

Local Drug Delivery



Dr. Mala Dixit

Author: Dr. Mala Dixit, Professor & Head, Dept. of Periodontics, **Address:** Nair Hospital Dental College, Mumbai-400008. **Tel.:** 022-23082714

Increasing knowledge of anaerobic bacteria as predominant agents in the development of periodontal disease has led to new treatment strategies aiming primarily at the suppression or elimination of specific periodontal pathogens. These strategies are based on systemic or local administration of antimicrobial agents. Antimicrobial agents may be delivered by direct placement into the periodontal pocket or via the systemic route. Each method of delivery has specific advantages & disadvantages. *Local therapy may allow the application of antimicrobial agents at levels that cannot be reached by the systemic route. Local therapy may be particularly successful if the presence of target organisms is confined to the clinically visible lesions. Even mild forms of unwanted effects may severely decrease pt. compliance. Local delivery is independent of pt. compliance.*

In order to be effective, the drug should not only reach the entire area affected by the disease, including the base of the pocket, but should also be maintained at a sufficiently high local concentration for some time. With mouthrinse or

CASE1: Patient with localized deep periodontal pocket treated with tetracycline fiber i.e. Periodontal Plus AB

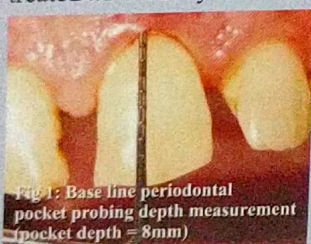


Fig 1: Base line periodontal pocket probing depth measurement (pocket depth = 8mm)



Fig 2: Golden yellow colored fibers being mixed with normal saline

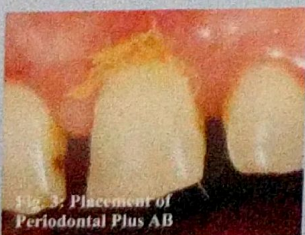


Fig 3: Placement of Periodontal Plus AB

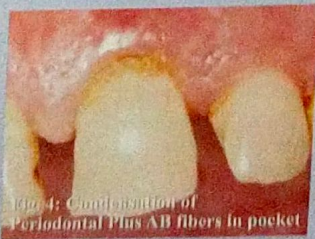


Fig 4: Consolidation of Periodontal Plus AB fibers in pocket



Fig 5: Placement of Cor-Pak periodontal dressing

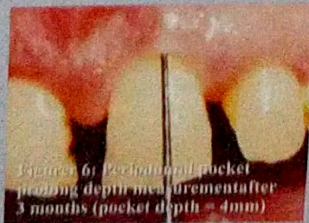


Fig 6: Periodontal pocket probing depth measurement after 3 months (pocket depth = 4mm)

supragingival irrigation it is not possible to predictably deliver an agent to the deeper parts of a periodontal defect. Agents brought into periodontal pockets by subgingival irrigation are washed out rapidly by the gingival fluid. Based on an assumed pocket volume of 0.5 ml & a gingival fluid flow rate of 20 μ l/h. Even a highly concentrated, highly potent agent would thus be diluted below a minimal inhibitory concentration (MIC) for oral microorganisms within minutes. If an agent can bind to surfaces & be released in active form, a prolonged time of antibacterial activity could be expected. Such an effect has in fact been noted for salivary concentrations of chlorhexidine after use of chlorhexidine mouthrinse. Although there are indications that this may also occur to a certain extent within the periodontal pocket, for instance after prolonged subgingival irrigation with tetracycline, the potential to create a drug reservoir of significant size on the small surface area available in a periodontal pocket is limited. To maintain a high concentration over a prolonged period of time, the flushing action of the crevicular fluid flow has to be counteracted by a steady release of the drug from a larger reservoir. Considering the small volume of a periodontal pocket & the pressure exerted by the tonus of the periodontal tissues on anything inserted, it appears unlikely that this task can be completed by a carrier that does not maintain its physical stability for some time & that cannot be secured against premature loss. Gels, for instance, rapidly disappear after instillation into periodontal pockets, unless they change their viscosity immediately after placement. Viscous &/or biodegradable devices show an exponential decrease of their concentration in gingival fluid. Depending on the physical & chemical nature of the carrier, the drug reservoir in the periodontal pocket will be depleted within hours to days after placement. *Controlled delivery of an antimicrobial agent over several days has been shown for tetracycline released from non-degradable monolithic ethylene vinyl acetate fibers.* The drugs investigated for local application include tetracycline, minocycline, doxycycline, metronidazole & chlorhexidine. A variety of methods to deliver antimicrobial agents into periodontal pockets have been devised & subjected to numerous kinds of experiments.

Although mechanical periodontal treatment alone improves clinical conditions sufficiently in most cases, adjunctive antimicrobial agents, delivered either locally or systemically, can enhance the effect of therapy in certain situations. Localized non-responding sites & localized recurrent disease may be treated with locally delivered

CASE 2: Patient with localized deep periodontal pocket treated with Chlorhexidine chip i.e. Pericol-CG

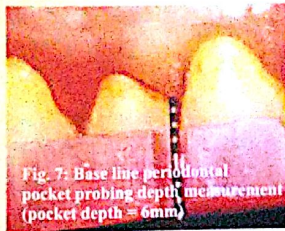


Fig. 7: Base line periodontal pocket probing depth measurement (pocket depth = 6mm)

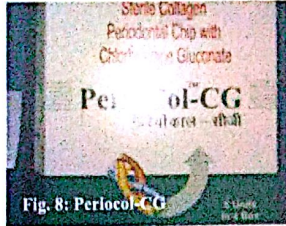


Fig. 8: Pericol-CG

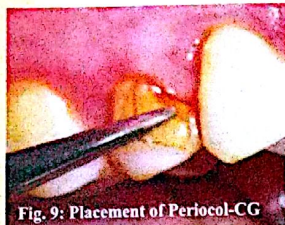


Fig. 9: Placement of Pericol-CG

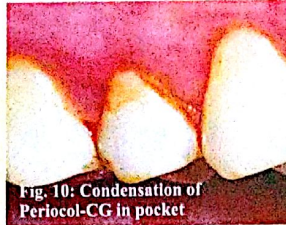


Fig. 10: Condensation of Pericol-CG in pocket

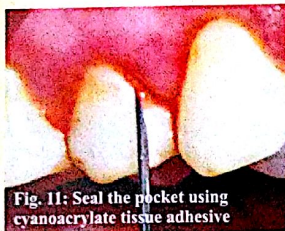


Fig. 11: Seal the pocket using cyanoacrylate tissue adhesive

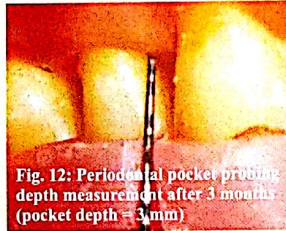


Fig. 12: Periodontal pocket probing depth measurement after 3 months (pocket depth = 3mm)

antibiotics. *Mechanical debridement before the application of antimicrobial agents, & mechanical plaque control after therapy, are essential for treatment success.* As different oral distribution patterns can be recognized in periodontitis patients for microorganisms such as P. gingivalis, local therapy may be less successful in patients where these organisms are widespread than in patients where the presence of pathogens is confined to isolated areas.

Thorough scaling & root planning is highly effective in the treatment of chronic periodontitis & is the standard approach to non-surgical periodontal therapy. Clinicians may consider the use of Local drug delivery in chronic periodontitis patients as an adjunct to scaling & root planning: • When localized recurrent &/or residual Pocket depth \pm 5 mm with inflammation is still present following conventional therapies.

Therapies other than Local drug delivery should be considered when: • Multiple sites with Pocket depth \pm 5 mm exist in the same quadrant. • The use of Local drug delivery has failed to control periodontitis (e.g., reduction of PD). • Anatomical defects are present (e.g., intrabony defects).

There are several clinical situations in which controlled delivery of antibacterial agents may prove to be clinically useful but for which no clinical studies are yet available. *These include* • *The treatment of furcation involvement* • *Pericoronitis* • *Dry sockets.* Another area of possible application is their use in periodontal surgery to reduce infection, particularly when guided tissue regenerative procedures are used. Their use in conjunction with anti-

inflammatory agents to control periodontal disease & to stimulate bone regeneration may also prove to be a useful line of treatment. The clinician's decision to use Local drug delivery should be based upon a consideration of clinical findings, the pt.'s dental & medical history, scientific evidence, pt. preferences, & advantages & disadvantages of alternative therapies. Commonly used agents for local drug delivery in periodontics:



1. **Atridox**:- doxycycline gel that conforms to the gum surface & then solidifies over the next few days.

2. **Elyzol**:- A gel or strip applied to the gum that is composed of metronidazole. Effective against parasites as well as bacteria. Studies show Elyzol achieves a greater bacterial reduction where doxycycline works faster.

3. **PerioChip**:- Placed into the gum pocket after scaling, the chip slowly releases Chlorhexidine a powerful bacteria-killing antiseptic. Reduction of pocket depths is reported - but it is not known whether these improvements are

sustained.

4. **Chlorhexidine gel (CHLOSITE)**:- It is a biodegradable xanthan-based gel consist of chlorhexidine in concentration of 1.5% of which 0.5 % is in the form of digluconate & 1.0% is in form of dihydrochloride (ratio 1:2). Xanthan confers mucoadhesive properties to the gel, also cross linking structure of xanthan controls the release of drug & it exhibits a near zero order drug release. Supplied in a form of syringe with a thin rounded tip needle that will not traumatize the tissues.



5. **Minocycline microspheres (Arestin)**:- contain antibiotics in tiny capsules. Studies report they are more effective in reducing pocket depth & bone loss than standard perio maintenance.

Patients obtain these benefits regardless of their smoking status, age, gender, or extent of disease.

6. **Periodontal Plus AB** @:- Periodontal plus AB is available in strips containing four individually packed & separable sterile bubble packs. Each sterile bubble pack consists of 25 mg of pure fibrillar collagen containing



Co-author: **Dr. Vishal Parmar**,
Address : Under Graduate Institute, Dr. D.Y.Patil Dental College & Hospital, Pimpri, Pune. Mob.No.: +91-9769133660
E-mail: dr.parmarvishal@rediffmail.com