





Utilizing Laser Technology in a Periodontal Environment

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Left untreated, serious consequences can occur

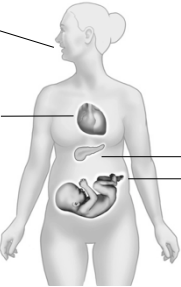
Without proper diagnosis and treatment, periodontal disease can lead to...

-  The spread of infection
-  Loss of teeth
-  Surgery

Healthy mouth, healthy body – The impact of oral health on overall health

ENTRY POINT FOR BACTERIA

The relationship between periodontal disease and diabetes is bi-directional – diabetes can worsen gum disease and gum disease can make diabetes difficult to manage.



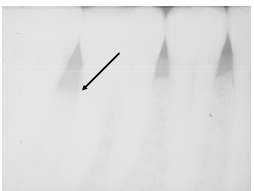
Patients with severe periodontal disease may have an increased risk of heart disease.

When severe gum disease is present, some pregnant women may be more likely to deliver a pre-term, low-birth-weight baby.

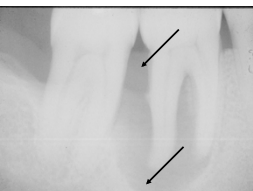
1. Jaffarali MK et al. J Am Dent Assoc 2011; 142:875-880.
 2. Lopez et al. J Periodontol 2002; 73:911-924.
 3. O'Brien AD et al. J Periodontol 1996; 67(Suppl 1): 1103-1113. 4. Kawanishi et al. J Clin Periodontol 2005; 32:268-272. 5. Pimental et al. Oral Diseases 2005; 11: 293-296. 6. Shadan YS et al. J Periodontol 2004; 75: 1594-1603. 7. Scaramanga P et al. Ann Periodontol 2003; 8: 38-53.

Progressive Periodontitis

1990



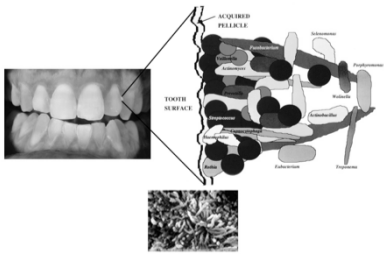
1995



Dental History is critical in formulating a patient's periodontal status

- **Familial history**
- **Medical status**
- **Smoking habit**
- **Stress activity**
- **Parafunctional habits**

Dental Plaque – An Oral Biofilm



Bacteria → Biofilm → ~~Plaque/Tartar~~ → ~~Bad Breath~~ → ~~GI/Perio~~ → **Enhanced Oral Health**

Signal Molecules

Compliance with Supportive Periodontal Therapy Part I and II: Risk of noncompliance in a ten year period, Novaes..2001

- **Factors of gender, age, surgery vs. non surgery**
- **43.9% noncompliant in surgery**
- **53.2% noncompliant in non surgery**
- **Highest risk for noncompliance:**
 - **Female**
 - **Under 30 years age**
 - **Over 51 years of age**
 - **Underwent non-surgical care**

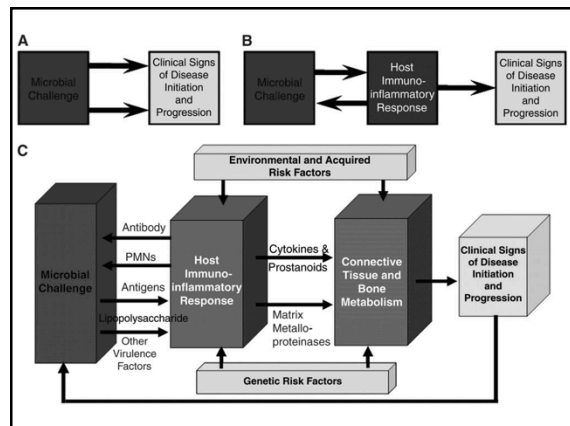
Local Delivery Antibiotics

- **User - friendly**
- **Stays in place**
- **Requires no removal**
- **Enhances the effect of debridement**

Probiotics

Defined as the daily administration of certain live microorganisms in amounts adequate to confer a health benefit on the host.

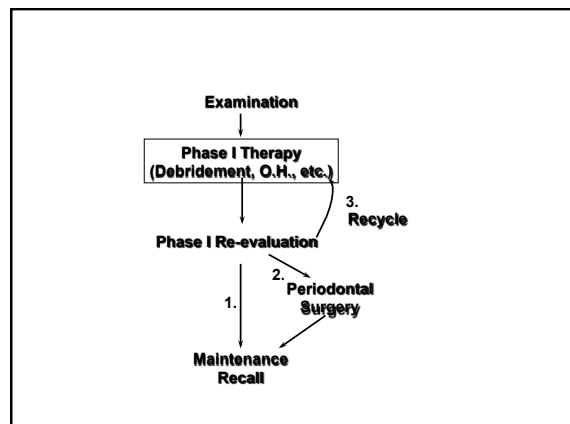
e to confer a health benefit on the host.



Data Collection

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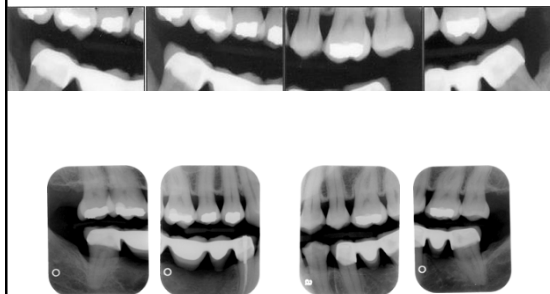
    graph TD
      A[Data Collection] --> B[Etiology]
      B --> C[Diagnosis]
      C --> D[Prognosis]
      D --> E[Treatment Plan]
    
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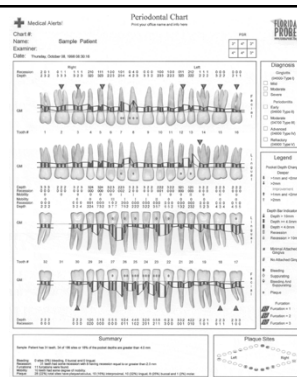
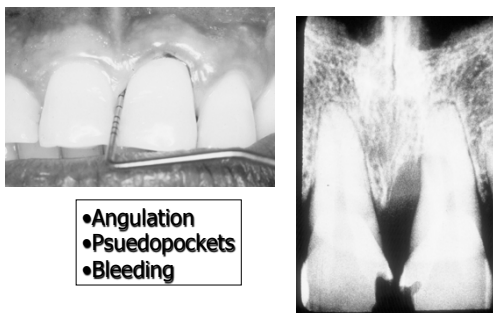
Data Collection

- ➔ Radiographic Exam
- ➔ Probing
- ➔ Tissue Characteristics
- ➔ Mobility

Digital Versus Digital.....



Depth of Sulcus Critical !!



Main Chart

Rationale for pocket reduction surgery....

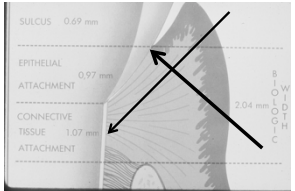
- Access to the sulcus by both the clinician and the patient
- Modify habitat for periodontal pathogens
- Decrease quantity/quality of host inflammatory cells

Attachment

- Long Junctional Epithelium
- Connective Tissue Adherence
- Connective Tissue Attachment
- New Attachment

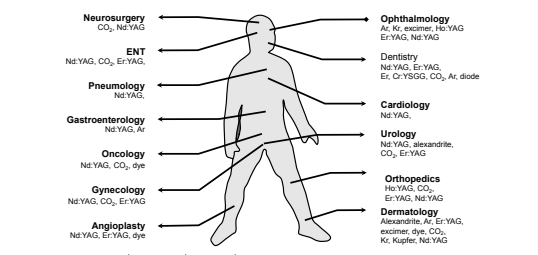
Procedures for Pocket Reduction

- Excisional periodontal surgery
 - Gingivectomy
- Incisional periodontal surgery
 - Flap surgery



Lasers

Fields of application in medicine



<p>Neurosurgery CO₂, Nd:YAG</p> <p>ENT Nd:YAG, CO₂, Er:YAG</p> <p>Pneumology Nd:YAG</p> <p>Gastroenterology Nd:YAG, Ar</p> <p>Oncology Nd:YAG, CO₂, dye</p> <p>Gynecology Nd:YAG, CO₂, Er:YAG</p> <p>Angioplasty Nd:YAG, Er:YAG, dye</p>	<p>Ophthalmology Ar, Kr, excimer, Ho:YAG, Er:YAG, Nd:YAG</p> <p>Dentistry Nd:YAG, Er:YAG, Er:Cr:YSSG, CO₂, Ar, diode</p> <p>Cardiology Nd:YAG</p> <p>Urology Nd:YAG, alexandrite, CO₂, Er:YAG</p> <p>Orthopedics Ho:YAG, CO₂, Er:YAG, Nd:YAG</p> <p>Dermatology alexandrite, Ar, Er:YAG, excimer, dye, CO₂, Kr, Krypton, Nd:YAG</p>
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| Basics | Wavelengths | Product info | Indications |

L- Light
A- Amplification by
S- Stimulated
E- Emission of
R- Radiation

Terminology:

Joule- a unit of energy, ability to do work

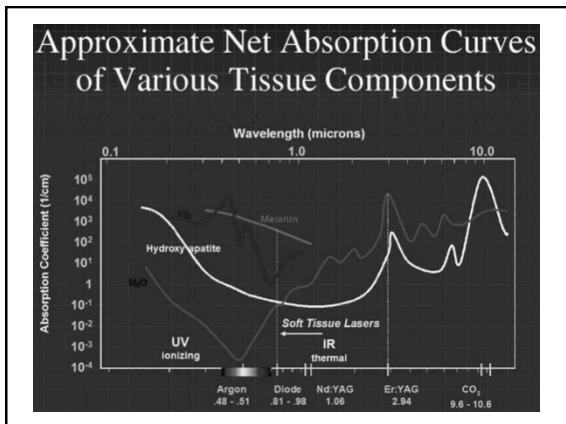
Watt- unit of power, the rate of doing work

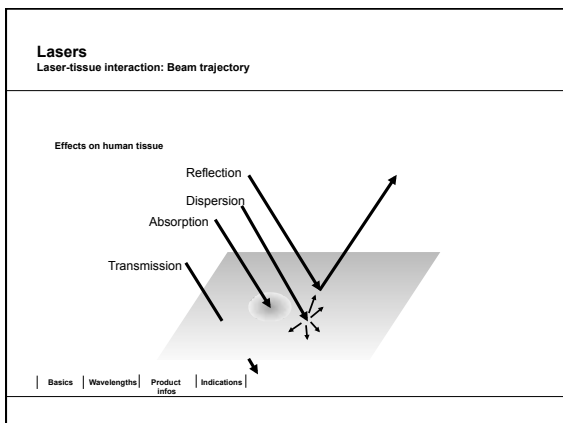
Frequency- the number of oscillations per unit time of a wave

One Watt = One Joule for one second

Laser Operating Parameters:

- Energy (Joules)
- Repetition Rate (Frequency)
- Power (Watts)
- Fiber size
- Energy Density
- Total Energy





Thermal Effect of Laser Energy on Tissue

Tissue Temperature (degrees C.)	Observed effect
37-50 > 60	Hyperthermia Coagulation,
70-90	Protein Denaturation
100-150	Welding
>200	Vaporization Carbonization *****

What happens with this energy?

- As the laser energy is absorbed by water, the water vaporizes within the cells and denatures the bacterial cells that comprise the decay.
- Thus, in a nut shell, the area is sterilized.

Laser Surgery Vs. Electrosurgery

- Less pain
- Less swelling
- Less redness
- Decreased surgical time on vascular lesions

Zones of necrosis...

- Electrosurgery: 500 to 700 cell layers (electro thermal)
- Laser: 3-5 cell layers (photo thermal)

Protecting Target and Non Target Tissue

- The laser should never be directed at an area that is not to receive energy.
- Specular reflections, which are mirror like reflections, should be eliminated.
- The laser is not a drill, it has an effect even when not in contact.
- All accidental exposures should be avoided.

Antibacterial...

- Bio-films
- Bacteriocidal

Soft Tissue

- Decontaminate
- De-epithelialize
- Degranulate
- Denature proteins
- Gingivectomy
- Inhibit epithelial migration...clot establishment

Hard tissue

- Tooth
 - Cementum
 - Calculus
 - Dentin
- Bone
 - Removes
 - Biostimulates

Access

- Hemostasis
- Visualize site

Diode lasers



Soft Tissue

- Decontaminate
- De-epithelialize
- Degranulate
- Denature proteins
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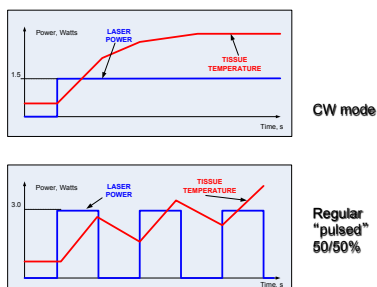
Diode Soft-Tissue Lasers

- **Advantages:**
 - Can cut and coagulate gingiva with virtually no bleeding or collateral damage to healthy tissue
 - Most cases - topical anesthetic is sufficient for a pain free procedure
 - Surgical precision
 - Little to no postoperative discomfort and a short healing time

Modes of Laser Operation:

- **Continuous Wave**
Maximizes coagulation and speed
- **Pulsed Wave (Gated or Free-Running)**
Minimizes thermal damage and pain

Pulsed Mode

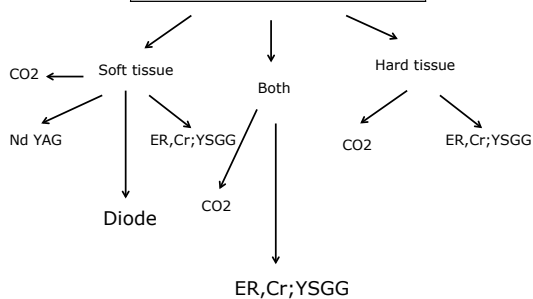


The time that the laser is off in a pulsed mode is termed "**Thermal Relaxation**". During this time, the target tissue is allowed a period of cooling.

Thermal Effects on Tissue Temperature (C):

37-50	Hyperthermia
>60	Coagulation, Protein Denaturation
70-90	Welding
100-150	Vaporization
>200	Carbonization

Choosing a laser



Rationale for pocket reduction surgery....

- Access to the sulcus by both the clinician and the patient
- Modify habitat for periodontal pathogens
- Decrease quantity/quality of host inflammatory cells

Primary tasks of a periodontal laser protocol....

1. Have a bactericidal effect
2. Remove diseased sulcular lining
3. Remove calculus
4. Create root detoxification
5. Promote repair via selective wound healing

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Comparison of Er,Cr:YSGG Laser and Hand Instrumentation on the Attachment of Periodontal Ligament Fibroblasts to Periodontally Diseased Root Surfaces: An In Vitro Study

Hakki, et al J Perio August 2010

laser-treated specimens showed a significantly higher pdl cell density, the Gracey-treated group showed a lower cell density compared to the positive control group

Biostimulation....

- Enhance angiogenesis
- Collagen formation
- Osteoblastic
- Fibroblastic

Low Level Laser Therapy (LLLT)

- ATP increase in mitochondria
- ROS decrease
- Growth factors increase
- Stressed cells react to light

Effects of LLLT

- Reduction of bad inflammation
- Regeneration of connective tissue
- Factor of energy power and time over a spot size
- Frequency can be a factor

Whitening & Temporary Pain Relief

Patented LaserWhite™ Handpiece

20-Minute Whitening
Achieve up to 10 shades of whitening with available handpiece and gel kit

Temporary Pain Relief
Treat TMJ and other myofascial disorders with available Deep Tissue Handpiece™

Cost for DTHP?

Rationale for pocket reduction surgery....

- Access to the sulcus by both the clinician and the patient
- Modify habitat for periodontal pathogens
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Perio Phase II Decisions

Periodontal Debridement/ Curettage

1. **Pocket Depth: 4-5 mm**
2. **Local factors as calculus**
3. **Edematous**
4. **Single rooted**
5. **Horizontal Bone loss**
6. **Less Compliant**

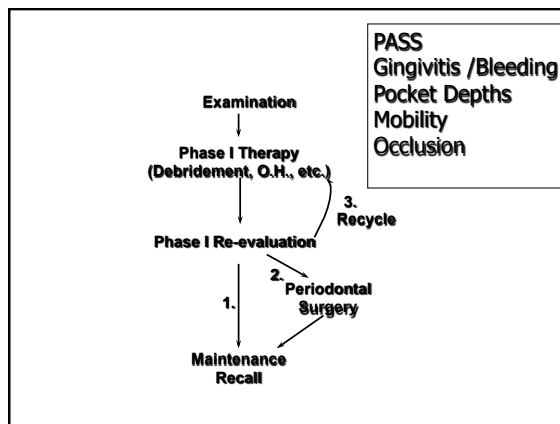
Perio Phase II Decisions

Surgical indications

1. **Pocket depths 5mm greater**
2. **Minimal local factors as calculus**
3. **Fibrotic gingivae**
4. **Multi rooted**
5. **Angular bone loss**
6. **More compliant**

Comparative summary of results from clinical trials using Nd:YAG, Er:YAG, or diode lasers for treatment of periodontitis(4-6mmPDs)

Laser	#of Trials	PPD	CAL	BOP (%)	Microbes
Nd:YAG	(10)	1.23	1.04	41	2/10
Erbium	(11)	2.30	1.68	47	0/11
Diode	(5)	1.70	1.52	68	1/5
Photo dyn	(5)	1.05	0.91	56	0/5



Steps in non surgical laser perio procedure

- Measurements
- Anesthesia
- Sulcular debridement
- Ultrasonic debridement
- Laser Bacterial Reduction
- LLLT
- Postoperative

Considerations for laser periodontal procedures...

- Measure GM to CEJ
- Measure CEJ to pocket depth
- Establish attached gingiva
- Consider horizontal osseous resorption
- Consider angular osseous resorption
- Establish esthetic requirement

Steps in non surgical laser perio procedure

- Anesthesia
 - No compromises for patient comfort
 - More inflammation, the deeper the pocket, the more local over topical

Steps in non surgical laser perio procedure

- Laser Bacterial Reduction
 - 0.5 watt
 - Un initiated tip
 - Continuous setting (CW)

Steps in non surgical laser perio procedure

- Sulcular debridement
 - Pulsed
 - 1 watt
 - initiated

Steps in non surgical laser perio procedure

- Ultrasonic debridement
 - If calculus, triple bend tip
 - If biofilm only, thin tip
 - Know concavities

Steps in non surgical laser perio procedure

- Laser Bacterial Reduction
 - 0.5 watt
 - Un initiated tip
 - Continuous setting (CW)

Steps in non surgical laser perio procedure

- Bio stimulation (LLLT)
 - Know SPOT size
 - 5-15 JOULES per square centimeter
 - Frequency more effective

Steps in non surgical laser perio procedure

- Pre and Postoperative
 - Anti inflammatory analgesics

Tip movement

- Faster movement: slow and shallow cutting
- Slower movement: fast and deep
- Speed and tip distance control depth

Perio Phase II Decisions Surgical indications

1. Pocket depths 5mm greater
2. Minimal local factors as calculus
3. Fibrotic gingivae
4. Multi rooted
5. Angular bone loss
6. More compliant

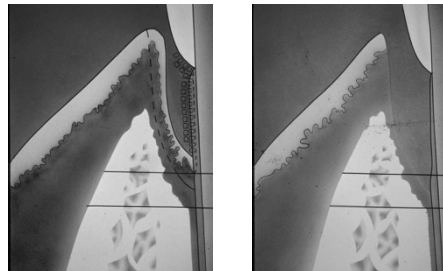
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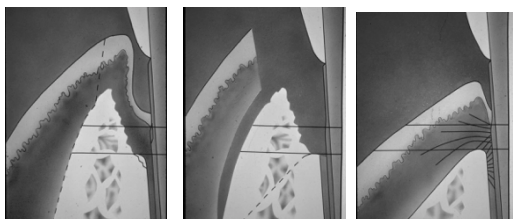
Steps in laser perio procedure

- Measurements
- Gingival reduction
- Sulcular debridement
- Ultrasonic debridement
 - Degranulation
 - Decortication
- Augmentation
- LLLT
- Postoperative

Surgical Curettage



Flap Surgery

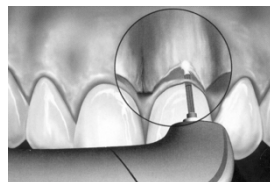


<p>Tooth</p> <p>Sulcus</p> <p>Junctional Epithelium</p> <p>Supracrestal fibers</p> <p>Cementum</p> <p>PDL</p> <p>Bone</p>		<p>Implant</p> <p>Sulcus</p> <p>Junctional epithelium</p> <p>Supracrestal adherence</p> <p>No PDL</p> <p>No Cementum</p> <p>Bone</p>
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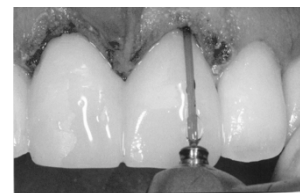
Treatment outcome following use of the erbium, chromium:yttrium, scandium, gallium, garnet laser in the non-surgical management of peri-implantitis: a case series

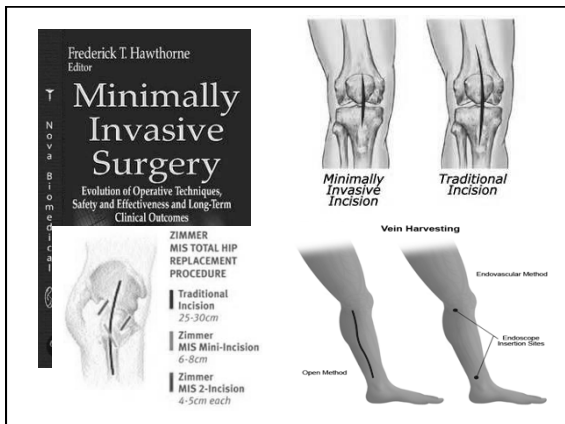
R. Al-Falaki, M. Cronshaw and F. J. Hughes
BRITISH DENTAL JOURNAL OCT 2014

- Mean pocket depth at baseline was 6.64
- 6 months pocket depth was 2.97



Closed Crown Lengthening





Why would a dentist want an laser for periodontal therapy

1. Implant market is variable
2. Today's practice must add technology
3. Ability to manage periodontal disease with minimally invasive procedures
4. Success is creating a practice niche and marketing such to the patients.
5. ONE MUST HAVE A STRAETEGY TO COMPETE!

■ **“The goal of my practice is simply to help my patients retain their teeth all of their lives if possible..... In maximum comfort, function, health, and esthetics”**

Dr. L. D. Pankey

