the past decade. Developing an effective agent that has substantivity, or the ability to bind and remain present in significant concentrations over time has been very challenging. Gingival crevicular fluid is constantly being turned over and has been estimated to be replaced about 40 times per hour in a five millimeter pocket. This, along with developing a means for sustained release of the drug, are a few of the many hurdles that need to be overcome with this type of therapy.

Many local delivery drugs have been placed on the market, all claiming to significantly improve clinical parameters when used appropriately. Some of the more popular agents include: 12.7 mg tetracycline –HCl fiber (Actisite®), 10% doxycycline hyclate gel (Atridox®), 2.5mg chlorhexidine chip (Periochip®), and minocycline-HCl microspheres (Arestin®). The following summarizes some of the drawbacks and advantages of each local delivery system.

### **Tetracycline Fibers**

These fibers are non-resorbable materials impregnated with 25% tetracycline powder that are placed at the base of a pocket and are intended to be present of 7 to 10 days before being removed. Most studies have looked at the use of these fibers in combination with scaling and root planing and have shown improvement in clinical parameters, however most of these benefits were transient. The lack of a sustained, long term release of the drug in a periodontal pocket using this material is a drawback as is the technique sensitive application of the fiber. In addition, a foreign body tissue response at the site of application can also be a problem.

### **Doxycycline Polymer**

A biodegradable polymer containing 10% doxycycline polymer is another common local delivery agent used in periodontal therapy. Some studies have shown an added benefit in terms of improvement in clinical attachment level gain when used in combination with mechanical therapy, however long term benefits of the drug like most local delivery agents remains questionable. The gel delivery system is intended to make application of the drug easier and there is no need to remove the vehicle like the fiber.

### **Chlorhexidine Chip**

This bioabsorbable agent contains 34% chlorhexidine gluconate in a gelatin matrix. The chip measures 5mm long and 5mm wide and is 1mm thick. The chip is placed in the pocket and is intended for long-term release of the agent as the gelatin matrix is slowly absorbed. Multiple studies have shown limited, but statistically significant benefits of the drug when compared to scaling and root planing alone. The drawback of this agent is mainly its cumbersome application and the size of the chip does not always fit every size pocket.

### **Minocycline Spheres**

Minocycline HCl 1mg in slowly resorbed microspheres is one of the newest and widely used local delivery agents available currently. Its ease of use, its high local concentration of the drug, and its slow, long term release makes this local delivery agent very popular. The powder is injected into the sulcus with a syringe and claims are made that the carrier coagulates and binds to the tissue eliminating the concern of crevicular fluid turnover. A .36mm increased pocket depth reduction has been reported when compared to scaling and

root planing alone. As with all of the studies investigating the added benefits of local delivery agents over scaling and root planing alone, a determination between clinical significance and statistical significance must be made.

## **Summary**

In summary, with periodontal therapy there will never be a magical “silver bullet” that can be used to treat the disease process. Each patient must be treated individually with a careful review of the medical history and a thorough evaluation of the extent and severity of the attachment loss. This review is intended to summarize what is available in terms of systemic and locally applied chemotherapeutic agents. It must be emphasized that although these drugs have beneficial effects, most studies reinforce the fact that they are not a substitute for mechanical therapy and must be used as adjunctive agents in nonsurgical therapy.