Chemotherapeutics in Periodontics

Definition
- Chemotherapy: The prevention or treatment of disease by chemical agents.

Prevalence Of Periodontal Diseases
- Gingivitis
  - 50% of U.S. population manifests on at least 6 teeth
- Periodontitis
  - 47% of the population manifests mild or moderate or severe forms
  - > 65 years of age prevalence increase to 70%
Introduction

• After stopping oral hygiene efforts, gingivitis can occur within 10 to 21 days

• Once oral hygiene efforts have been re-instated gingivitis can be reversed in 4-7 days.

Loe et al., JP 1965

Mechanical Plaque Removal

• Brush & floss once a day to control plaque

• Limitations
  – Average person brushes less than one minute
  – Tooth brush penetrates 1-3 mm into sulcus
  – 1/3 of patients floss occasionally
  – 2% of patients floss daily

Lang et al., JP 1973

Levels of “Cure”

• Immunity from Disease
• Prevention of Disease
• Treatment for Disease

<table>
<thead>
<tr>
<th>Severity</th>
<th>Benefit</th>
<th>Cost</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>Clear</td>
<td>Low</td>
<td>Low</td>
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<tr>
<td>Moderate</td>
<td>Middle</td>
<td>Middle</td>
<td>Middle</td>
</tr>
<tr>
<td>Advanced</td>
<td>Unpredictable</td>
<td>Higher</td>
<td>Higher</td>
</tr>
</tbody>
</table>
Purpose of Chemotherapeutics

• Utilized to control bacterial component of inflammation:
  – Periodontitis
  – NUG
  – Non-responsive adult periodontitis

• Post-surgical therapy:
  – Tetracycline shown to inhibit MMP (ie: collagenase) activity

Purpose of Chemotherapeutics

Various Methods:
  – Systemic Antibiotics
  – Local Antibiotic Delivery
  – Irrigation
  – Combinations

Historical Concepts

• 1950’s
  – Era of Infectious disease and antibiotics

• 1965-1980
  – Non-specific plaque era

• 1980’s
  – “Find the Bug and Prescribe the Drug”

• 1990’s-present
  – Multifactoral nature of common disease
Oral Rinses

- Listerine
- Chlorhexidine
- Povidone iodine
- Sodium chloride
- Crest Pro Health

Effectiveness of Irrigation

| Pocket penetration of oral rinses | 10 ml dye rinsed 1 min. Teeth extracted. 0.2 ± 0.3 mm |
| Irrigation at pocket orifice | Disposable syringe Reached bottom 6% of time Infrequently reached apical plaque border plaque Dye penetrated 34-38% |
| Irrigation within pocket | 1-2 mm into pocket with Pik Pocket Penetration 70-90% of PD in <6 mm Penetration 64-74% of PD in >7 mm |
| Irrigation with ultrasonic | Depth of dye to tip not depth of pocket Minimal lateral spread even in deep pockets |

Greenstein JOP (1998)

Waterpik Water Flosser

- Device that delivers pulsed irrigation of water or other solution supragingivally and subgingivally
- Also known as dental water irrigator, home irrigator, water flosser
Dental Water Jet: Mechanism of Action

- Delivers a pulsating fluid that incorporates a compression and decompression phase
- This creates two zones of fluid movement called hydrokinetic activity.

Hydrokinetic Activity

- 2 zones of fluid movement
- Impact zone—initial fluid contact with an area of the mouth
- Flushing zone—depth of fluid penetration within a subgingival sulcus or periodontal pocket

Flushing zone
Impact zone
Fluid Penetration

<table>
<thead>
<tr>
<th>Oral Hygiene Aid</th>
<th>Depth of Fluid Penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toothbrush</td>
<td>1 to 2 mm</td>
</tr>
<tr>
<td>Rinsing</td>
<td>2 mm</td>
</tr>
<tr>
<td>Dental Floss</td>
<td>3 mm</td>
</tr>
<tr>
<td>Dental Water Jet</td>
<td>6 mm</td>
</tr>
</tbody>
</table>

Indications for Recommendation

- Individuals on periodontal maintenance
- Individuals who are noncompliant with dental floss
- Individuals with special needs
  - Individuals with dental implants
  - Individuals with diabetes
  - Individuals with orthodontic appliances
  - Individuals with prosthetic bridgework and crowns

Benefits of Home Irrigation

- Biofilm removal?
- Bleeding reduction
- Gingival inflammation reduction
- Periodontal pathogens reduction
- Reduction in inflammatory and destructive host response
Tooth Surface Prior to Treatment

- Untreated tooth surface (in vivo) covered in plaque biofilm as seen under a scanning electron microscope (SEM)
- (Image courtesy of Water Pik, Inc., Fort Collins, CO)

Tooth Surface After Treatment

- Tooth treated with a 3-second pulsating spray at medium pressure (in vivo)
- (Image courtesy of Water Pik, Inc., Fort Collins, CO)

Standard Irrigation Tip

- Made of plastic material
Irrigant Solutions

- Water
- Listerine
- Chlorhexidine gluconate
- Diluted stannous fluoride
- Tetracycline solutions

Systems for Professional Irrigation

- Blunt-tipped irrigating cannula attached to a hand-held syringe
- Ultrasonic unit equipped with a fluid reservoir
- Specialized air-driven handpiece that connects to the dental unit

Effectiveness of Professional Irrigation

- The status of professional subgingival irrigation is still controversial
- In-office subgingival irrigation with an antimicrobial agent has been shown to have only limited or no beneficial effects over periodontal instrumentation alone
Effectiveness

- There is no long-lasting substantivity of the antimicrobial agent due to the continuous flow of gingival crevicular fluid from the periodontal pocket
- A substantive antimicrobial agent, such as chlorhexidine gluconate, would have to be retained in the pocket and be released slowly over time to have a beneficial effect

Effectiveness

- Depth of periodontal pocket and presence of calculus impedes flow of solution to depth of pocket
- Weak evidence to support use of professional irrigation as a means to enhance outcome of nonsurgical periodontal instrumentation
- If performed before instrumentation, may reduce incidence of bacteremia and number of bacteria in aerosols

Oral Rinses

- Most studies showing an improvement performed on gingivitis patients
- Those studies conducted on periodontitis patients either demonstrated no improvement or a clinically insignificant improvement

(AAP 1996)
Antibacterial Agents

- Bisguanides
  - Chlorhexidine gluconate
    - PerioGard®
    - Peridex®
    - Generic
    - Alcohol free Paroex
- “Gold Standard”

Substantivity

- Substantivity—the ability of a chemical plaque control agent to be retained in the oral cavity and be released slowly over time with a continued antimicrobial effect

Mechanism Of Action

- Binds to negatively charged oral tissues
  - Rapid release
- Increase bacterial cell membrane permeability 
  → cell lysis
- Decreases bacterial attachment
Cell Lysis

CHX Side Effects
- Brown staining
- Bitter taste
- Increased calculus formation
- Dulling of taste sensation
- Desquamative lesions

Indications
- Post surgery
- IMF (intermaxillary fixation)
- Orthodontics
- Aphthous ulcers
Chlorhexidine Use Instructions

• Rinse no more than once every 12 hours
• Clear mouth of all tastes before rinsing
• Do not drink water for one hour after rinsing
• Indefinite shelf-life and excellent use for oral ulcers

Chlorhexidine

• Stains can be removed “easily” except under leaky composites

Spectrum Of Activity

• Broad Spectrum
• Gram positive and negative organisms, bacteria, yeast & fungi
• 99% of HIV is inactivated after a 30 second exposure
Alcohol & Mouthrinses

- Possible association between high alcohol mouthrinses and oral cancer
- Problem with preservatives & flavors
- National Cancer Institute doesn’t recommend a change in mouthrinse habits


Alcohol-Free Mouthwashes

- Alcohol-free
- Studies shows similar efficacy to regular Listerine like products
- Reduces oral malodor
  - Alcohol dries mucosa
- Does not soften, increase staining or cause color changes in composite resin restorations

BreathRx® Products

- Zytex-containing products (VSC)
  - Mouthrinse
    - Contains Cetylpyridinium Chloride
    - Alcohol free
  - Gum
  - Tongue gel
  - Tongue spray
- Tongue scraper
  - Decreases malodor
Phenolic Essential Oils

- LISTERINE®
- Generic brands
- History
  - Longest clinical use
  - Original application in 1885
  - Only OTC rinse to receive
    - ADA approval

Mechanism Of Action

- Cell wall destruction & inhibition of bacterial enzymes
- “Extract” LPS (endotoxin) from Gram negative bacteria
- Anti-inflammatory

Efficacy

- Reduces plaque 20-34%
- Reduces gingivitis 28-34%
- Rinsing for one minute can reduce colony counts in aerosols 92-94%
Side Effects

- Initial burning sensation
- Bitter taste
- Occasional staining
- Epithelial sloughing

Formula

- Thymol, eucalyptol, methyl-salicylate & menthol
- 26.9% alcohol
- Cool mint and fresh burst
  Listerine®
  - 22% alcohol
  - Retained active ingredients
- Rx: Swish and expectorate bid

Quaternary Ammonium Compounds

- Cetylpyridinium Chloride
  - Cepacol® (0.05 % or 0.1%)
  - Scope® (domiphen bromide .005%)
  - Colgate® (benzethonium chloride)
- 50 year history of use
- No substantivity
Mechanism Of Action

• Binds to negatively charged oral tissues
  – Rapid release
• Increase bacterial cell membrane permeability causing cell lysis
• Decreases bacterial attachment

Cell Lysis

Fluid influx → Cell Lysis / Death

Efficacy

• Reduces plaque 14% (in vitro?)
Side Effects

- Burning sensation
- Tooth stain
- Increased calculus formation
- Mucosal desquamation

Mouthrinse Clinical Effects

- Gingivitis - some benefit
  - Home & office irrigation reduces subgingival bacterial counts
- Periodontitis - no lasting benefit
  - Irrigation over 2-4 weeks reduced BOP & plaque, clinical parameters returned to baseline 8 weeks after stopping irrigation
- Malodor?

Dentifrices

- Crest
- Colgate
- Sensodyne
- Tom’s
- Aim
- Baking soda
Dentinal Hypersensitivity

![Diagram of dentinal fluid and pulp]

Products Available For Dentinal Hypersensitivity

- **OTC**
  - Sensodyne
  - Crest with sensitivity
  - Colgate sensitivity
- **Prescription**
  - Gel-Kam
  - Prevident 5000 + Sensitive

Crest Pro-Health

- Significant gingivitis reduction
- Clinically proven dentinal hypersensitivity reduction
  - SF 0.454%
- Effective cavity protection
Crest Sensitive
- Potassium nitrate 5%
- SF 0.243%

Colgate Sensitive Paste
- Contains 5% Potassium Nitrate
- Provides clinically proven sensitivity relief
- Desensitizes the dental pulp nerve fibers of the tooth and helps prevent nerve stimulation
- Contains 0.24% Sodium Fluoride (1100 ppm F-)
- Remineralizes the enamel, strengthening the tooth surface and providing caries protection

Colgate Total SF
- Stannous Fluoride stabilized with zinc phosphate
- Sensitivity relief
- Strengthens and whitens
- Reduces plaque, gingivitis, calculus, and malodor
Sensodyne Rapid Relief
• Active ingredient – SF
• https://youtu.be/ZO0c41aIdHw

Colgate/Tom’s Sensitive
• Dentin hypersensitivity treatment by natural process of tubule occlusion
• Instant and lasting relief for 4 weeks from pain and discomfort of sensitivity.
• Helps block pain stimuli, such as tactile pressure and cold air
• Instant and lasting sensitivity relief that last 4 weeks after a single application.
• No fluoride!

Colgate Products
• Colgate Professional Sensitivity Relief Serum
  – Pro-Argin technology
  – Arginine bicarbonate
  – Calcium carbonate
  – Others
Pro-Argin Technology

Dentinal Hypersensitivity

• After Colgate Sensitive Pro-Relief

• Before Colgate Sensitive Pro-Relief

Prescription Strength Toothpaste for Sensitive Teeth

• 1.1% Sodium Fluoride, 5% Potassium Nitrate
• Clinically proven sensitivity relief
• Significant remineralization of root caries in as little as three months (38%) and six months (57%)\(^1\)
• Therapeutic decay prevention safe for exposed root surfaces
• Mild formula
• Low abrasion Level
• Mild mint flavor
Tongue Scrapers

- Biggest source of:
  - Oral malodor
  - Bacterial reservoir
  - Drainage products
  - Food debris

Systemic Antibiotics

- Use of systemic antibiotics with SC/RP for treatment of adult periodontitis has not demonstrated an improvement over SC/RP alone (AAP 1996)
- Limited, but statistically significant improvement demonstrated with rapidly progressive and refractory cases treated with combinations of systemic antibiotics and SC/RP (Matkovic, et al. 1993)
- Localized juvenile periodontitis patients treated with systemic antibiotics and SC/RP responded better than those treated with SC/RP alone (Kornman, et al. 1985)
Antibiotics

- Systemic route
  - High dosage
  - Low dosage
- Local route
  - Non-resorbable
  - Resorbable

Systemic Antibiotics

- Indications
  - IE prophylaxis/LJPI prophylaxis
  - NUG or periodontal abscess with fever or lymphadenopathy
  - Persistent pathogenic infection
  - Other medically compromised patients
  - Not for routine chronic periodontitis!!!
  - Refractory periodontitis
  - Aggressive periodontitis

Infective Endocarditis

- Can be fatal
- Trauma from dental procedures
- Microorganisms can enter bloodstream
- Bacteria growths form on heart valves
- Invasive treatment requires pre-medication
Infective Endocarditis

- Acute form:
  - High fever, leukocytosis and death in < 6 weeks;
  - Associated with infections by S aureus, Strep pneumoniae or pyogenes

- Subacute and chronic:
  - Patients with prior valvular disease; slow, indolent course, with low grade fever, night sweats, and weight loss; caused by viridans-streptococci (S sanguis, S mutans, S mitor)

Most Recent Recommendations

- Artificial heart valves
- History of infective endocarditis
- Certain specific, serious congenital (present from birth) heart conditions, including
  - Unrepaired or incompletely repaired cyanotic congenital heart disease, including those with palliative shunts and conduits
  - Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first six months after the procedure
  - Any repaired congenital heart defect with residual defect at the site or adjacent to the site of a prosthetic patch or a prosthetic device
- Cardiac transplant that develops a problem in a heart valve.

Infective Endocarditis

The valve is partially covered with fibrin and partially ulcerated.
Procedures Which Endocarditis Prophylaxis Recommended

- All dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa.*
- The following procedures and events do not need prophylaxis:
  - Routine anesthetic injections through non-infected tissue
  - Taking dental radiographs
  - Placement of removable prosthodontic or orthodontic appliances
  - Adjustment of orthodontic appliances, placement of orthodontic brackets
  - Shedding of primary teeth
  - Bleeding from trauma to the lips or oral mucosa

Endocarditis Prophylaxis

- If recommended then should be given for all periodontal procedures to include probing, prophylaxis, scaling and root planing, surgical procedures

Late Joint Prosthetic Infection Prophylaxis

- New Guidelines
Regimens For Prophylaxis

Antibiotic Therapies

- Amoxicillin
- Tetracyclines
- Metronidazole
- Augmentin
- Clindamycin
- Combination therapies

Penicillin

- Bacteriocidal against Strep and Staph and others
- Inhibits cell wall synthesis
- Excreted via urine
- Rarely used in perio
- Allergic potential high
- Often used in odontogenic infections
Amoxicillin

- Bacteriocidal
- Effective against
  - Some Aerobic Gram + organisms
  - Some Aerobic Gram – organisms
  - Heliobacter pylori
- Inhibits cell wall synthesis
- Excreted via urine

Amoxicillin

- Drug interactions
  - Probenecid increases blood level of amox
  - Bacteriostatic drugs may block cidal effects of amox
    - Chloramphenicol, macrolides, sulfonamids, tetracyclines
- Usual dental dosage
  - 2 grams stat and then 500 mg tid for 7-10 days

Doxycycline

- Broad spectrum, bacteriostatic to Gram (+) and Gram (-) aerobic & anaerobic bacteria
- Binds to 30 S ribosomal subunit
- Excreted via urine
- 100 mg bid X 21 days
Low Dose Doxycycline

Find out about Periostat 20 mg
The whole mouth treatment for adult periodontitis.

Tablets (Doxycycline Hyclate Oral) – 20 mg (100) - $118.98

Matrix Metalloproteinases
Collagenases

Collagenase 1 (MMP-1)
Fibroblast

Collagenase 2 (MMP-8)
Neutrophil

Collagenase 3 (MMP-13)
Osteoclast

Potential Role Of Periostat® In Smokers

Smoking control
Plaque control
IL-1levels
Tissue response
MMP levels
MMP inhibitors
Rate of disease progression

Smoking control
IL-1 reducing drugs
MMP inhibitors

IL-1
Levels
Tissue
Response
MMP
Levels

Level of Bacteria
Summary:
“There are situations in which conventional therapy does not always achieve the desired clinical outcome. For example, certain patients possess non-microbial risk factors which are difficult to reduce or eliminate (e.g., smoking, diabetes) or are beyond the clinician’s ability to control (e.g., genetic predisposition). In these instances...the use of host modulatory therapy in conjunction with antibiofilm treatment may prove to be advantageous. However this concept needs to be proved in controlled clinical trials.”

Periostat® - ADA Seal Of Acceptance
“Periostat® has been shown to help stop the progression of periodontitis when used as directed as an adjunct to scaling and root planing, in a conscientiously applied program of oral hygiene and regular professional care.”

Mean PPD Change
Periostat Phase IV Study

Mean PPD Change
Periostat Phase IV Study
Low Dose Doxycycline

- Take 20 mg bid X 90 days
- Advantages
  - Anti-collagenase effect
  - No bacterial resistance formation
- FDA approved
- Used with SC/RP or in patients that did not respond

Periostat® Studies

- Golub et al., 1990
  - 81% reduction of collagenase activity S/P in GCF
- Caton et al., 2000
  - Small but statistically significant clinical improvement over SC/RP alone
- Greenstein, 1999
  - Drug administration is NOT a substitute for proper debridement of root surfaces

Metronidazole

- Bactericidal for Gram (-) anaerobes
- Inhibits DNA replication
- Excreted in both urine & feces
Metronidazole

- Adverse effects
  - GI upset, nausea, vomiting & metallic taste
  - Psuedo-membranous colitis
  - Disulfuran-like effect (Antabuse)
    - Avoid alcohol
  - CNS stimulation
    - High doses (>4000 mg/day)
  - Discolored urine

- Drug interactions
  - Coumadin
    - ↑ anticoagulant effect
  - Alcohol
  - Barbituates and hydantoins
    - ↓ effectiveness of metronidazole

- Usual Dose:
  - 500 mg q 8 h x 7-10 days

Augmentin

- Amoxicillin + 125 mg Clavulanic acid
  - Wider range of activity
  - Inhibits hydrolyzation by β-lactamase producers

- Adverse effects
  - Allergy
  - GI upset
  - PMC
Augmentin

- Drug interactions
  - Coumadin
  - Birth control pills
  - Methotrexate toxicity
  - Probenecid
    - ↑ levels of antibiotic
- Usual dose for refractory periodontitis
  - 500 mg tid x 7-10 days (500 mg amoxicillin with only 125 mg clavulanate)

Clindamycin

- Bacteriostatic
  - Gram (-) and Gram (+) aerobes & anaerobes
  - Inhibits protein synthesis (50 S ribosome)
  - Peptostreptococcus and Bacteroides
- Adverse Effects
  - GI upset
  - Allergy
  - Pseudomembranous colitis
  - Superinfection

Clindamycin

- Usual doses for refractory periodontitis
  - 300 mg tid x 8-10 days
- IE prophylaxis
  - 600 mg 1 h before appt
Combination Therapy

- Refractory periodontitis
  - Metronidazole + Amoxicillin
    - 250 mg metronidazole + 500 mg amoxicillin
tid x 7-10 days

Compliance

- Compliance rates vs. frequency:
  - 1 time per day (qd)= 73%
  - 2 times per day (bid)= 70%
  - 3 times per day (tid)= 52%
  - 4 times per day (qid)= 42%

Greenberg, Clin Ther, 1984

Systemic Antibiotics

- Bottom Line:
  - Critical review of evidenced based literature:
    - Strongest data supporting systemic antimicrobial therapy are for refractory and recurrent periodontitis
    - Some forms of periodontitis and NUG/P also have strong support for the use of systemic antimicrobials

1) Ellen and McCulloch 1996
2) 1996 World Workshop also supports this conclusion (Drisko)
Biological Enhancement

• What is biological enhancement?
• What biologic mediators have been studied?

Biological Enhancement

• Biological enhancement—attempts to enhance the outcomes of periodontal surgery by using chemical or biologic mediators to influence healing following periodontal surgical procedures

Local Chemo Agents

• Root biomodifiers
• Hemostatic agents
• Vasoconstrictors
• Local anesthetics
• Topical anesthetics
Methods Studied to Date
- Root surface modification
- Growth factors
- Enamel matrix derivative (EMD)
- Platelet rich plasma (PRP)
- Bone morphogenetic proteins (BMP)

Root Surface Modification
- Chemical and biologic mediators used in an attempt to enhance the healing of the gingiva adjacent to the tooth roots

Root Biomodification
- Agents
  - Tetracycline
  - Citric Acid
  - EDTA
Doxycycline

- Topically applied
- 50 mg/mL X 2 minutes
- Removes smear layer
- Substantivity (anti-collagenase activity)
- Effect on collagen matrix
- Detoxification
- Anti-microbial effect questionable

Prefgel

- 24% EDTA
- Cleanses and opens up fibrillar matrix
- Removes smear layer

Root Biomodification Studies

- Regeneration on diseased roots
  - Cole and Crigger
  - Lopez
- Soft tissue grafts
  - Miller
- Stahl
  - 1/6 only showed cementogenesis histologically
- Renvert
  - No difference in CAL gain vs saline in OFD
### Hemostatic Agents

- Used to stop bleeding
- Aid in blood clotting
  - Lidocaine 1:50,000
  - Hemodent
  - Avitene (thrombin)
  - Hemcon (shellfish allergy)
  - Epinephrine (historical)
  - Tranexamic acid rinse

### Vasoconstrictors

- Drugs that narrow arteries
  - Limit use in patients with uncontrolled hypertension
- Used in dental anesthetics
  - Epinephrine
  - Neo-Cobefrin

### Dental Anesthetics

- Topical anesthetic:
  - Reduces pain of the needle
- Benzocaine 20%
  - Placed on dry mucosa with cotton-tipped applicator or on a cotton roll
- Best topical ever (AAA)
  - Lidocaine, Prilocaine, Tetracaine, Phenylephrine
  - Swab on and rinse off
Topical Anesthetics
- Hurricane Gel (20% Benzocaine)
- AAA Topical
  - 12.5% Lidocaine, 12.5% Tetracaine, 3% Prilocaine, 3% Phenylephrine in an Aq. Base, Coloring, & Flavoring
- Oraqix 2.5% lido and 2.5% prilocaine
  - Atraumatic 30 sec onset
  - 15-31 min duration
- Others

Local Antibiotics/Devices
- Resorbable devices
  - Arestin® (2% minocycline microspheres)
  - Atridox® (polylactide with 10% doxycycline)
  - Emdogain®
  - PerioChip®
  - Membranes
    - Atrisorb®, BioGide®, BioMend®, AlloDerm®, Guidor®, others
- Non-resorbable devices
  - Membranes
    - ePTFE or PTFE with or without TR
Benefits of Controlled-Release Delivery Devices

- Result in a small increase in attachment level in a periodontal pocket (0.05 to 2 mm)
- When used along with periodontal instrumentation, they can result in both an improvement in probing depth reduction and a clinical attachment gain

Comparison of Drug Delivery Systems

<table>
<thead>
<tr>
<th>System</th>
<th>Composition</th>
<th>Resorbable (time)</th>
<th>Controlled or Sustained Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHX Chip</td>
<td>Hydrolyzed gelatin matrix; CHX</td>
<td>Yes (8 days)</td>
<td>Controlled</td>
</tr>
<tr>
<td>Doxycycline polymer</td>
<td>Doxycycline hyclate (10%)</td>
<td>Yes (27 days)</td>
<td>Controlled</td>
</tr>
<tr>
<td>Minocycline microspheres</td>
<td>Minocycline (1-mg)</td>
<td>Yes (21 days)</td>
<td>Sustained Release</td>
</tr>
</tbody>
</table>
Arestin® Studies

- Open label trial
  - 27,000 sites in 921 patients
  - Increased PPD reduction over SC/RP alone
  - Easy to use
- Many abstracts but few long term published studies
- Several studies in the works
- Research
Arestin Placement Subgingival

Atridox®

- Polylactide with 10% doxycycline
- Bioabsorbable
- High concentrations of antibiotic at site
- Increased concentration with seal
Higher concentrations of doxycycline obtained when cyanoacrylate used over Atridox®

Atridox® Studies

• Atridox® without concomitant SC/RP equally effective as SC/RP for SPT patients
  – Garrett et al., JP 2000; 141 patients
• Atridox® not effective in smokers; SC/RP seemed to be effective
  – Ryder et al., JCP 1999; 350 patients
• Atridox® as effective as SC/RP in advanced chronic periodontitis patients
  – Garrett et al., JP 1999; 411 patients

Periochip®

• 2.5 mg CHX (34%) in linked gelatin matrix; 5 X 5 X 1 mm
• Bioabsorbable
• Anti-microbial
• You scaled, you root planed, now Chip
PerioChip®

• Inserted into a periodontal pocket with probing pocket depth (PD) ≥5 mm
• Recommended every 3 months if PD ≥5 mm
• Up to 8/visit

Periochip® Studies

• Studies show more improvement when combined with SC/RP over SC/RP alone
• Placed in PPD > 5 mm
• Repeated at 3 and or 6 months
• More sites with decreased PPD ≥ 2 mm

Enamel Matrix Derivative (EMD)

• Research into the use of EMD instead of barrier materials to deter the early growth of epithelium next to the root surface, allowing time for growth of the cementum, PDL, and alveolar bone
Emdogain®

- Adjunct to surgery
- Enamel matrix protein
  - Mediates formation of acellular cementum
- Two components
  - Emdogain protein
  - Propylene glycol
- Emdogain TS
  - Incorporates PerioGlas

Emdogain® Procedure

Emdogain®
Barrier Membrane

- The membrane delays the growth of epithelial cells along the tooth root.
- This provides time for the cementum, PDL, and bone to form next to the root.

Regeneration Membranes

Bio-Gide®

Connective Tissue Side
Bio-Gide®

- Bio-Gide provided better bone fill around exposed implants than ePTFE
  - Zitmann et al., 1997
- Bio-Gide in combination with Bio-Oss and autogenous bone provided histologic regeneration
  - Camelo et al., 2001
- Bio-Gide successful in ridge augmentation with Bio-Oss
  - Zitmann et al., 2001

Non-resorbable Membranes

- ePTFE (Gore-Tex®)
  - GTR
- ePTFE with titanium reinforcement
  - GBR
- PTFE (Cytoplast)
Gore-Tex (ePTFE) Studies

- ePTFE superior to DFDBA alone
  - Mellado et al., 1995
- ePTFE become exposed ~50% of the time reducing results
  - Machtei et al.,
- Regeneration on mandibular molars and buccal furcations of maxillary molars predictable with ePTFE
  - Pontoriero et al., 1988, 1995
- Numerous others
Platelet Rich Plasma (PRP)

- Being studied for its possible ability to enhance the healing process
- Good short term effects but no long term benefits noted.
- Not recommended by the AAP

Bone Morphogenetic Proteins: BMP

- Studied for its osteoinductive effects that might enhance bone regeneration
- However, BMP has resulted in ankylosis.
- Much further study of BMPs is needed.
- Infuse®

Analgesics

- Pain relieving drugs
- Don’t cure the cause of the pain
- Uses in dentistry:
  - Toothache
  - Relief of pain after treatment
Narcotics

- Rarely used
- Moderate to severe pain
- Cause drowsiness
- Can cause addiction (~3 weeks)
- Should not share any drugs but especially not narcotics!!!
- Examples: Codeine, Demerol, Tylenol #3, Vicodin, Percoset
- PMP aware

Narcotics Review

Narcotics Mechanism Of Action

- Binds to specific receptors resulting in inhibition of adenylate cyclase activity manifesting as hyperpolarization of the neuron which results in suppression of spontaneous discharge and evoked responses
Non-narcotic Analgesics

- Mild to moderate pain alone
- Severe pain when ibuprofen and acetaminophen combined
- Minimal side effects
- NSAIDS reduce fever / inflammation

Combination Therapy

- Ibuprofen 600-800 mg q 8 h
- Acetaminophen 1000 mg q 8 h

- Literally in all pain studies best pain relief of all other medications
- Narcotics do not relieve pain just make you not care that it hurts!

Formation of Primary Mediators of Wound Healing (Eicosanoids)

- Injury
  - Cell Membrane
  - Phospholipids (phospholipase)
  - Arachidonic Acid (20:4n-6) (lipooxygenase)
  - Prostaglandins
    - vasodilation
    - chemotaxis
    - fever
    - pain
  - Prostacyclin
    - dilation
    - antithrombotic
    - vasodilation
  - Thromboxane
    - platelet aggregation
    - vasoconstriction
  - Leukotrienes
    - smooth-muscle contraction
    - vascular permeability alteration
    - chemotaxis
    - vasoconstriction
Conclusions

- Systemic antibiotics alone are not proven to halt disease progression
- Locally delivered antibiotics in combination with SC/RP may show statistically significant but questionable long-term results, clinically
- Irrigation can not substitute for SC/RP
- Limited use of LDA in cases not demonstrating a response to conventional therapy
- Caution should be used in employing antibiotic therapy due to ever-increasing resistance

Conclusions

- Rinses, irrigant, systemic antibiotics and locally applied devices are adjuncts to conventional periodontal therapy.
- Some seem to greatly increase success of treatment of some periodontal diseases.
- New products are constantly being released with varying results.
- Objective assessment of each new product is prudent.

Questions?