Review and Update on Non-Surgical Periodontal Therapy

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Presentation Outline

- Review of Concepts and Definitions
- Diagnosis and Treatment Plan
- Initial Periodontal Therapy
  - Oral hygiene instruction
  - Scaling and root planing
  - Removal of plaque retentive factors
  - Lasers in non-surgical periodontal treatment
- Evaluation of the Initial Periodontal Therapy

Presentation Outline

- Additional Topics:
  - Full-Mouth Disinfection
  - Topical Antimicrobials
  - Systemic Antibiotics
  - Locally Delivered Antimicrobials
  - Periodontal Host Modulation
- Final Remarks

REMEMBER THIS ALWAYS …

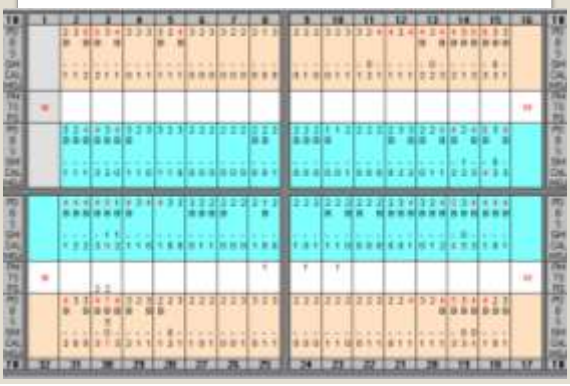
There is no substitute for an *accurate periodontal diagnosis* and *adequate conventional* (i.e., mechanical) *periodontal treatment*.

Periodontal Diagnosis

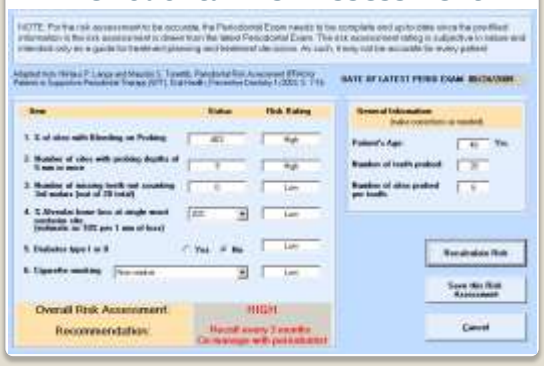
- Full mouth series of radiographs including bitewings
- Full mouth periodontal chart
  - Bleeding on probing
  - Plaque Index
- Description of gingival tissues
- Description of calculus presence
- Risk assessment and goals of treatment
- Thorough discussion with patient regarding findings and treatment plan

Example of Clinical Case

Periodontal Chart



Periodontal Risk Assessment



Periodontal Diagnosis

- **Example of chart notes for 1st visit:**

- Purpose: Initial comprehensive examination
- Chief Complaint:
- History of Chief Complaint:
- Medical History:
- Dental History:
- Oral Hygiene/Gingival Tissues: Plaque Index, Percentage of BOP
- Calculus (location, quantity, distribution):
- Treatment Provided: Full-mouth periodontal charting (probing depth, clinical attachment level, bleeding on probing, mobility, furcation involvement). Explanation of initial findings. Treatment plan explained.
- Evaluation:
  - Radiographic Findings:
  - Periodontal Diagnosis (AAP, 1999 Workshop):
  - Additional Clinical Findings:
  - Occlusal Factors:
  - Restorative Factors:
  - Risk Assessment and Periodontal Prognosis:
    - Short Term (< 5 years): whole dentition __ versus selected teeth __
    - Long Term (> 5 years): whole dentition __ versus selected teeth __

Periodontal Diagnosis

- Suggested Treatment Plan:
  - Education on the etiology of periodontal disease
  - Oral hygiene instructions and motivation
  - Four quadrants of scaling and root planing (SRP)
  - Minor/initial restorative care
  - Reevaluation of initial periodontal therapy 4-8 weeks after last quadrant of SRP
  - Surgical Phase (including antibiotic therapy):
    - Maxillary right
    - Maxillary left
    - Mandibular right
    - Mandibular left
  - Reevaluation of surgical therapy 6-8 weeks after the last quadrant of surgery.
  - Completion of Restorative Phase and Other Treatment Needs
  - Periodontal maintenance at 3-month intervals or according to patient's plaque control
- Evaluation:
- Next Visit:

Periodontal Diagnosis

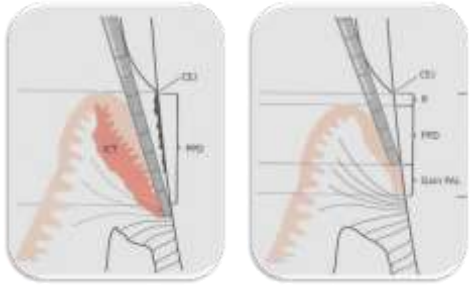
- Routine Chart Notes:
  - P - purpose
  - H – medical history
  - O – oral hygiene
  - T – treatment provided
  - E - evaluation
  - N – next visit

Periodontal Diagnosis

- Reference for Periodontal Diagnosis:
  - Armitage G.C.: Development of a Classification System for Periodontal Disease and Conditions. *Ann Periodontol* 1999; 4:1-6.
    http://www.joponline.org/toc/annals/4/1
- Reference for Periodontal Risk Assessment:
  http://www.previser.com/

Reviewing Concepts:

Probing Depth, Attachment Level and Bleeding on Probing



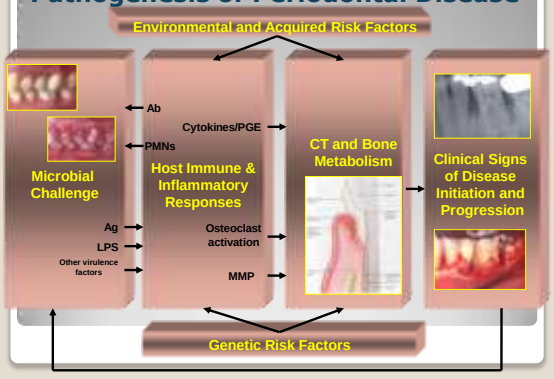
Periodontal Diseases Are Infections

Experimental Gingivitis in Man

Löe et al., 1965

- Gingivitis (~15 to 21 days)
- Health (~7 to 10 days)

Pathogenesis of Periodontal Disease



Initial Periodontal Therapy

- Patient education and motivation
- Oral hygiene instruction/daily antimicrobials
- Scaling and root planing combined or not combined with antimicrobials
- Removal of additional retention factors for plaque, such as overhanging margins of restorations, ill-fitting crowns, etc.
- Minor restorative work
- Extraction of hopeless teeth
- Reevaluation in 4-8 weeks after last ScRP

Criteria for Periodontal Surgery

- ☐ Gingivitis
  - OHI + ScRP
- ☐ Slight Periodontitis
  - OHI + ScRP
- ☐ Moderate Periodontitis
  - OHI + ScRP
  - Surgery (?)
- ☐ Severe Periodontitis
  - OHI + ScRP
  - Surgery

No surgery

Initial Periodontal Therapy:

Mechanical & Chemical Aspects

Patient Education and Motivation

Current Concepts: Mechanical Plaque Control

- Mechanical plaque control: the best approach for the prevention and treatment of gingivitis.
- Prevention of gingivitis requires only meticulous removal of plaque every 48 hours.
- In general, no more than 60% of the overall plaque is removed at each episode of oral hygiene.

Claydon, 2008

Current Concepts: Mechanical Plaque Control

- The main benefit of twice-a-day oral hygiene is the adjunctive chemical action of the dentifrice.
- Epidemiological studies have shown that gingival health improves with up to twice-daily brushing but not more frequently than that.

Claydon, 2008

Current Concepts: Mechanical Plaque Control

- Toothbrush design:
  - Handle size: Long contoured handle performs better than short and flattened.
  - Head size: Small is best.
  - Filament: Arrangement and height do not matter. High-filament density is more effective.
  - Automated brushes …

Claydon, 2008

Partial Classification of Powered Toothbrushes by Mode of Action

Design	Mode of Action and Brand Example
Lateral Motion	Brush head action that moves laterally from side to side. Philips Sonicare: www.philips.com
Counter Oscillation	Adjacent tufts, containing between 6 and 10 filaments, rotate in one direction and then counter-rotate with adjacent tufts moving in opposite directions. Interplak Brush: www.conair.com
Rotation Oscillation	The whole brush head rotates in one direction followed by the other. Oral B Braun: www.oralb.com ; Colgate Motion: www.colgate.com
Sonic	300,000 strokes per minute: Sensonic: www.waterpik.com 20,000 strokes per minute: Colgate 360: www.colgate.com
Ultrasonic	The toothbrush filaments vibrate at ultrasonic frequencies (>20 kHz) Ultrasonex Brush: www.saltoninc.com
Ionic	An electric current is applied to the filaments during toothbrushing that alters the charge polarity of the tooth and results in the attraction of dental plaque towards the filaments and away from the tooth. No automated action is provided. Hukuba Ionic: www.ionicbrush.com

Powered Toothbrushes

- Higher compliance: one study showed 62% of participants continued daily use for 36 months
- Sales of powered toothbrushes doubled between 1999 and 2001
- Powered toothbrushes may remove 84% of the plaque in 2 minutes and 93% in 6 minutes

Claydon, 2008

PLAQUE reduction for powered vs. manual toothbrushes at (1-3 months) and (>3 months)

Type of Toothbrush	Number of Studies		Number of Participants		Effect size	
	1-3 months	> 3 months	1-3 months	> 3 months	1-3 months	> 3 months
Lateral motion	6	2	402	220	None	None
Counter oscillation	4	2	184	69	None	Moderate
Rotation oscillation	15	3	1181	266	Moderate	Moderate
Circular	3	1	168	40	None	None
Ultrasonic	3	1	171	46	None	None
Ionic	3	1	179	64	None	Slight

Claydon, 2008

GINGIVITIS reduction for powered vs. manual toothbrushes at (1-3 months) and (>3 months)

Type of Toothbrush	Number of Studies		Number of Participants		Effect size	
	1-3 months	> 3months	1-3 months	> 3 months	1-3 months	> 3months
Lateral motion	8	2	627	220	None	None
Counter oscillation	4	2	172	69	None	None
Rotation oscillation	16	4	1256	423	Moderate	Moderate-High
Circular	3	1	168	40	None	None
Ultrasonic	3	1	171	46	None	None
Ionic	2	1	116	64	None	Slight

Claydon, 2008

Interdental Cleaning

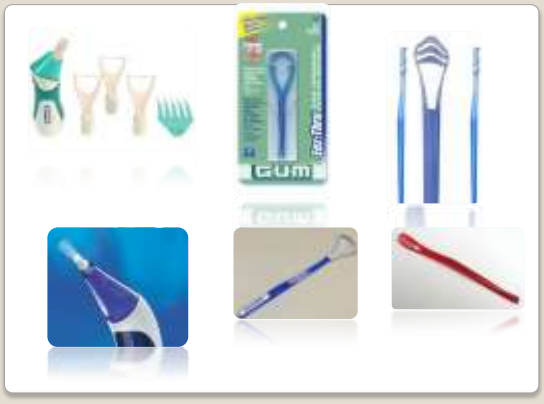
- No systematic reviews available
- Overwhelming number of options:
  - Floss or tape, super floss and flossers
  - Woodsticks or brushes (single or multi-tufted)
  - Mechanical or electrical devices
- The general population lacks:
  - Knowledge
  - Motivation
  - Skill

Clinical Studies on Oral Hygiene	
Stewart and Wolfe 1989	Lack of reinforcement of oral hygiene over time increased poor compliance.
MacGregor et al 1998	2-10% of the population floss regularly and effectively.
Bader 1998	A substantial part of the population never floss at all.
Beals et al 2000	Patient's average brushing time is 37 seconds.
Kalsbeek et al 2000	Only 10% of the population floss daily.
Lang et al 2004	Only 20% of the patients regularly perform acceptable flossing.

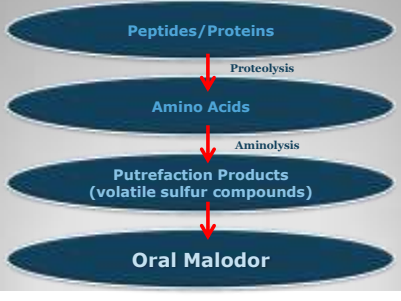
Efficacy of Dental Floss

- The dental professional should determine, on an individual basis, whether high quality flossing is an achievable goal. Routine instruction to use floss is not supported by scientific evidence.

Berchier et al., 2008



Bacterial Putrefaction



Breath VSC & Some Amines

Name	Odor Qualification
Hydrogen sulfide	Rotten eggs
Methyl mercaptan	Pungent, rotten cabbage
Dimethyl Sulfide	Unpleasantly sweet
Allyl methyl sulfide	Garlic-like
Carbon disulfide	Slightly pungent
Dimethylamine	Fishy, ammoniacal
Trimethylamine	Fishy, ammoniacal

Tongue Coating

Winkel et al., 2003

Irrigation Devices

- Water jet: 1,200 pulsations per minute with pressure of 55-90 psi reduces bleeding and gingivitis.
- Pulsation action:
  - Impact zone: where the solution initially contacts in the mouth at the gingival margin
  - Flushing zone: where the water or other irrigant reaches subgingivally

Gorur et al, 2009 and Ciancio et al, 2009

Dental Water Jet Reduction of Inflammation and Biofilm

Study	Duration	N	Agent Used	% Bleeding Reduction	% Gingivitis Reduction	% Plaque Reduction
Al-Mubarak et al 2002	3 months	50	Water	43.4	66.9	64.9
Barnes et al 2005	4 weeks	105	Water	36.2-59.2	10.8-15.1	8.8-17.3
Brownstein et al 1990	8 weeks	44	CHX (0.06%)	52-59	25.4-31.1	14.3-19
Burch et al 1983	2 months	47	Water	57.1-76.6	29.3-37.7	52-55.7
Chaves et al 1994	**6 months**	105	CHX (0.04%) Water	**54** **50**	**26** **26**	35 16
Ciancio et al 1989	6 weeks	61	Listerine H_2O/Alcohol 5%	27.6 13.6-31.2	54-55.7 59.9-61.9	23-24 9.6-13.3
Cutler et al 2000	2 weeks	52	Water	56	50	40
Flemmig et al 1990	**6 months**	175	CHX (0.06%) Water	**35.4** **24**	**42.5** **23.1**	53.2 0.1

Ciancio, 2009

Dental Water Jet Reduction of Inflammation and Biofilm

Study	Duration	N	Agent Used	% Bleeding Reduction	% Gingivitis Reduction	% Plaque Reduction
Flemmig et al 1995	**6 months**	60	Acetylsalicylic Acid 3% Water	**50**	**8.9** **29.2**	55.6 0
Felo et al 1997	3 months	24	CHX (0.06%)	62	45	29
Fine et al 1994	6 weeks	50	Listerine Water	14.8-21.7 7.5-10.6		36.8-37.7 15.5-18.4
Jolkovsky et al 1990	3 months	58	CHX (0.04%) Water	NR NR	33.1 18.6	51.6 25.6
Lobene 1969	**5 months**	155	Water		**52.9**	7.9
Newman et al 1994	**6 months**	155	Water H_2O/Zn Sulfate	**22.8** **8.8**	**17.8** **6.5**	6.1 9.2
Sharma et al 2008	4 weeks	128	Water	84.5		38.9
Walsh et al 1992	8 weeks	8	CHX (0.2%) Quinine Salt		45 14	77 0

Ciancio, 2009

Dental Water Jet Reduction of Inflammation and Biofilm (Water Only)

Product	# of Studies	N	Duration (months)	% Bleeding Reduction	% Gingivitis Reduction	% Plaque Reduction
Waterpik	**16**	1225	1-6	**22.8-84.5**	**10.8-66.9**	**0.1-64.9**
OxyJet	1	64	2	26	11	4.4
Hydro Floss	2	69	3		No data Non-significant	40% (anterior teeth) 2.2

Ciancio, 2009

Chemical Plaque Control: Dentifrices

Dentifrices

- **An agent with antiplaque activity must have demonstrated a significant benefit on gingival health in randomized controlled studies of at least 6 months duration to receive approval by the ADA.**
- Main components:
  - Mild abrasives to remove debris and residual surface stains. Examples: calcium carbonate, dehydrated silica gels, hydrated aluminum oxides, magnesium carbonate, phosphate salts and silicates.
  - Fluoride to remineralize tooth. All ADA-Accepted dentifrices contain fluoride.
  - Humectants to prevent water loss. Examples include glycerol, propylene, glycol and sorbitol.
  - Flavoring agents, such as saccharin and other sweeteners to provide taste. (No ADA-Accepted dentifrices contain ingredients that would promote caries.)
  - Thickening agents or binders to stabilize the formula. They include mineral colloids, natural gums, seaweed colloids or synthetic cellulose.
  - Detergents to create foaming action. They include sodium lauryl sulfate, sodium N-Lauryl sarcosinate.

ADA Approved Dentifrices (>50)

	Company Name:	Number of Products:
1	Church & Dwight Co., Inc.	2
2	Colgate-Palmolive Co.	18
3	Del Laboratories, Inc.	1
4	Dental Technologies, Inc.	2
5	GlaxoSmithKline Consumer Healthcare	4
6	JM Murray Center, Inc.	3
7	Keefe Group	1
8	Optimal Healthcare Products, LLC	1
9	Plak Smacker	2
10	Procter & Gamble Co.	11
11	Sheffield Pharmaceuticals	2
12	Tom's of Maine	7

www.ada.org

Studies of 6 months' duration involving stannous fluoride dentifrices

Study	Active	Control	Plaque % reduction vs. control	Gingivitis % reduction vs. control
Beiswanger et al 1995	SnF	NaF	3	**19***
Beiswanger et al 1997	SnF	NaF	-2	**18***
Mankodi et al 1997	SnF	NaF	20*	**21***
Mankodi et al 2002	SnF	MFP	7*	**22***
McClanahan et al 1997	SnF	NaF	3	**21***
Perlich et al 1995	SnF	NaF	3	**21***
Williams et al 1997	SnF	NaF	23*	**22***

NaF, sodium fluoride; MFP, sodium monofluorophosphate; SnF, stannous fluoride.
* Statistically significant

Davies, 2008

Studies of 6 months' duration involving triclosan/copolymer dentifrices

Study	Active	Control	Plaque % reduction vs. control	Gingivitis % reduction vs. control
Allen et al 2002	Tric/copoly	NaF	30*	**23***
Bolden et al 1992	Tric/copoly	NaF	17*	**29***
Cubells et al 1991	Tric/copoly	NaF	25*	**20***
Deasy et al 1991	Tric/copoly	MFP	32*	**26***
Denepitiya et al 1992	Tric/copoly	NaF	18*	**32***
Garcia-Godoy et al 1990	Tric/copoly	NaF	59*	**30***
Grossman et al 2002	Tric/copoly	NaF	14*	**4**

NaF, sodium fluoride.
* Statistically significant

Davies, 2008

Studies of 6 months' duration involving triclosan/copolymer dentifrices

Study	Active	Control	Plaque % reduction vs. control	Gingivitis % reduction vs. control
Kanchanakamol et al 1995	Tric/copoly	NaF	12*	1
Lindhe et al 1993	Tric/copoly	NaF	31*	27*
Mankodi et al 1992	Tric/copoly	NaF	12*	20*
McClanahan et al 1997	Tric/copoly	NaF	0	2*
Palomo et al 1994	Tric/copoly	NaF	11*	21*
Svatun et al 1993	Tric/copoly	NaF	19*	25*
Triratana et al 1993	Tric/copoly	NaF	35*	26*
Winston et al 2002	Tric/copoly	Naf	9	0

NaF, sodium fluoride.
* Statistically significant

Davies, 2008

Chemical Plaque Control: Mouthrinses

Antimicrobial Mouthrinses

- For most of our patients, biofilm cannot be suppressed by mechanical methods only
- Evidence supports the adjunctive use of mouthrinses in a daily basis
- Main brands available in the US market are all safe products

Summary of Placebo-Controlled Trials of Chlorhexidine (CHX) & Listerine in Gingivitis Patients

Citation	Trial Length (months)	No. of Patients	Agent	Plaque Reduction (%)	Gingivitis Reduction (%)
Grossman et al. 1989	6	481	CHX 0.12%	49	31
Grossman et al. 1986	6	380	CHX 0.12%	61	39
Löe et al. 1976	24	120	CHX 0.2%	45	27
Lang et al. 1982	6	158	CHX 0.1% CHX 0.2%	16 19	67 80
Gordon et al. 1985	9	85	Listerine	20	24
Lamster et al. 1983	6	145	Listerine	22	28
Overholser et al. 1990	6	124	Listerine	36	36
Charles et al. 2001	6	316	Listerine	56	23
DePaola et al. 1989	6	107	Listerine	34	34

Take Home Messages: Dentifrices & Mouthrinses

Meta-Analysis

- Systematic review of literature to evaluate the efficacy of antigingivitis and antiplaque products in six-month trials.
- Seventeen studies support the antiplaque, antigingivitis effects of dentifrices containing 0.30% triclosan and 2.0% gantrez copolymer.
- There is no evidence of efficacy for triclosan with either soluble pyrophosphate or zinc citrate.

Meta-Analysis

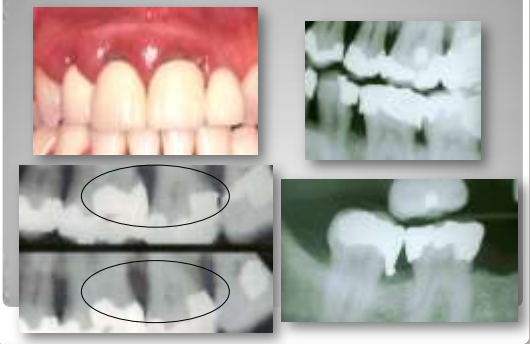
- Stannous fluoride is both clinically and statistically significant as an antigingivitis agent.
- Twenty-one studies support essential oils as efficacious mouthrinses.
- Seven studies support a strong antiplaque, antigingivitis effect for 0.12% CHX.

Gunsolley, 2006
JADA December Issue

Scaling and Root Planing: Rationale

- Smooth surfaces are easier to clean and maintain
- Less potential to accumulate plaque and calculus
- To eliminate biologically-incompatible cementum/dentin (cementum-bound endotoxin)
- To make root surfaces biologically compatible for healing and long-term care

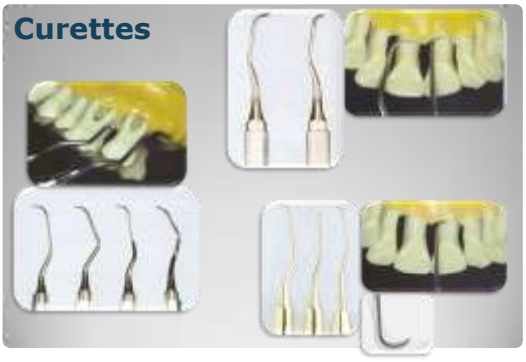
Correction of Defective Restorations



Instruments and Instrumentation

- What is new?
  Should we consider changes?
  - Hand instruments
  - Ultrasonic and Sonic instruments
  - Rotating instruments
  - Reciprocating instruments
  - Laser instruments

Curettes



Files

- Have a series of blades
- Can fracture or crush calculus
- Can gouge root surfaces if used incorrectly
- Examples: Hirschfield and Orban

Furcation Curettes and Files

Dental Implant Curettes & Others

Sonic and Ultrasonic Inserts

Instrument Sharpening

Sharpening

Which one would you use?

Removal of Calculus

- Sites with PD >5 mm have consistently shown remaining calculus after "closed" ScRP.
  - Waerhaug, 1978
  - Rabbani et al., 1981
  - Magnusson et al., 1984
  - Sherman et al., 1990
- Surgically treated sites have shown improved efficacy of scaling and root planing.
  - Eaton et al., 1985
  - Caffesse et al., 1986

Other Factors

- Root anatomy
  - Single-rooted vs. multirooted
  - Concavities
  - Tooth furrows
- Skill of the operator (Brayer et al., 1989)
  - Experience becomes more relevant in deep probing depth (>6mm) sites.
- Time allowed (Badersten et al., 1981)
  - Hand instruments: 6-8 min. per tooth
  - Ultrasonic instruments: 4-6 min. per tooth

Calculus Detection

- Instruments:
  - Explorer EXD 11/12
  - Caries explorer 17
- Gentle air stream
- Gauze pressure/drying
- Soft tissue coloration
- Root should feel:
  - Smooth
  - Hard
- No calculus left behind

Ultrasonic and Sonic Scalers

- Outcome: uneven root surface
- Supplement with hand instrumentation for smoother surface (Björn & Lindhe, 1962)
- Clinical studies on ScRP with ultrasonic or hand instruments have shown that 4-7 mm pockets responded equally well to either technique
  - Torafson et al., 1979
  - Badersten et al., 1981

Is a smooth surface really needed?

- Junctional epithelium readapts to root surface after ScRP in uneven root surfaces.
  - Waerhaug, 1956
- Ultrasonic instrumentation is considered the best instrument for ScRP in furcation areas.
  - Leon & Vogel, 1987

Ultrasonic vs. Sonic

- Sonic is air driven and vibrations are generated mechanically.
- Vibrations of 2,000-6,500 cycles per second (Hertz)
  - Studies: *in vitro* (Lie & Leknes, 1985) and clinical (Loos et al., 1987 and Baehni et al., 1992) have shown that sonic scaler was as effective for calculus removal as the ultrasonic instrument.
  - Sonic scaler caused less root surface roughness than ultrasonic.

Ultrasonic

- Ultrasonic vibrations are produced by a metal core which can change dimension in an electromagnetic field with operating frequency between 25,000 and 45,000 cycles per second (Hertz).
- Two types of ultrasonics:
  - **Magnetostrictive** – elliptic vibration
  - **Piezoelectric** – linear vibration
- Sonic and piezoelectric generate less heat than magnetostrictive. Water cools frictional heat only and helps flushing away debris.

Ultrasonic

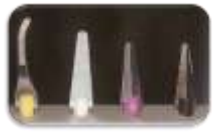
- Reduction of time and fatigue
- All aspects of the tip work
- Uses water for cooling and lavage
- Improved access to areas such as furcations

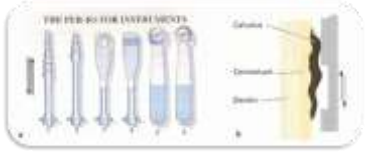
- TF 10 (Black) for heavy calculus removal
- Slim-line (Green) for finishing and access

Piezo Power Scaling

Reciprocating Instruments

- Profin®
- Eva®
- PER-IO-TOR®
  - Similar planing properties to manual hand instruments with minimal removal of tooth structures (Mengel et al., 1994)
- 1.2 mm reciprocating motion





Results After the Use of Reciprocating Instruments

Laser Instruments

- Er:YAG (erbium-doped: yttrium, aluminium and garnet laser) has been used for ScRP with early positive results.
- There is lack of evidence that this technology offers true advantage when compared to traditional methods. Cobb, 2006
- There is no evidence to support the superiority of the Nd:YAG laser over traditional modalities of periodontal therapy.

Slot et al, 2009

Laser Type	Common Abbreviation	Delivery Tip	Reported Periodontal Applications
Carbon dioxide	CO_2	Hollow waveguide; beam focused when 1 to 2 mm from target surface	Soft tissue incision and ablation; subgingival curettage
Neodymium:yttrium-aluminum-garnet	Nd:YAG	Flexible fiber optic system of varying diameters; surface contact required for most procedures	Soft tissue incision and ablation; subgingival curettage and **bacterial elimination**
Holmium:yttrium-aluminum-garnet	Ho:YAG	Flexible fiber optic system; surface contact required for most procedures	Soft tissue incision and ablation; subgingival curettage and **bacterial elimination**
Erbium:yttrium-aluminum-garnet	**Er:YAG**	Flexible fiber optic system or hollow waveguide; surface contact required for most procedures	Soft tissue incision and ablation; subgingival curettage; **scaling of root surfaces**; osteoplasty and ostectomy
Erbium, chromium:yttrium-selenium-gallium-garnet	Er,Cr:YSGG	Sapphire crystal inserts of varying diameters; surface contact required for most procedures	Soft tissue incision and ablation; subgingival curettage; osteoplasty and ostectomy
Neodymium:yttrium-aluminum-perovskite	**Nd:YAP**	Flexible fiber optic system; surface contact required for most procedures	Soft tissue incision and ablation; subgingival curettage and **bacterial elimination**
Indium-gallium-arsenide-phosphide; gallium-aluminum-arsenide; gallium-arsenide	**InGaAsP (diode) GaAlAs (diode) GaAs (diode)**	Flexible fiber optic system; surface contact required for most procedures	Soft tissue incision and ablation; subgingival curettage and **bacterial elimination**
Argon	Ar	Flexible fiber optic system	Soft tissue incision and ablation

Air Polishing

- Air-powered slurry of warm water and sodium bicarbonate.
- Ideal for extrinsic stain removal and soft deposits.
- Tooth structure can be lost and gingival tissue injury can occur if improperly used.
- Other powder:
  aluminum trihydroxide

Air Polishing

- Contraindications: respiratory illnesses, hypertension, sodium restricted diets, or medications affecting electrolyte balance.
- Use pre-procedural rinse with 0.12% chlorhexidine gluconate to minimize the microbial content aerosol.
- High-speed evacuation should always be used.

Perioscopy

Perioscopy

- Clinical studies:
  - The use of periodontal endoscope resulted in statistically significant improvement in calculus removal during ScRP, which was most evident in deeper PD sites
  - The clinical significance of this level of improvement is unknown

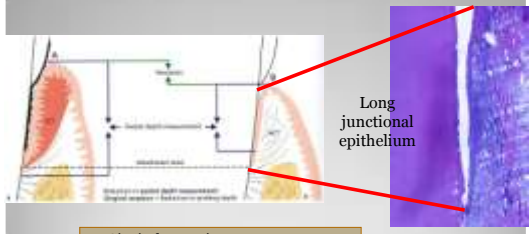
    Geisinger et al., 2007

  - Periodontal endoscope use in ScRP provided no significant improvement in calculus removal in multirooted molar teeth

    Michaud et al., 2007

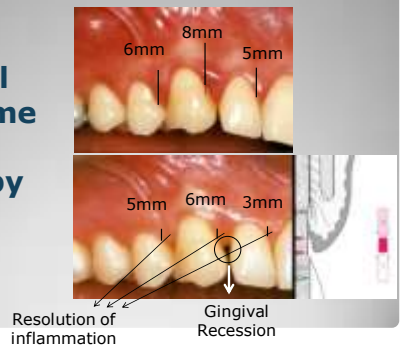
Healing after Initial Therapy

Outcome of Therapy



1. Gingival Recession
2. Reduction of PD and slight gain in CAL
3. Reduced BOP
4. Radiographic bone fill

Clinical Outcome of Therapy



Radiographic Outcome of Treatment

Results After ScRP
(Non-Molar Sites)

Initial Probing Depth	Probing Depth Reduction	Attachment Change
< 3 mm	0.5 mm	- 0.5 mm
3-6 mm	1.0 – 1.5 mm	- 0.5 /+ 0.5 mm
7->10 mm	2.5 – 5.0 mm	+ 0.5/+2.0 mm

Full-Mouth Disinfection (FMD)

- Conventional ScRP (q 2 weeks)
- Full-mouth ScRP (within 24 hours)
- Full-mouth disinfection (Quirynen et al., 1995)
  - ScRP in 24 hours combined with antimicrobials (CHX rinses, subgingival irrigation, tongue debridement)
  - Prevent re-colonization of bacteria coming from other niches in the mouth (e.g., pockets, tongue, etc.)
- Seven randomized clinical trials (at least 3 months duration) showed a modest advantage for FMD (i.e., PD reduction and CAL gain)

Cochrane Database Syst Rev 2008

Full-Mouth Disinfection (FMD)

- FMD with CHX use only may lead to pyrexia
- Use of systemic antibiotic has been suggested
- FMD with azithromycin 3 days before procedure has shown benefits

Gomi et al., 2007

- Clinicians should select the treatment modality based on practical considerations related to patient preference and clinical workload

Kinane & Papageorgakopoulos, 2008

Summary & Conclusions on ScRP

- Critical and relevant phase of periodontal therapy.
- Important to understand soft tissue response
- Develop a professional relationship with patient.
- Success of therapy may lead to no surgery.
- ScRP is a time-consuming and technique-sensitive procedure.
- Before delegating this form of treatment, the dentist needs to understand all technical and scientific aspects related to this topic.

Antibiotics/Antimicrobials & Drug Delivery

- Topical
- Systemic (peroral)
- Controlled-release: polymers to control drug concentrations

Systemic Antibiotics

Systemic Antibiotics in Periodontics

- For common forms of gingivitis and periodontitis, ScRP should always be carried out before antibiotics are administered
- Development of resistant bacterial strains is a major concern in medicine

Systemic Antibiotics in Periodontics: Main Indications

- Refractory Cases
- Aggressive Periodontitis
- Medical conditions
- Acute periodontal infections
  - Periodontal abscess
  - NPD: NUG/NUP
- Periodontal Regeneration Surgeries
- Implant Dentistry
- Post-surgical infections

Selection of Antibiotics

- Travels easily to infection site
- Concentration in GCF, gingiva and bone
- Minimal side effects
- Research showing efficacy

Single-Drug Regimens

- **Penicillin**
  - Beta-lactam, first antibiotic used in humans
  - Broad spectrum
  - More than 90% of dose is absorbed
  - Bactericidal (inhibits synthesis of cell wall)
  - Useful in initial therapy, abscess, NUG and after periodontal surgery
  - Low toxicity, allergic reactions
  - Safe drug in general

Single-Drug Regimens

- **Tetracycline**
  - Most commonly prescribed adjunctive agent in periodontal treatment
  - Broad spectrum/bacteriostatic
  - GCF concentration 5-7x more than serum
  - Gastrointestinal disturbance
  - Photosensitivity, discoloration of mucosa
  - Discoloration of children's teeth
  - No mixture with calcium or metal ions
  - Candida super infection

Single-Drug Regimens

- **Minocycline**
  - Semisynthetic tetracycline
- **Doxycycline**
  - High compliance (single daily dose)
  - Useful after scaling and root planing in severe periodontal cases such as aggressive and refractory periodontitis

Single-Drug Regimens

- **Metronidazole**
  - Nitroimidazole, effective against anaerobic bacteria and parasites
  - No effect on facultative and aerobic organisms
  - Side effects:
    - Metallic taste, headache
    - Vertigo, peripheral neuritis
    - No alcohol: intestinal disturbance
  - Used in NUG/NUP
  - Used in combination therapy with other antibiotics

Single-Drug Regimens

- **Clindamycin**
  - Lincosamide, usually bacteriostatic
  - Bactericidal in high doses
  - Similar to erythromycin in terms of spectrum
  - Main feature: "bone penetration"
  - Recommended for patients allergic to Penicillin
  - Side effects:
    - Diarrhea and gastric upset
    - Pseudomembranous colitis (rare)

Single-Drug Regimens

- **Ciprofloxacin**
  - Fluoroquinolone
  - Seems to be beneficial on refractory cases
  - It may be combined with metronidazole
  - Adverse effects:
    - GI upset
    - Oral candidiasis
    - Photosensitivity

Single-Drug Regimens

- **Azithromycin**
  - Macrolides Family
  - Bacteriostatic
  - Used for upper and lower respiratory tract infections, including oral infections such as periodontitis, periodontal abscesses and other acute oral infections
  - It has better absorption than erythromycin due to its high resistance to gastric acids
  - It achieves high oral soft- and hard-tissue concentration

Combination Therapy

- **Advantages**
  - Broadens antimicrobial range of the therapeutic regimen of a single antibiotic.
  - Prevents emergence of resistant bacteria through overlapping antimicrobial mechanisms.
  - Lowers the dose of individual antibiotics by exploiting possible synergy between two drugs.

Combination Therapy

- **Disadvantages**
  - May increase adverse reactions
  - Potential for antagonist drug interactions with improperly selected antibiotics

Combination Therapy

- Do not combine bactericidal with bacteriostatic
- Amoxicillin and clavulanic acid – it protects amoxicillin from enzymatic degradation by penicillinase
- Augmentin® + Doxycycline (***sequential***)
- Amoxicillin or Augmentin® + Metronidazole
- Ciprofloxacin + Metronidazole

Antibiotics and Dosage Often Used in the Treatment of Periodontal Diseases

Antibiotic	Dosage
Amoxicillin with Clavulanic Acid	500 mg 3 x/day for 8 days
Ciprofloxacin	500 mg 2x/day for 8 days
Clindamycin	150 mg 3 x/day for 8 days
Doxycycline	200 mg the first day, then 100 mg/day for 15 days
Metronidazole	500 mg 3 x/day for 8 days
Metronidazole and Amoxicillin	250 mg 3 x/day (each drug) for 8 days
Metronidazole and Ciprofloxacin	500 mg 3 x/day (each drug) for 8 days
Tetracycline	500 mg 3 x/day for 21 days

Cost of Systemic Antibiotics*

Amoxicillin	500 mg	30 caps	$ 12.99
Augmentin	500-125 mg	30 tabs	$ 166.71
Z-Pak	250 mg	Disp Pack	$ 62.24
Ciprofloxacin	500 mg	30 tabs	$ 117.10
Clindamycin	150 mg	30 caps	$ 24.99
Doxycycline	100 mg	30 caps	$ 12.99
Doxycycline	100 mg	20 tabs	$ 31.99
Tetracycline	500 mg	30 caps	$ 15.99
Metronidazole	500 mg	30 tabs	$ 12.99

*source: www.drugstore.com

Systemic Anti-Infective Periodontal Therapy: A Systematic Review

- Meta-analysis of 22 studies showed consistent benefit in mean CAL change for different populations, for different therapies, and for different antibiotics.
- Systemic antibiotics were uniformly beneficial in providing improvement in CAL, when used as adjuncts to ScRP and were consistently beneficial, although of borderline significance, when used as adjuncts to ScRP plus surgery or as a standalone therapy.

Systemic Anti-Infective Periodontal Therapy: A Systematic Review

- Found statistically significant improvements for CAL for tetracycline, metronidazole, and an effect of borderline statistical significance for the combination of amoxicillin + metronidazole.
- Aggressive periodontitis patients benefited more from antibiotics than chronic periodontitis patients.

Systemic Anti-Infective Periodontal Therapy: A Systematic Review

- Due to lack of sufficient sample size for many of the antibiotics tested, it is difficult to provide guidance as to the more effective ones.

Haffajee et al., 2003

Conclusions on Systemic Antibiotics

- In periodontics, systemic antibiotics should be an exception rather than the rule.
- If indicated, they should be used as adjuncts to mechanical therapy.
- They should not be used in cases of poor plaque control.
- Evidence has shown that they offer little, if any, adjunctive effect on smokers.

Conclusions on Systemic Antibiotics

- They should be considered especially in refractory and aggressive cases of periodontitis.
- They should be used in acute conditions and some medical situations.
- There is a current trend favoring combined antibiotic therapy (e.g., amoxicillin and metronidazole).
- There is still lack of proper guidelines and decision remains empirical.

Topical Antimicrobial Agents for Treatment of Periodontal Disease

Rationale for Using Topical Antimicrobial Agents

- Pathogens may be unreachable
  - Deep vertical defects
  - Furcation
  - Dentin tubules
  - Biofilm
- Systemic antibiotics
  - Adverse reactions
  - Patient compliance

Principles of Topical Antimicrobial Agents

- **Local delivery**
  - Pocket irrigation
  - Drug ointment/gel
  - Prolonged release

Local Delivery Device

- **Ideally, it should:**
  - Establish a drug reservoir
  - Have effective concentration
  - Be active for prolonged period of time

Products Available in the USA

Advantages of Controlled-Release Delivery

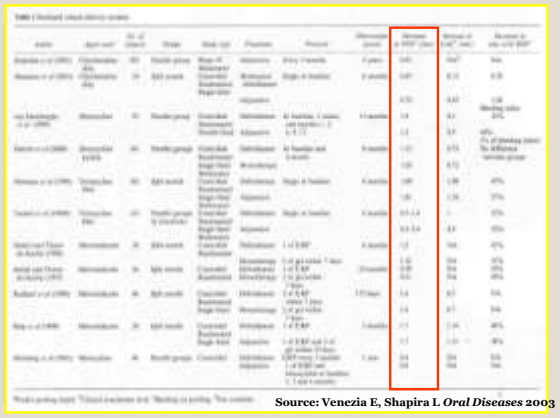
- Prolonged drug levels within therapeutic range
- Minimization of harmful or systemic side effects
- Protection of drugs with short *in vivo* half lives
- Improvement of patient compliance

Disadvantages of Controlled-Release Delivery

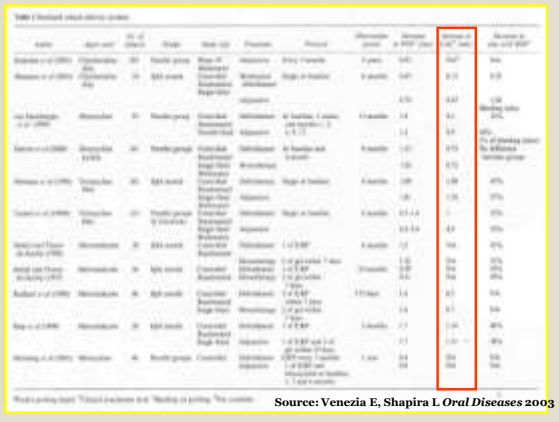
- Low volume of the periodontal pocket (0.5μL): Restricts size of the delivery system and total volume of drug-polymer applied.
- High turnover rate of crevicular fluid (40 times/hr): Participates not only in drug diffusion but also clearance.

Lingering Questions

- Are the improvements with adjunctive locally administered antimicrobials consistent?
- Are the clinical improvements with locally administered antimicrobials clinically relevant or meaningful?



Source: Venezia E, Shapira L *Oral Diseases* 2003



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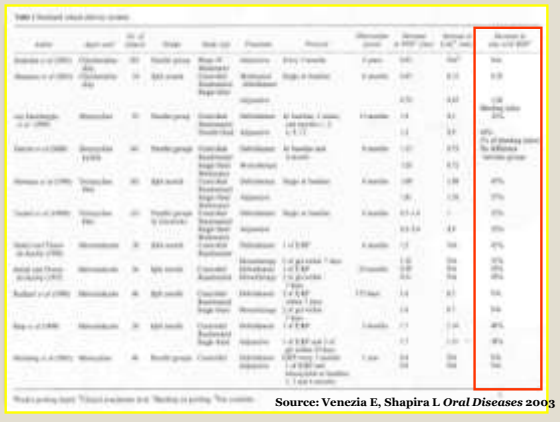

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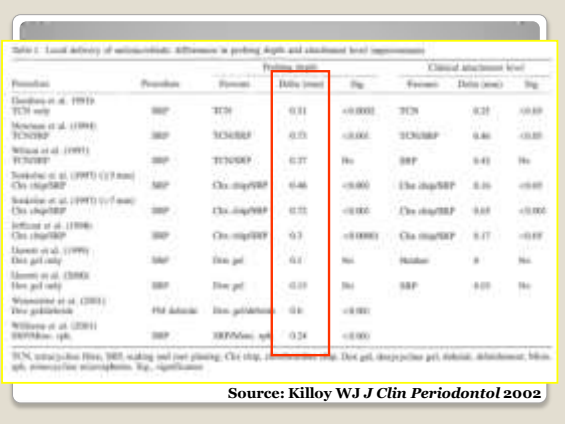
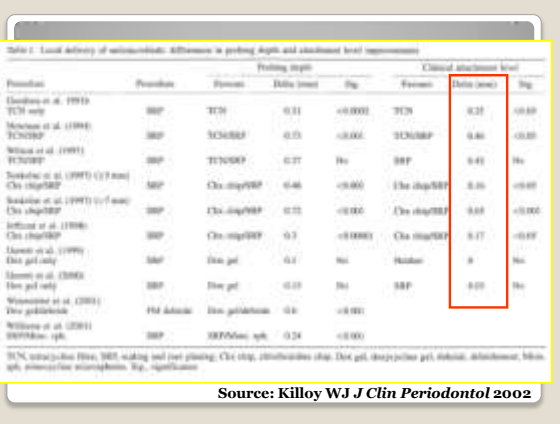


Source: Killoy WJ *J Clin Periodontol* 2002



Source: Killoy WJ *J Clin Periodontol* 2002

Main Results of Systematic Review
(Hanes & Purvis, 2003)

- 32 studies with 3,700 subjects
- All studies reported substantial reductions in gingival inflammation and bleeding
- Meta-analysis on 19 studies comparing ScRP alone or combined with antimicrobials showed favoring results for the combined therapy in both PD reduction and CAL gain

American Academy of Periodontology Statement on Local Delivery of Sustained or Controlled Release Antimicrobials as Adjunctive Therapy in the Treatment of Periodontitis

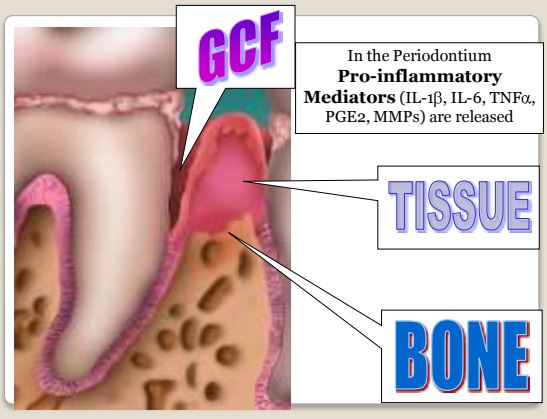
"The clinician's decision to use locally delivered antimicrobials should be based upon a consideration of clinical findings, the patient's dental and medical history, scientific evidence, patient preferences, and advantages and disadvantages of alternative therapies."

Greenstein, J Periodontol 2006 Review Article

Summary: Antimicrobials in General

- Data reaffirm the overall effectiveness of ScRP as the standard of care.
- Evidence consistently demonstrates enhanced clinical improvements with adjunctive antimicrobials in patients with chronic periodontitis.
  - Systemic
  - Topical
  - Controlled-release
- Clinicians must assess overall patient risks (e.g., disease severity, distribution, smoking) and treatment goals in selecting cases for adjunctive antimicrobial treatment.

Periodontal Host Modulation



Host Modulators

- NSAIDs
- Bisphosphonates ?
- Statins ?
- **Low-Dose Doxycycline**

Pathogenesis of Periodontal Disease

Health

Natural Enzyme Inhibitors
TGFβ, IL-4, IL-10, IL-12, TIMPs

Tissue Destructive Enzymes
IL-1, IL-6, TNFα, PGE, MMP

Balance of Tissue Destruction in the Periodontium

Pathogenesis of Periodontal Disease

Disease

Natural Enzyme Inhibitors

Poor Oral Hygiene
High Susceptibility
Systemic Risk Factors
- Smoking
- Genetics
- Diabetes

Overproduction
Tissue Destructive Enzymes

Imbalance of Tissue Destruction in the Periodontium

Compliance, Cost and Significance

- 4 times daily_____27%
- 3 times daily_____44%
- 2 times daily_____67%
- Once daily_____89%

- Doxycycline Hyclate (20 mg tabs) _____ 60 tabs = $ 63.98
- Doxycycline Hyclate (100 mg tabs) _____ 15 tabs = $ 10.49

Source: www.drugstore.com

Statistical vs. Clinical Significance

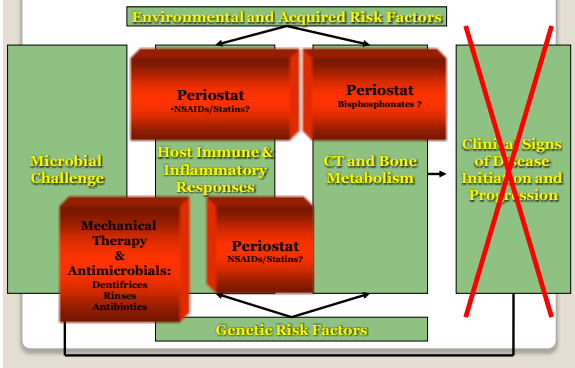
Periodontal Host Modulation

- There may be a role for the use of host-modulating agents in the treatment of periodontitis in conjunction with conventional therapy.
- There may be a publication bias and a tendency for significant or beneficial findings to be published over non-significant results for novel therapies.

Periodontal Host Modulation

- Based on data available (meta-analysis) regarding Periostat® with definitive ScRP, it was demonstrated that it provided a statistically significant improvement with respect to PD reductions and gains in CAL when compared to ScRP alone.
- The use of Periostat® appears safe and may be an adjunctive aid in the management of chronic periodontitis.

Arresting Periodontal Disease Progression



Final Remarks

- Clinicians need to decide which patients are at greatest risk for future disease progression. We still lack proper diagnostic tools for this matter.
- Currently, there are a number of adjunctive therapy options that clinicians should consider besides mechanical treatment.

THANK YOU !

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