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Local Drug Delivery of Herbs for Treatment of Periodontitis

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Abstract

Periodontitis--a serious, progressive form of periodontal disease--involves inflammation of gum tissue in the mouth, potentially leading to loosened teeth and bone loss. Periodontitis describes a group of related inflammatory disease resulting in destruction of the tissues that support the tooth. It results from extension of the inflammatory process initiated in the gingiva to the supporting periodontal tissues. Local Delivery devices are systems designed to deliver agents locally into periodontal pocket but without any mechanism to retain therapeutic levels for a prolonged period of time. The Periodic use of local delivery systems in reducing probing depths, stabilizing attachment Levels and minimizing bleeding would allow better control of the disease.

Keywords: Periodontitis, Local Drug Delivery, Herbal drugs

INTRODUCTION

The word "periodontitis" comes from *peri* ("around"), *odont* ("tooth") and *-itis* ("inflammation"). Periodontitis--a serious, progressive form of periodontal disease--involves inflammation of gum tissue in the mouth, potentially leading to loosened teeth and bone loss. Diet, hygiene and hereditary factors can contribute to periodontitis and its precursor, gingivitis [1,2,3]. Although advanced stages of periodontitis can require gum-grafting surgery and tooth extraction, natural herbs can also help halt or reverse the

progression of the disease. Recent development of science and technology has revolutionized the basic outlook and approach to the problems of periodontal disease. Earlier it has been assumed that periodontal problems were invariably progressive and the morbid effects increase with passage of time. A thorough understanding of the etiopathogenesis of periodontal disease has provided the clinicians and researchers with a number of diagnostic tools and technique that has widened the treatment options. Periodontitis describes a group of related

inflammatory disease resulting in destruction of the tissues that support the tooth. It results from extension of the inflammatory process initiated in the gingiva to the supporting periodontal tissues.

Clinical features of Periodontitis [4] include bleeding, pus discharge, halitosis, tooth mobility, functional impairment and ultimately tooth loss. The standard clinical measures for periodontitis are bleeding on probing, clinical attachment level and pocket depth. Tooth loss especially in the anterior region can cause psychological trauma to the patient. 5-20% of population suffers from severe generalized periodontitis, though mild to moderate periodontitis affects a majority of adults. The immediate goal is to prevent arrest, control or eliminate periodontitis and to restore the lost, form, function, esthetics and comfort. Periodontal disease therapy has been directed at altering the periodontal environment to one, which is less conducive to the retention of bacterial plaque in the vicinity of gingival tissue. Active phase of the disease can be reversed dramatically by reducing the plaque levels. Classic regimens to achieve this aim include

- (1) Instructions in oral hygiene
- (2) Scaling

- (3) Correction of inadequate restorative dentistry

- (4) Root planning

- (5) Surgical elimination of pockets etc.

Topical administration of antibacterial agents in the form of mouth washes, dentifrice or gels

Can be used effectively in controlling supragingival plaque. Irrigation systems or devices can deliver agents into deep pockets but clinically not effective in halting the progression of periodontal attachment loss.

Symptoms

In the early stages, periodontitis has very few symptoms and in many individuals the disease has progressed significantly before they seek treatment. Symptoms may include the following:

- Redness or bleeding of gums while brushing teeth, using dental floss or biting into hard food (e.g. apples) (though this may occur even in gingivitis, where there is no attachment loss)
- Gum swelling that recurs
- Halitosis, or bad breath, and a persistent metallic taste in the mouth
- Gingival recession, resulting in apparent lengthening of teeth. (This may also be caused by heavy handed brushing or with a stiff tooth brush.)
- Deep pockets between the teeth and the gums (pockets are sites where the

attachment has been gradually destroyed by collagen-destroying enzymes, known as *collagenases*)

- Loose teeth, in the later stages (though this may occur for other reasons as well)

Patients should realize that the gingival inflammation and bone destruction are largely painless. Hence, people may wrongly assume that painless bleeding after teeth cleaning is insignificant, although this may be a symptom of progressing periodontitis in that patient.

Cause

Periodontitis is an inflammation of the periodontium—the tissues that support the teeth. The periodontium consists of four tissues:

- gingiva, or gum tissue;
- cementum, or outer layer of the roots of teeth;
- alveolar bone, or the bony sockets into which the teeth are anchored;
- Periodontal ligaments (PDLs), which are the connective tissue fibers that run between the cementum and the alveolar bone.

The primary etiology (cause) of gingivitis is poor oral hygiene which leads to the accumulation of a mycotic^{13, 14, 15} and bacterial matrix at the gum line, called dental plaque. Other contributors are poor nutrition and underlying medical issues

such as diabetes. New finger nick tests have been approved by the Food and Drug Administration in the US, and are being used in dental offices to identify and screen patients for possible contributory causes of gum disease such as diabetes.

Local Drug Delivery

Recently a new approach using local delivery systems containing antimicrobial has been

Introduced. This produces more constant and prolonged concentration profiles. Both topical Delivery system and controlled release system have been termed as local delivery. The term Local delivery and site-specific delivery are sometimes used synonymously. The potential Therapeutic advantage of local delivery approach has been claimed to be several fold.

Local Delivery devices are systems designed to deliver agents locally into periodontal pocket but without any mechanism to retain therapeutic levels for a prolonged period of time. The Periodic use of local delivery systems in reducing probing depths, stabilizing attachment Levels and minimizing bleeding would allow better control of the disease.

In 1979 first proposed the concept of controlled delivery in the treatment of

periodontitis. The Effectiveness of this form of therapy is that, it reaches the base of periodontal pocket and is

Maintained for an adequate time for the antimicrobial effect to occur. Periodontal pocket Provides a natural reservoir bathed by gingival crevicular fluid that is easily accessible for the

Insertion of a delivery device. Controlled release delivery of antimicrobials directly into periodontal pocket has received great interest and appears to hold some promise in periodontal therapy. Some techniques for applying antimicrobial subgingivally, such as subgingival irrigation, involve local delivery but not controlled release. Controlled release local delivery systems, in which the antimicrobial is available at therapeutic levels for several days, have been evaluated in several forms and using different antimicrobials.

Controlled delivery systems are designed to release drug slowly for more prolonged drug availability and sustained drug action. These delivery systems are also called sustained release, controlled - release, prolonged release, timed release, slow release, sustained action, prolonged action or extended action. . There are distinct phases in a periodontal treatment plan where a dental practitioner can use this sustained release device

1. As an adjunct to Scaling and Rootplaning
2. Periodontal maintenance therapy: Recurrent periodontitis usually involves only A few teeth. These sites are ideal for the Treatment with this device.
3. For whom surgery is not an option or those who refuse surgical treatment.
4. Sustained release device is a less invasive treatment option and it requires less time compared to surgical treatment.

Drugs used for local drug delivery

Different drugs used for local delivery are tetracyclines including doxycycline and Minocycline, metronidazole and chlorhexidine¹. Tetracyclines are bacteriostatic for many pathogens at concentrations found in the gingival crevicular fluid after systemic administration (3-6 microgram/ml). However, local delivery of these agents provides high concentrations that are bacteriocidal. Local application of tetracyclines has been associated with minimal side effects. Metronidazole's spectrum of activity is relatively specific for obligate anaerobes. Chlorhexidine is an antiseptic, which adheres to organic matter and demonstrates low toxicity when applied topically and not adsorbed well into the tissues

Herbs for Periodontitis

Eucalyptus Extract [5,6]

Eucalyptus extract may improve the condition of your oral health. A double-masked study published in the *Journal of Periodontology* in 2008 revealed that subjects who chewed eucalyptus-containing gum found relief from the disease's symptoms--including less gum bleeding, improved "gum pocket" depth and reduced plaque accumulation. Using gum, toothpaste or tinctures containing eucalyptus extract could benefit your mouth.

Bloodroot [7]

Due to its natural alkaloids, bloodroot can curb the growth of bacteria responsible for gum disease. Sometimes included in oral health products such as toothpaste and mouthwashes, this herb can calm inflammation and prevent bacteria from deepening your periodontal pockets, which helps you halt the bone decay that eventually leads to tooth loss. To benefit from this herb, look for dental products that list bloodroot as an ingredient and follow the manufacturer's instructions for use.

Neem Leaf [8]

Neem leaf extract can help reduce bacteria and plaque levels that cause the

progression of periodontitis. In 2004, the *International Journal of Dentistry* published a study showing that subjects using neem gel experienced periodontal improvement when compared to a control group. A study published the same year in the *Journal of Ethnopharmacology* revealed similar findings. To take advantage of this herb's bacteria-reducing properties, use a mouthwash made with several drops of neem leaf extract mixed in water, and use it twice daily.

Chamomile [9]

Throughout history, cultures around the world have made use of chamomile's medicinal benefits. With its anti-inflammatory and antibacterial properties, chamomile can help soothe inflammation from periodontitis and reduce the levels of unhealthy bacteria in your mouth. Drink chamomile tea to expose your gums to this herb, or look for mouthwashes and toothpastes that contain chamomile. [10, 11]

Herbal Combinations

Along with individual herbs, herbal combinations can help you combat periodontitis. One powerful mixture includes peppermint oil, menthol, sage oil, chamomile, caraway oil, clove oil, myrrh tincture and echinacea extract--all of

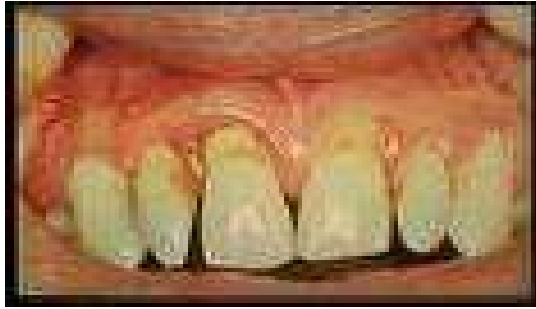


Fig No1: Periodontal Disease

which reduce periodontitis symptoms and can improve the health of your mouth. To reduce your gum inflammation, combine several drops of the herbal mixture with water and use it as a mouthwash three times per day [12]

Management

The cornerstone of successful periodontal treatment starts with establishing excellent oral hygiene. This includes twice daily brushing with daily flossing. Also the use of an interdental brush (called a Proxi-brush) is helpful if space between the teeth allows. Persons with dexterity problems such as arthritis may find oral hygiene to be difficult and may require more frequent professional care and/or the use of a powered tooth brush. Persons with periodontitis must realize that it is a chronic inflammatory disease and a lifelong regimen of excellent hygiene and professional maintenance care

with a dentist/hygienist or periodontist is required to maintain affected teeth.

- Initial therapy
- Reevaluation
- Surgery
- Maintenance
- Alternative treatments

Prevention

Daily oral hygiene measures to prevent periodontal disease include:

- Brushing properly on a regular basis (at least twice daily), with the patient attempting to direct the toothbrush bristles underneath the gum-line, to help disrupt the bacterial-mycotic growth and formation of sub gingival plaque.
- Flossing daily and using interdental brushes (if there is a sufficiently large space between teeth), as well as cleaning behind the last tooth, the third molar, in each quarter.

- Using an antiseptic mouthwash. Chlorhexidine gluconate based mouthwash in combination with careful oral hygiene may cure gingivitis, although they cannot reverse any attachment loss due to periodontitis.
- Using a 'soft' tooth brush to prevent damage to tooth enamel and sensitive gums.
- Using periodontal trays to maintain dentist-prescribed medications at the source of the disease. The use of trays allows the medication to stay in place long enough to penetrate the biofilms where the microorganism are found.
- Regular dental check-ups and professional teeth cleaning as required. Dental check-ups serve to monitor the person's oral hygiene methods and levels of attachment around teeth, identify any early signs of periodontitis, and monitor response to treatment.

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