Periodontics for the General Dentist

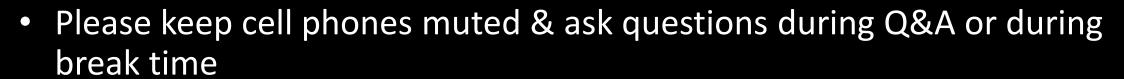
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- The views and conclusions expressed are those of the presenter and sometimes based on anecdotal experience.
- Clinical images have not been altered/edited to misrepresent treatment results.
- Thank you to all my sponsors Dowell and Impladent

To Get The Most From This Presentation

- Listen with Intention- It is NO coincidence that you are here
- Be Open to Learning New Information
- Have fun learning

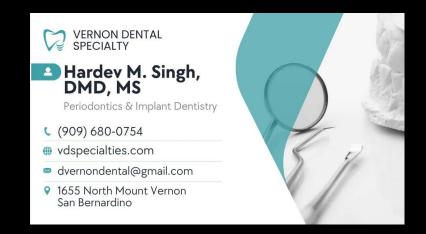




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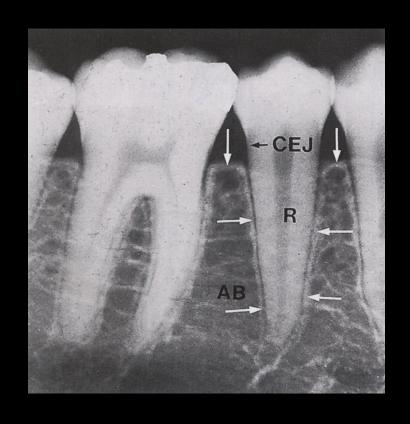


Objectives

- Recognize the roles of non-surgical and surgical therapies
- Differentiate between resection and regenerative periodontal treatments
- Identify anatomical factors contributing to periodontitis
- Understand the link between restorative therapy and periodontitis
- Determine criteria for saving teeth versus opting for implant therapy

Periodontium



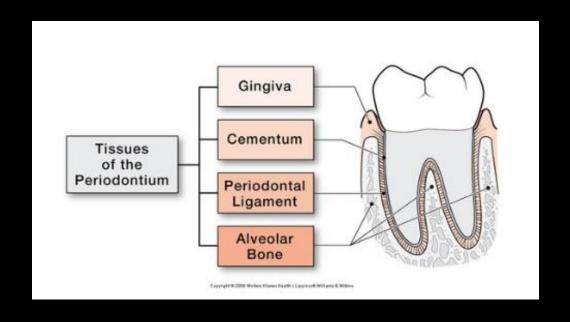


Healthy adult periodontium, soft and hard tissue are harmonious

Periodontium

Periodontium consists of:

- 1. Gingiva
- 2. Cementum
- 3. Periodontal Ligament (PDL)
- 4. Alveolar Bone- Cortical, cancellous bone & alveolar bone proper



Gingival Complex



Attached Gingiva (AG)





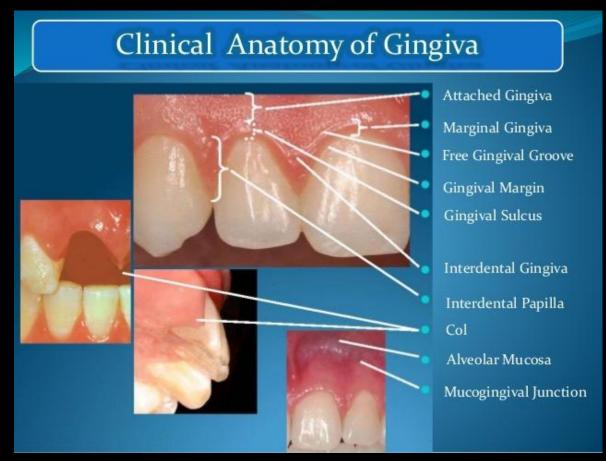
- AG protects the gingiva against mechanical forces & it being separated from the tooth
- Lacks elastic fibers & is firmly bound down
- Different from free gingiva & oral mucosa which are movable

Interdental Gingiva

- Occupies gingival embrasure which is interproximal space beneath the area of tooth contact
- Pyramidal or col shape

The shape depends on:

- The presence or absence of a contact between the adjacent teeth
- The distance between the contact point and osseous crest
- The presence or absence of recession



Attached Gingiva

Health

Color: Pale/ Coral pink



Color: Pigmentation

- Light Brown Black
- Seen in dark skinned individuals
- Not necessarily a sign of pathology (melanoma!)



Attached Gingiva







Lack of soft and hard tissue

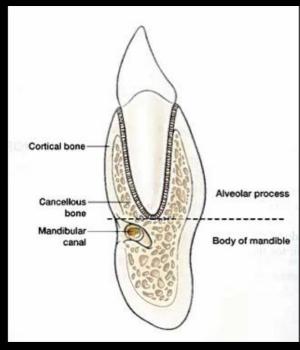
Health

- Widest zone Max anterior vs. Narrowest zone- Mand first PM per Serio et al.
- Facial gingival width can vary b/w 1-9 mm per Bowers et al.
- Controversy on minimum amount of keratinized attached tissue needed for health

Alveolar Bone

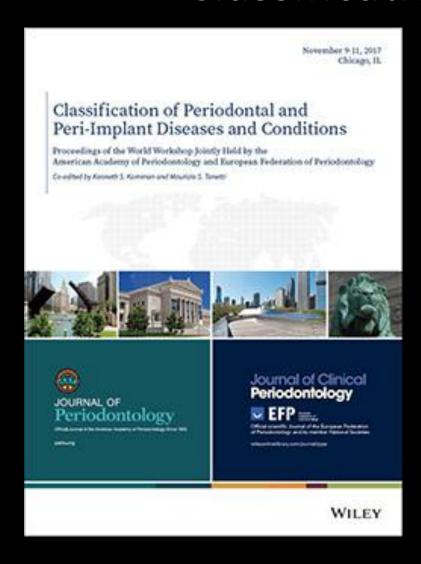
Alveolar Crest

- The most coronal portion of the alveolar process
- Located 1 to 2 mm apical to the CEJ in healthy individual
- Follows the contours of the CEJs





Classification of Periodontal Diseases





The World Workshop classified Periodontal and Peri-Implants Diseases and Conditions (J Periodontol 2018:89;Suppl 1 p173-82)

Classifications

Classification at-a-Glance



2018 Classification of Periodontal and Peri-Implant Diseases and Conditions

Periodontal Health, Gingival Diseases and Conditions

- · Periodontal Health and Gingival Health
- · Gingivitis: Dental Biofilm-Induced
- · Gingival Diseases: Non-Dental Biofilm-Induced

Periodontitis

- · Necrotizing Periodontal Diseases
- Periodontitis
- · Periodontitis as a Manifestation of Systemic Disease
- Periodontal Abscesses and Endodontic-Periodontal Lesions

Periodontal Manifestations of Systemic Diseases and Developmental and Acquired Conditions

- · Systemic Diseases or Conditions Affecting Periodontal Supporting Tissues
- Mucogingival Deformities and Conditions
- · Traumatic Occlusal Forces
- · Tooth- and Prosthesis-Related Factors

Peri-Implant Diseases and Conditions

- · Peri-Implant Health
- Peri-Implant Mucositis
- · Peri-Implantitis
- Peri-Implant Soft and Hard Tissue Deficiencies

Classifications

Three forms of periodontitis:

- Periodontitis (plaque induced etc.)
- Necrotizing Periodontitis (NO ulcerative anymore)
- Periodontitis as a manifestation of systemic diseases

No usage of term Aggressive Periodontitis (AgP)





- Ag P is now "Periodontitis as Manifestation of Systemic Diseases"
- Less than 5% cases, very rare and seen in younger patients

Periodontal health





Intact Periodontium

- Periodontal pockets ≤ 3mm
- Bleeding <10% & No Loss of attachment



Reduced Periodontium

- Loss of attachment present with bleeding < 10% on pockets ≤ 3mm
- NO pockets ≥ 4mm with bleeding

Health vs Disease





- In a healthy periodontium both soft tissue & hard tissue harmonious
- Normal architecture can vary slightly but has protective functions such as knife edge margins, interdental papilla filling the embrasure space, pink color & KT
- In unhealthy tissues, the gingival margin is rolled, interdental papilla is blunted, erythematous & lack of KT

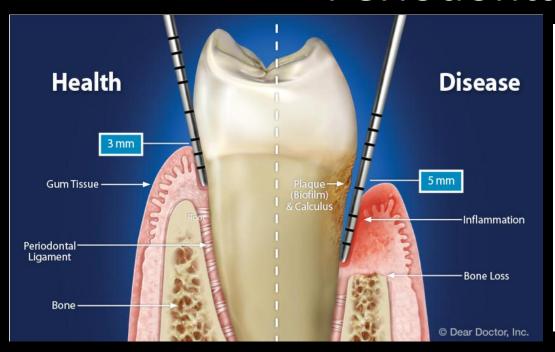
TABLE 1 Diagnostic look-up table for gingival health or dental plaque-induced gingivitis in clinical practice

Intact periodontium	Health	Gingivitis
Probing attachment loss	No	No
Probing pocket depths (assuming no pseudo pockets) ^a	≤3 mm	≤3 mm
Bleeding on probing ^a	<10%	Yes (≥ 10%)
Radiological bone loss	No	No
Reduced periodontium		
Non-periodontitis patient	Health	Gingivitis
Probing attachment loss	Yes	Yes
Probing pocket depths (all sites & assuming no pseudo pockets) ^a	≤3 mm	≤3 mm
4		
Bleeding on probing ^a	<10%	Yes (≥ 10%)

Periodontitis "Case"

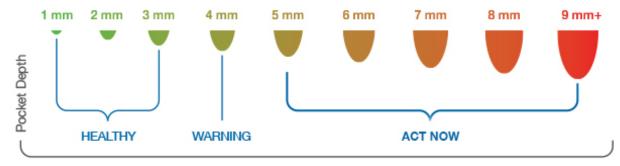
Successfully treated stable periodontitis patient	Health	Gingivitis in a patient with a history of periodontitis
Probing attachment loss	Yes	Yes
Probing pocket depths (all sites & assuming no pseudo pockets) ^a	\leq 4 mm (no site \geq 4 mm with BOP) ^b	≤3 mm
Bleeding on probing ^a	<10%	Yes (≥ 10%)
Radiological bone loss	Yes	Yes

Periodontal Measurements



Pockets increase in depth

Your dental professional will measure the depth of your pockets using a tiny probe. A pocket of 4 or more millimeters is a sign that you have gum disease. If you wait to treat your gum disease, it could lead to painful and expensive surgery in the future. So don't wait. Ask your dental professional how ARESTIN® can help prevent further damage today.



A pocket depth of **4 mm** or more may mean you have an infection.

A pocket depth of **7 mm** or more has the highest risk of permanent damage.

- Probing depth (PD) measured from free gingival margin (GM) to sulcus base
- Recession (Rec) measured from CEJ to GM, assigned a + number, gingival overgrowth assigned a – number (inflamed gingiva, pseudo pockets etc.)
- Clinical Attachment Level (CAL)- measured from the CEJ to sulcus base

CLINICAL ATTACHMENT LOSS, CALCULATION

CALCULATING CAL IN THE PRESENCE OF RECESSION OF THE GINGIVAL MARGIN

When recession of the gingival margin is present, the CAL is calculated by adding the probing depth to the gingival margin level.

Example

Probing depth measurement: 4 mm
Gingival margin level: +2 mm*
Clinical attachment loss: 6 mm

" = 2 mm of tissue needs to be added for the gingival margin to be at its normal level.

CALCULATING CAL WHEN THE GINGIVAL MARGIN COVERS THE CEJ

When the gingival margin is coronal to the CEJ, the CAL is calculated by **subtracting** the gingival margin level from the probing depth.

Example

Probing depth measurement: 9 mm
Gingival margin level: -3 mm*
Clinical attachment loss: 6 mm

* = 3 mm of tissue needs to be taken away for the gingival margin to be at its normal level.

CALCULATING CAL WHEN THE GINGIVAL MARGIN IS AT THE NORMAL LEVEL

When the gingival margin is slightly coronal to the CEJ, no calculations are needed since the probing depth and the clinical attachment level are equal.

Example

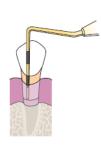
Probing depth measurement: 6 mm Gingival margin level: 0 mm* Clinical attachment loss: 6 mm

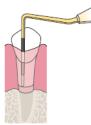
* = gingival margin is at the normal level; therefore no gingival tissue needs to be added or taken away (0).

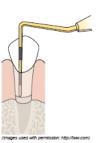
(Images used with permission: http://i

Nield-Gehrig JB, Fundamentals of Periodontal Instrumentation and Advanced Root Instrumentation, 7th ed, Wolters Kluwer/Lippincott Williams and Williams PN, 453.

220 Periodontology













- Ramfjord et al. proposed that attachment loss considered the measure of disease progression
- Use software that calculates CAL automatically
- FYI- if your x-rays & PD don't match, audits will occur

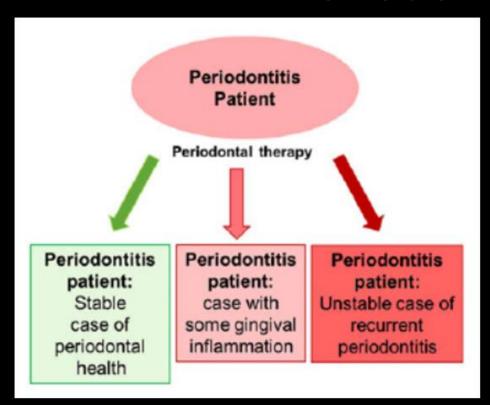






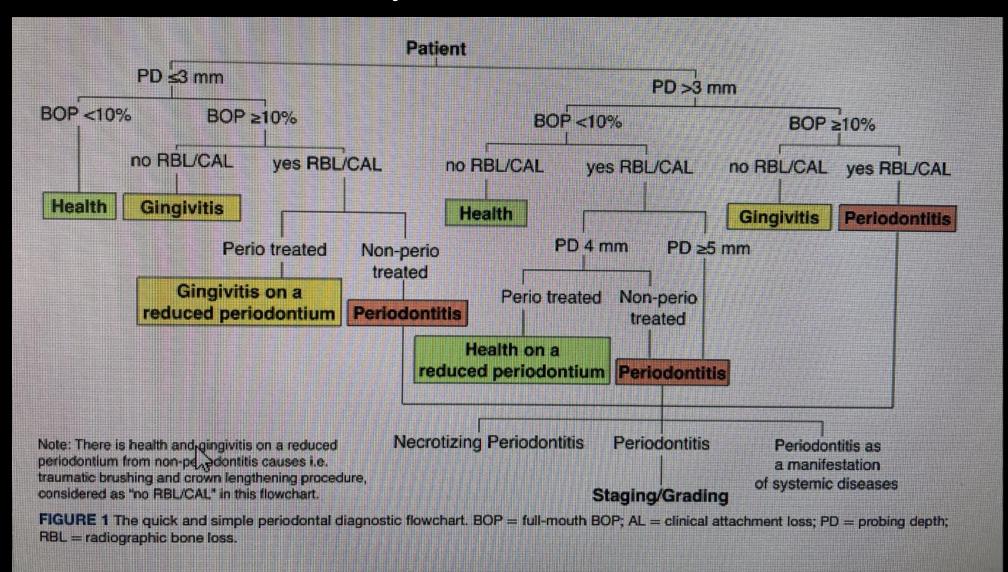
- Loss of attachment (LOA) is NOT always associated with periodontal disease
 Reasons of LOA
- 1. Non carious cervical lesions (abrasions, abfraction etc.)
- 2. Crown lengthening
- 3. Extractions that affect root of adjacent dentition
- 4. Endodontic issues & Caries

Periodontitis Definition



- Buccal/facial CAL ≥3mm AND pocketing ≥ 3mm is detectable with ≥ 2 teeth, OR
- Interdental CAL is identifiable at ≥ 2 teeth
- The observed CAL cannot be attributed to non-periodontitis related origin

Summary of Classifications



Staging

Disease Severity and Complexity of Management

Stage I: Initial Periodontitis Stage II: Moderate Periodontitis Stage III: Severe Periodontitis Stage IV: Advanced Periodontitis

Grading

Periodontitis grade

Grade A: Slow rate of progression Grade B: Moderate rate of progression Grade C: Rapid rate of progression

Periodontitis Definition

PERIODONTITIS: STAGING

Staging intends to classify the severity and extent of a patient's disease based on the measurable amount of destroyed and/or damaged tissue as a result of periodontitis and to assess the specific factors that may attribute to the complexity of long-term case management.

Initial stage should be determined using clinical attachment loss (CAL). If CAL is not available, radiographic bone loss (RBL) should be used. Tooth loss due to periodontitis may modify stage definition. One or more complexity factors may shift the stage to a higher level. See perio.org/2017wwdc for additional information.

	Periodontitis	Stage I	Stage II	Stage III	Stage IV
Severity	Interdental CAL (at site of greatest loss)	1 – 2 mm	3 – 4 mm	≥5 mm	≥5 mm
	RBL	Coronal third (<15%)	Coronal third (15% - 33%)	Extending to middle third of root and beyond	Extending to middle third of root and beyond
	Tooth loss (due to periodontitis)	No tooth loss		≤4 teeth	≥5 teeth
Complexity	Local	Max. probing depth s4 mm Mostly horizontal bone loss	Max. probing depth S mm Mostly horizontal bone loss	In addition to Stage II complexity: Probing depths ≥6 mm Vertical bone loss ≥3 mm Furcation involvement Class II or III Moderate ridge defects	In addition to Stage III complexity: • Need for complex rehabilitation due to: — Masticatory dysfunction — Secondary occlusal trauma (tooth mobility degree ≥2) — Severe ridge defects — Bite collapse, drifting, flaring — <20 remaining teeth (10 opposing pairs)
Extent and distribution	Add to stage as descriptor	For each stage, describe extent as: Localized (<30% of teeth involved); Generalized; or Molar/incisor pattern			

PERIODONTITIS: GRADING

Grading aims to indicate the rate of periodontitis progression, responsiveness to standard therapy, and potential impact on systemic health.

Clinicians should initially assume grade B disease and seek specific evidence to shift to grade A or C. See perio.org/2017wwdc for additional information.

	Progression		Grade A: Slow rate	Grade B: Moderate rate	Grade C: Rapid rate
Primary criteria	Direct evidence of progression	Radiographic bone loss or CAL	No loss over 5 years	<2 mm over 5 years	≥2 mm over 5 years
Whenever available,	Indirect evidence of progression	% bone loss / age	<0.25	0.25 to 1.0	>1.0
direct evidence should be used.		Case phenotype	Heavy biofilm deposits with low levels of destruction	Destruction commensurate with biofilm deposits	Destruction exceeds expectations given biofilm deposits; specific clinical patterns suggestive of periods of rapid progression and/or early onset disease
Grade modifiers	Risk factors Smoking Diabetes	Smoking	Non-smoker	<10 cigarettes/day	≥10 cigarettes/day
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Diabetes	Normoglycemic/no diagnosis of diabetes	HbA1c <7.0% in patients with diabetes	HbA1c ≥7.0% in patients with diabetes

- Staging determines severity and extent of damage to periodontal tissues
- Grading assesses rate of disease progression
- Document charts properly with both staging and grading

Table comparing

Staging & Grading

Characteristics	Staging	Grading
Definition	Staging is a system that doctors use to evaluate and determine the size of a tumor and amount of spread of cancer in the body	Grading is a system that doctors use to assess how differentiated cancer cells are
Names of the categories	TNM system	Categories are indicated by the letter G and either an X or a number is assigned
What the categories mean	TO – no tumor found Tis – tumor in situ T1 to T4 – size of the tumor NO – no spread to lymph nodes NI to N4 – extent of spread to lymph nodes MO – no metastasis M1 – metastasis found	GX – cancer is not graded G1 – cells very differentiated (look like normal cells) G2 – cells moderately differentiated G3 – cells poorly differentiated G4 – cells undifferentiated (most abnormal)
Microscopic features	Not concerned with the microscopic appearance of cells	Is concerned with the microscopic appearance of cells
Tumors	Focus is on the tumors	Focus is on the cells DB Difference Belween.net

Periodontitis Definition

nges occur from basic perio classifications?

medical oncology model using STAGING & GRADING

based on Staging & Grading

cation done to promote better way of communicating ntists, hygienists & other medical colleagues

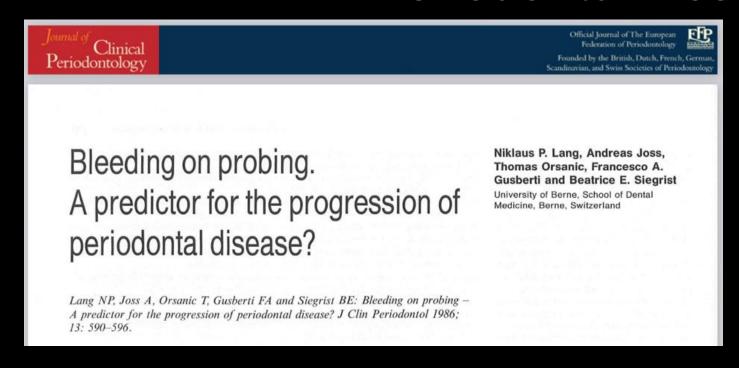
Periodontal Disease





- Multifactorial disease with an inflammatory & infectious component
- Edematous and erythema seen with bop in non-smokers
- Smokers have less bop due to nicotine-induced vasoconstriction of gingival blood vessels

Periodontal Disease

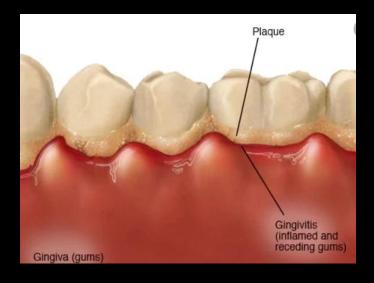




Studies show bleeding is an indicator of future periodontal disease

Etiology of Periodontal Disease







- Plaque leads to gingivitis & periodontal disease "SILENT DISEASE"
- Bacterial plaque produces harmful endotoxins causing inflammation
- Inflamed gingiva detach from teeth leading to periodontal pockets



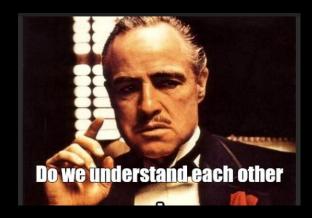


• Plaque left untreated for more than 48 hours can initiate gingivitis per Lang et al. Give patients plaque disclosing tabs for self care



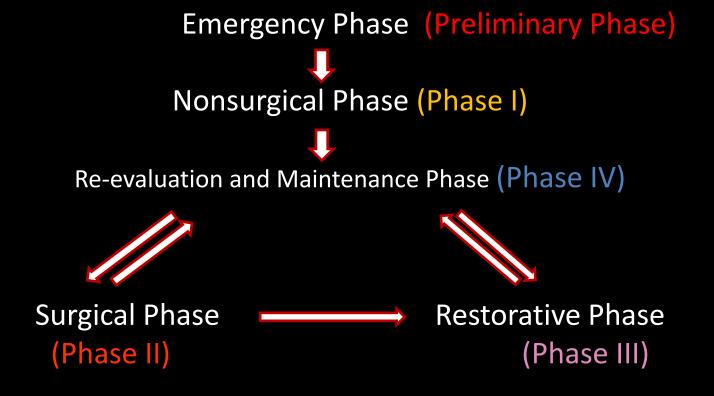
Indication of Non-Surgical Therapy (NST)





- In certain cases, NST may alleviate extent of perio surgery
- Enables provider to see patient compliance & motivation, does patient understand?
- To control plaque-induced gingival inflammation
- To mitigate effects of systemic risk factors such as diabetes & smoking

Sequence of Therapeutic Procedures



Non-Surgical Therapy Goals



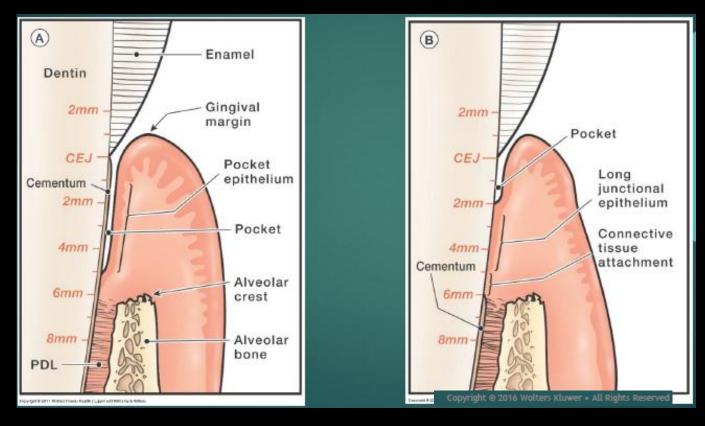






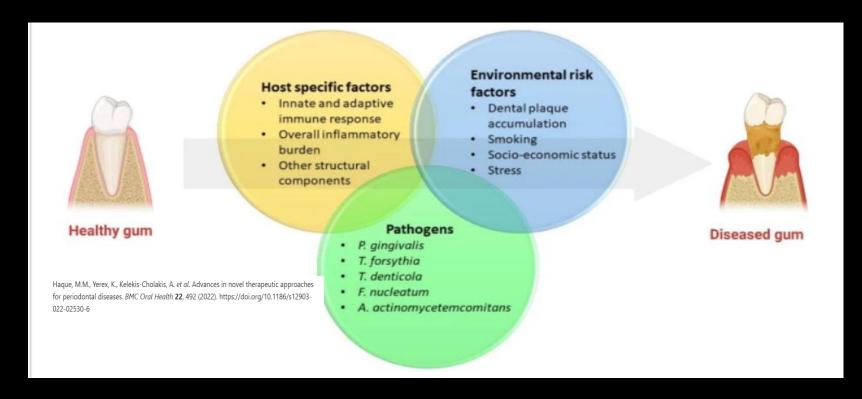
- To improve the attachment level by eliminating inflammation/infection
- To decrease the bacterial insult to the patient & create a healthy periodontal environment
- To mitigate the effects of systemic risk factors such as diabetes and smoking
- To alleviate local environmental risk factors

Non-Surgical Therapy Healing



- Repair Formation of long junctional epithelium after instrumentation
- Regeneration- Formation of bone, cementum or PDL fibers

Non-Surgical Therapy (NST)



- NST defined as removal of supra & subgingival calculus along with biofilm
- Roots are "smoothed" out, preserve root cementum
- Periodontal instrumentation is a critical step in nonsurgical periodontal therapy



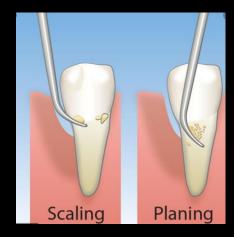


- NST involves treatment of periodontitis or plaque-induced gingivitis via :
- 1. Instrumentation using scaling and root planing
- 2. Usage of chemical agents Minocycline (Arestin), Peridex etc.
- 3. Laser therapy
- 4. Rectifying and/or control of local & systemic contributing factors
- 5. Effective compliance program & daily self care measure
- 6. Placing patients on PMT (3,4,6 months?)

Non-Surgical Therapy-Terminology







• Scaling-defined as instrumentation of the crown & root surfaces

Root planning-defined as intentional removal of diseased cementum;
 necessary for the removal of biofilms that contains endotoxins



Non-Surgical Therapy-Instrumentation

- Using power instrumentation is optimal choice over hand instrumentation
- Greater efficacy seen in deplaquing teeth surfaces especially in furcation sites
- Instrumentation NOT meant in shallow pockets, studies show pockets < 2.9mm had loss of attachment per Lindhe et al.

Instrumentation Rationale

- To arrest the progression of periodontal disease & eliminate inflammation of the periodontium
- To improve effectiveness & maintenance of patient self care
- To prevent the recurrence of the disease process especially during the maintenance period & to stabilize the attachment level
- Instrumentation NOT meant in shallow pockets

Non-Surgical Therapy



Non-Surgical Therapy (Chemical Agents)

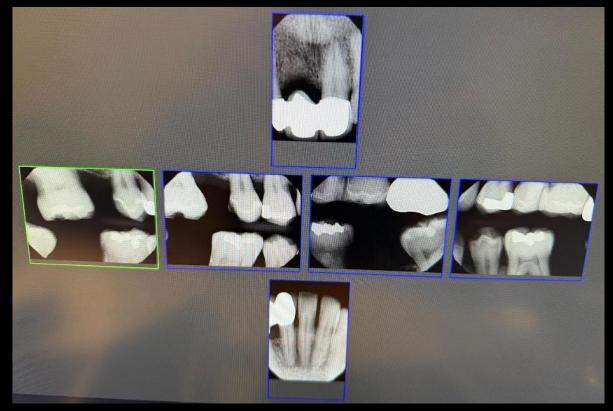






- In certain localized deep pockets, recommend agents such as Arestin
- Perio Protect involves a delivery of 1.7% hydrogen peroxide gel to chemically debride biofilm from periodontal pocket

Non-Surgical Therapy (Chemical Agents)



"My GP referred me because I am having pain on my lower molars, my hygienist has been taking care of me with Arestin and it's been great"





- #19,30 have severe radiographic bone loss on distal with radiographic calculus
- Prognosis is hopeless

Frequency Guidelines for Perio Tray® Delivery

PERIO TRAY DELIVERY BEFORE SRP/SURGERY

Deepest pocket 4-6mm: 3x/day @

15 minutes for 2 weeks

Deepest Pocket ≥7mm: 4x/day @

15 minutes for 2 weeks

PERIO TRAY DELIVERY AFTER SRP/SURGERY

2x/day @ 10-15 minutes until next perio maintenance appointment

MAINTENANCE

The overall goal is to reduce usage to 1x/day @ 10-15 minutes. Patients with severe periodontal disease may remain at 2x/day @ 10-15 minutes for best biofilm management.

Guidelines for use per manufacturer

Journal of Periodontology

786

Hydrogen Peroxide: A Review of Its Use in Dentistry



Milton V. Marshall,* Lewis P. Cancro,† and Stuart L. Fischman[‡]

In conclusion, adverse irritant effects from exposure to $\leq 3\%$ H₂O₂ were rare. In animals, premalignant lesions and weak enhancement of tumor formation was reported with prolonged use of 30% H₂O₂. Use of solutions of $\leq 3\%$ H₂O₂ in the oral cavity, even for prolonged periods of time should prove safe and beneficial in reducing plaque and supragingival microflora. For periodontal disease, therapeutic delivery of H₂O₂ requires mechanical access to subgingival pockets.

Marshall M, Cancro L, Fischman S. Hydrogen peroxide. A review of its uses in dentistry. J Periodontol 1995;66:786-796.

- Low concentration of hydrogen peroxide decreases plaque & gingivitis
- Researchers concluded that mechanical debridement is still needed to treat periodontitis

Patient self care









- Provide patient with appropriate oral hygiene instructions (OHI)
- Ask them to show you floss or interproximal plaque removal techniques
- Recommend using Nimbus toothbrush & ADA approved antimicrobial agents' usage

Chlorhexidine Gluconate (0.12%)

PROS CONS



- Reduces plaque > than Listerine, 50 -80% reduction in gingivitis
- Has substantivity, bonds to hard and soft tissue, lasts up to 24 hours in mouth.
- Bactericidal in greater concentrations

- Stains teeth & tongue brown, can cause slight calculus formation.
- Temporary alteration of taste, should be last thing you do after brushing and flossing
- Studies show that possible disruption of fibroblastic activity

Successful Non-Surgical Therapy







- No bleeding on probing (bop) w/ excellent oral hygiene
- Decreased mobility of teeth
- Pocket depth < 5 mm
- No calculus detection pink & firm gingival tissue consistency

FDA-approved products for periodontal disease

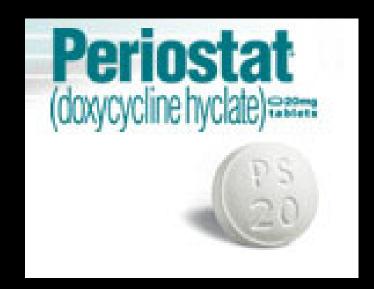


- Total[®]
 - Triclosan and fluoride toothpaste
- Listerine[®]
 - Essential oils
- Prohealth®
 - Cetylpyridinium chloride (CPC) is a quaternary ammonium compound
- Peridex/Perioguard®
 - Chlorhexidine (cationic bisbiguanide)mouthrinse
- PerioChip[®]
 - Chlorhexidine chip
- Atridox[™]
 - Doxycycline gel

- Actisite®
 - Thread-like fiber with tetracycline
- Arestin microspheres®
 - Tiny round particles with minocycline
- Periostat[®]
 - Low-dose doxycycline tablets



Periostat



- Subantimicrobial Doxycycline Hyclate
- 20mg tablet, BID for months
- In clinical studies, Periostat® was shown to be safe for as long as 12 months.
 Typically, the drug is taken for periods of no less than 3 months
 - Reduces the elevated collagenase activity in the gingival crevicular fluid of patients with adult periodontitis
 - Suppresses collagenase
 - Inhibits host response (host modulator)

Non-Surgical Periodontal Therapy





latrogenic effects on the periodontium

- Tissue sloughing and damage by pressure necrosis of a curette
- Post-scaling periodontal abscess and infection

Periodontal Reevaluation



- After initial SRP done reevaluation must be done ~4-6 weeks
- Sufficient time for healing of epithelium & connective tissue
- Possible root hypersensitivity and gingival recession can occur

Periodontal Reevaluation

- Update the medical status accordingly with any new medications
- Do a thorough periodontal assessment PD, BOP, CAL, REC
- Compare results of initial periodontal exam and reeval
- Treatment plan for areas in non-responsive disease sites





- Patient on left will need to go back to disease control, right will go to surgical treatment
- Reevaluations gages how serious a patient is on saving dentition
- In a patient with poor OH and active periodontal disease avoid restorative therapy

Periodontal Referrals





- Patients must be informed of periodontal condition regardless of restorative plan
- By ignoring their periodontal condition, liable for negligence
- Document properly with ALL pros & cons and educate patient
- A patient with periodontal pockets could litigate if periodontal condition ignored



When to Refer?

Signs of disease recurrence per Chace et al. include:

- Recurrence of BOP
- Increased probing depth
- Radiographic bone loss
- Progressive mobility
- Patient complaining of no improvement after all non-surgical therapy is completed

Ramifications & Responsibilities



Legal Responsibilities



Dentist's responsibilities to patient

- · Properly licensed
- · Skill, care, judgment
- · Patient autonomy
- · Do not abandon patient
- Refer to specialist
- Standard techniques, materials, drugs
- Reasonable results within reasonable time
- Patient privacy
- · Adequate instructions
- · Reasonable fees

Patient's responsibilities to dentist

- All instructions will be followed, e.g., postoperative instructions; home-care instructions; cooperation with treatment such as wearing elastics, controlling diet, conducting oral hygiene, etc.
- Appointments will be kept.
- Fees for services will be paid.
- Patients will conform to generally accepted modes of behavior.
- Patients will be truthful regarding their health history and other administrative inquiries.



- Negligently performing dental work.
- Failure to diagnose or treat a dental condition.
- Any intentional misconduct.
- Failure to properly detect an oral disease or malformation.
- Improper sterilization of dental or surgical utensils.
- Installation of defective or shoddy dental products.
- Failure to regularly update medical history. A dental treatment provider should update a patient's medical
 history at every visit. If there are no changes, the care provider should note that in the chart as well,
 especially if the patient has a complicated medical history. The provider should complete a new medical
 history about every three years.
- Failure to detect oral pathology. Oral pathology focuses on the diagnosis and treatment of oral diseases, including oral cancer. Overlooking a potentially malignant lesion or failing to diagnose oral cancer is a cause of many malpractice claims.
- Failure to detect periodontal disease. Periodontitis, or gum disease, can lead to tooth loss due to the destruction of the surrounding tissue. It may also contribute to heart and lung diseases. When a dental professional fails to examine for gum disease over an extended time, the disease goes undetected and untreated.









- All these cases were referred to me a month after cementing FPD
- Never let production goals take priority over your ethics and standard of care
- If patient filed a lawsuit for damages, plaintiff would easily win



c/c "I have been having cleanings on a regular basis, I don't know why I am being referred"



Case #3: Dental Implants

In the implant loss subset, two to 10 implants were lost, and treatment planning was alleged to be deficient to non-existent. The patient with the post-operative infection succumbed to the infection. In 24 of the negligence claims involving dental implant surgery, the defendants were general dentists, and one was a periodontist.

Case #5: Periodontal Disease

There were 19 cases of failure to diagnose or treat periodontal disease in a timely fashion. All defendants were general dentists. In most of these cases, X-rays were taken routinely, and periodontal probings were rarely or never recorded



Common Types of Dental Malpractice

- The types of dental treatments most involved in malpractice lawsuits are:
- Extractions: Problems from getting a tooth pulled include injections, nerve damage, and perforations of nearby mouth tissues and sinuses.
- **Dental Infections:** Infections following dental procedures can lead to blood poisoning, brain abscesses, and cardiac complications. Infections may require hospitalization and surgical intervention.
- **Endodontic Procedures:** Injuries from root canals and similar endodontic procedures include infections, sinus and nerve damage, blocked blood vessels, and dental instruments left in the canal.
- Dental Implants: Patients have been injured by infections, lost implants, and inadequate follow-up care.
- Crowns and Bridges: Improperly placed crowns and bridges can result in unsightly gaps, the inability to chew properly, infections, and more.
- Periodontal Disease: Malpractice lawsuits typically stem from the dentist's failure to adequately diagnose and treat the disease.
- Orthodontics: Badly installed braces and other corrective treatments can result in multiple tooth loss, infections, and root complications.
- **Dental Anesthesia:** Wrongfully administered anesthesia is the most common cause of dental malpractice resulting in death to adult and child patients.
- Oral Cancer: A dentist's failure to timely recognize mouth cancers can be deadly to the patient.

How referrals protect us



- Dentists are continuous target of malpractice claims (easy target)
- Trend has a profound impact on several aspects of dentistry
- Litigation affects entire team, time off, subpoenas, yelp etc.
- Protect yourself by working within the standard of care

Indications for Periodontal Surgery



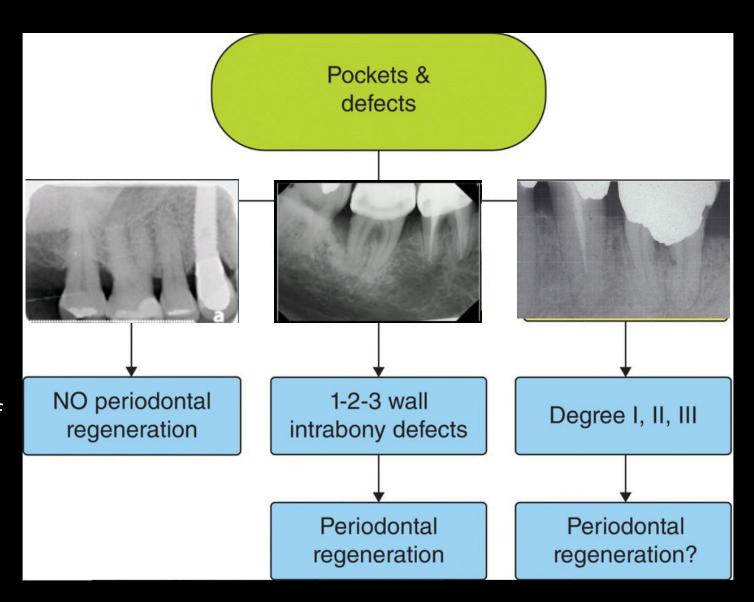
Surgical Therapy

Resective

- Subtractive procedure involving the surgical removal of the gingiva & reshaping the bone with usage of hand instruments and carbide burs
- Goal is eliminating pocket & correcting bone architecture
- Horizontal defects

<u>Regenerative</u>

- Additive procedure involving the usage of materials such as bone graft, GTR or biologics
- Goal is formation of Cementum, PDL & Bone
- Vertical and furcation defects



Resective



subtractive osseous surgery is designed to restore the form of preexisting alveolar bone to the level present at the time of surgery or slightly more apical to this level

Regenerative



Additive osseous surgery includes procedures directed at restoring the alveolar bone to its original level

Courtesy of Dr Shivanand

LANAP - Laser Assisted New Attachment Procedure



- A. Perio probe indicates excessive pocket depth
- B. Laser radiation vaporizes bacteria, diseased tissue, pathologic proteins, and alerts the practitioner to the presence of tartar
- **C.** Ultrasonic scaler and special hand instruments are used to remove root surface accretions
- D. Bone is modified at time of surgery
- E. Laser is used to form a gel-clot containing stem cells from bone and PDL
- F. Reattachment of reté ridges to clean root surface, with a stable fibrin clot at the gingival crest to create a 'classification'
- G. Occlusal trauma adjusted
- H. New attachment is regenerated



Surgical Therapy

Resection

- Resective procedures warranting osteoplasty & ostectomy
- Involves the surgical removal of the gingiva & reshaping bone
- Eliminates pocket & correct bone architecture
- Not done in anterior teeth, consider LANAP or regenerative

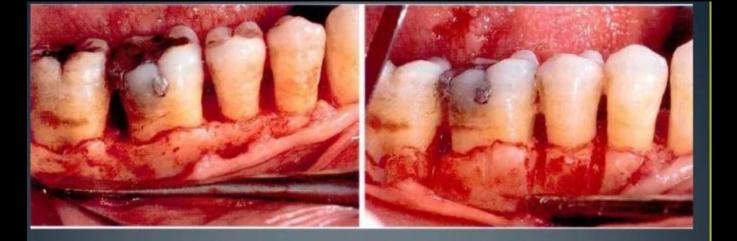
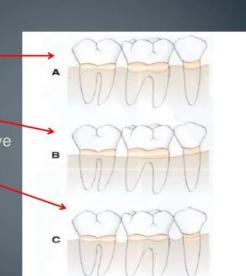


Figure 7.1. An example of positive architecture is shown in this human dry mandible. The buccal alveolar bone is apical to the interproximal crest. Courtesy of Dr. Hyman Smukler, Brookline, MA, USA.

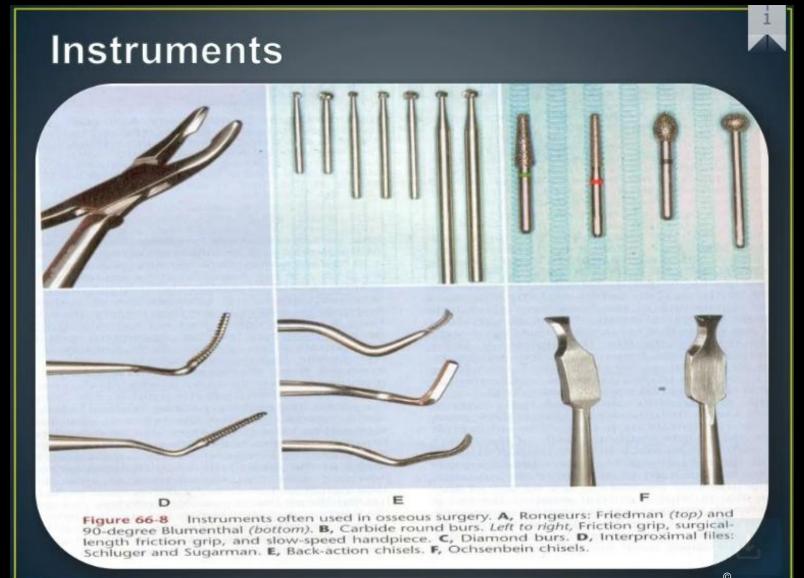




- Flat
- Reverse / negative
- Ideal



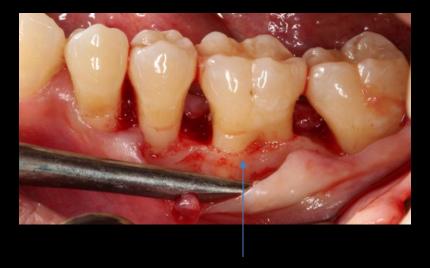
Surgical Therapy- Resection



Surgical Therapy- Resection







Be mindful of interproximal reduction, sometimes compromise needed

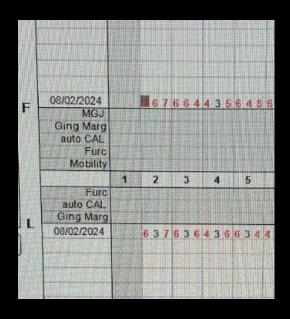
Case 1 - Pockets seen on lower quad, with extreme bleeding upon probing

- Granulation tissue with removal of diseased epithelium improves attachment
- Expectations -longer teeth, possible additional sensitivity, less bop ,PD reduction

Surgical Therapy-Resection







Case 2- Periodontal pockets seen on upper quad, PA & BW taken

- Horizontal defect primarily, minimal vertical
- Etiology primarily calculus, what else?

Surgical Therapy-Resection





- Calculus removed and ledges contoured
- Extreme bleeding in deeper pocket sites, be prepared
- Critical to review medical history prior to periodontal surgery

Residual Calculus









Calculus Ring

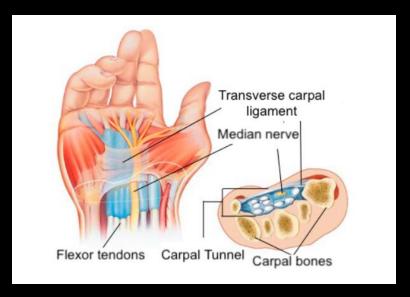
Granulation tissue

Why is so much residual calculus being left behind?

Etiology -Poor OH, Crowding, Occlusal trauma, Instruments (possible)

Ergonomics & Dental Scalers/Curettes





- Could poor ergonomics be related to residual calculus?
- Dental curettes NOT tailored for comfort leading to musculoskeletal disorders (MSD)
- Hand fatigue & chronic pain can lead to tendinitis & carpal tunnel syndrome (CTS)





Article

A Novel Ergonomic Curette Design Reduces Dental Prophylaxis-Induced Muscle Work and Fatigue

Kairong Lin ¹, Cherie Wink ¹, Ben Dolan ², Kathryn Osann ³, Ali A. Habib ⁴, Jill Gehrig ⁵ and Petra Wilder-Smith ¹,*

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- Henry Samueli School of Engineering, University of California Irvine, Irvine, CA 92617, USA; dolanb@uci.edu
- School of Medicine, University of California Irvine, Irvine, CA 92612, USA; kosann@hs.uci.edu
- Department of Neurology, University of California Irvine, Orange, CA 92868, USA; aahabib@hs.uci.edu
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- Correspondence: pwsmith@uci.edu; Tel.: +1-949-824-7632

Abstract: Background: To compare fatigue, comfort, and muscle work associated with the use of two periodontal curettes during scaling: one with a novel adaptive design, the other with a conventional non-adaptive design. Methods: Twelve hygienists scaled a typodont using two Universal Barnhart 5/6 curettes: (1) a prototype featuring an adaptive silicone-covered handle (Curette A), and (2) a stainless-steel curette (Curette B). Surface Electromyography (sEMG) traced muscle work. Hand positions, fatigue, comfort, pinch, and grasp strength were recorded. Paired t-tests and a repeated measures ANOVA with covariates were tested for differences. The significance level was set at p < 0.05. Results: Curette A performed significantly better in all categories. Pinch and grasp strength and fatigue were significantly reduced post-instrumentation for Curette B. Curette A required significantly less (i) total muscle work and (ii) work in individual muscles. Comfort, correct grasp, and blade adaptation were significantly better using Curette A. Conclusions: A curette featuring a novel adaptive handle design demonstrated significantly improved ergonomic performance. Additional clinical studies are needed to solidify our understanding of the potential short- and long-term benefits of the novel curette handle design. Practical Implications: A novel adaptive curette handle design that enables the clinician to adapt the instrument across the index finger may reduce musculoskeletal burden and fatigue, as well as improve comfort during periodontal instrumentation.

Keywords: adaptive curette; dental hygienist; dental hygiene; ergonomics; electromyography; musculoskeletal disorder



Citation: Lin, K.; Wink, C.; Dolan, B.; Osann, K.; Habib, A.A.; Gehrig, J.; Wilder-Smith, P. A Novel Ergonomic Curette Design Reduces Dental Prophylaxis-Induced Muscle Work and Fatigue. Dent. J. 2023, 11, 272.

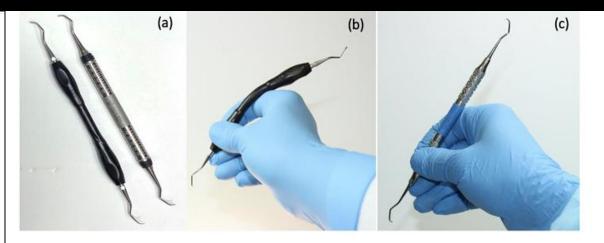
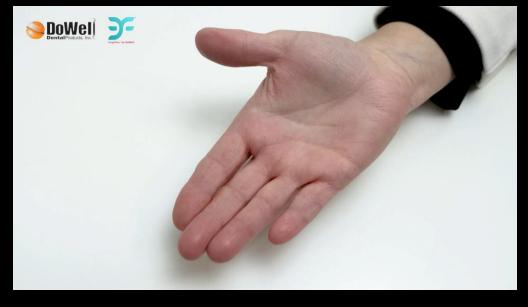
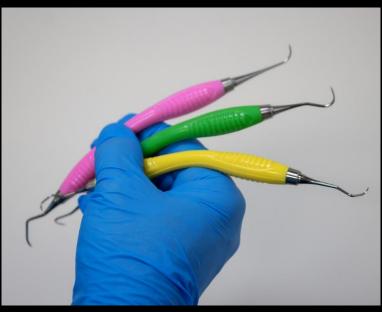


Figure 2. Dental curettes: (a) LHS: prototype adaptive curette; RHS: conventional stainless-steel curette; (b) prototype adaptive curette in 1 adaptive configuration; (c) conventional stainless-steel curette.



Ergonomics





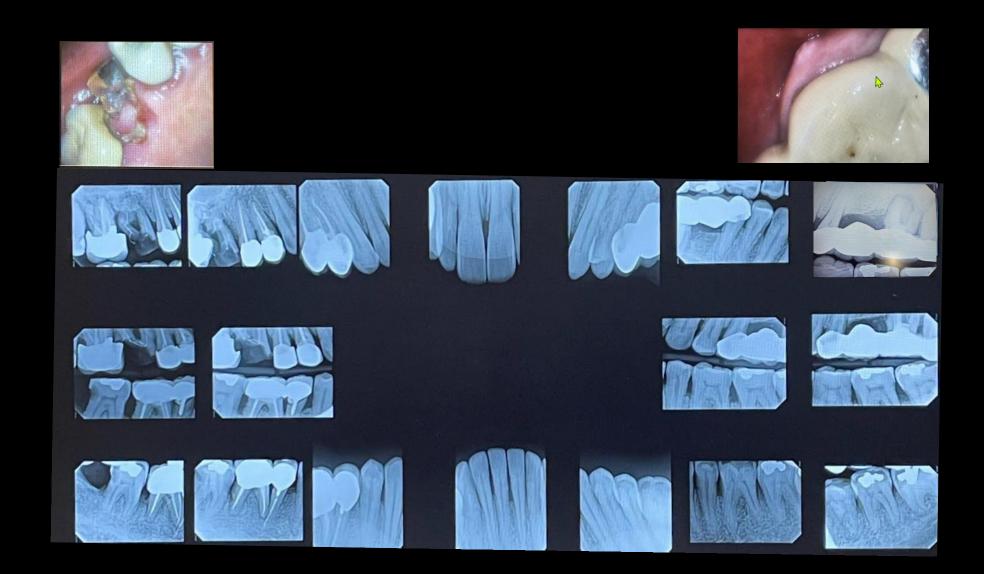


- Usage of repeated conventional rigid curettes causes fatigue
- Breakthroughs in designs leading to greater flexibility and less rigidity

Ergo Flex Usage



Referral for osseous surgery- disease control primarily!



Surgical Therapy- Functional Crown Lengthening







"I can't pack cord around #28, please help!"
Resective surgery needs removal of soft & hard tissue







- 6-8 weeks for final impression posterior, 4-6 months for final impression anterior
- Recession on adjacent teeth can occur during healing (please wait!)
- Explain to patient in layman terms prior to sending patient to periodontist

Surgical Therapy- Functional Crown Lengthening



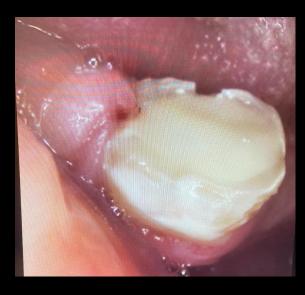






- More KT, the better clinical crown exposure
- Apically position flap not coronally, always take a PA prior
- If tissues rebound, possible revision surgery as needed

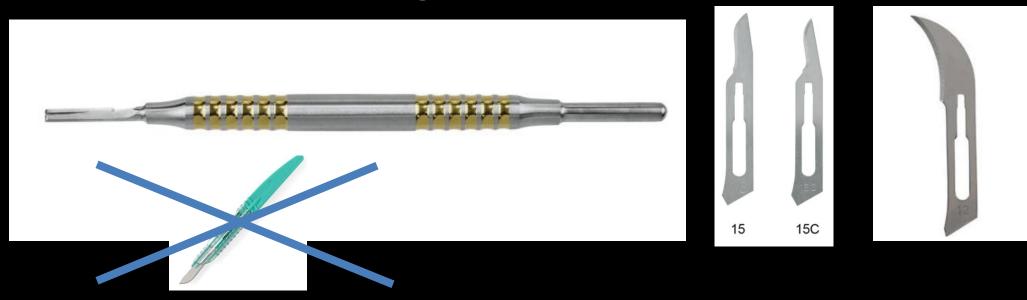
Surgical Therapy- Functional Crown Lengthening



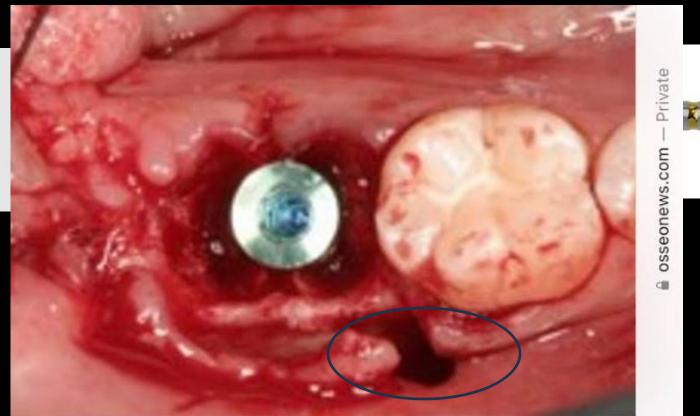


- PLAN YOUR CASES PROPERLY! Don't start with Second Molars
- Factors to consider: Amt of KT, crown: root, anatomical variations, restorative plan, ferrule etc.
- If interested in periodontal surgery start with crown lengthening

Surgical Instruments



- Surgical kit needs instruments other than perio probe & mirror
- Start incision using a 15/15C blade, in tight corners try a #12 blade
- AVOID DISPOSABLES!





- After making initial incision to bone, use Orban knife to remove any fibers/tags
- Follow initial incision with a periosteal/ Buser stay on bone & expose ridge
- Premature flap release leads to flap tear

Full vs. Partial Thickness





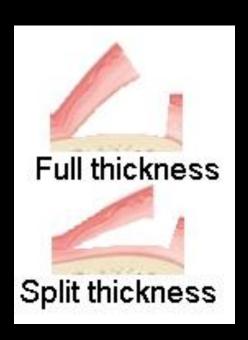
Full

Partial

(Photographs from Mealey textbook)

Full vs. Partial Thickness

- Incision depth determines design
- Full thickness = Mucoperiosteal
 - Flap contains periosteum
 - Exposes bone
 - Less bleeding
 - Majority of periodontal surgery
- Partial = Split thickness
 - Flap does NOT contain periosteum
 - Periosteum stays on bone
 - More bleeding
 - Soft tissue surgery





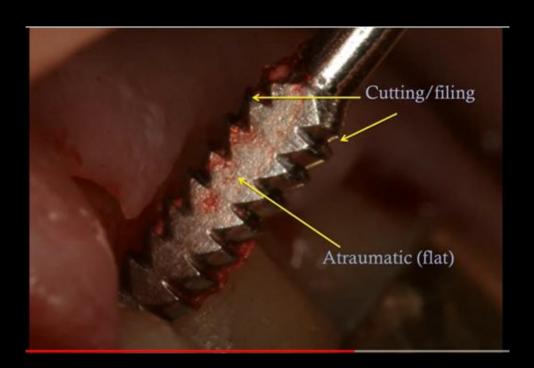




- Upon flap exposure, use a Minnesota & Pritchard elevator for site reflection
- Remove all granulation tissue with hand instruments & cavitron
- Periosteal chisels along with carbide burs for contouring







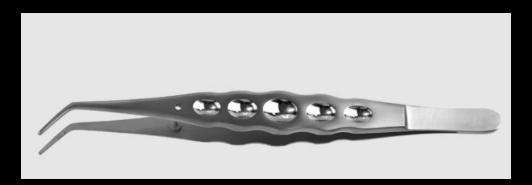


- For crown lengthening & osseous surgeries, use hand instruments like Sugarman & Schluger files
- Use in narrow sites if not adequate interproximal reduction









- Have scissors/micro scissors, cotton pliers & suture holders in kit
- Recommend suturing with a CASTROVIEJO for delicate movements
- More finesse movement designed for smaller tissue bites

Surgical Kit





- All instruments needed for perio surgery should be in an autoclavable plastic kit
- Ergonomic Instruments & not too heavy or light (fatigue)

Resective - Esthetic Crown Lengthening





"I was referred because my temporaries keep coming off and I have to much gum tissue"





- Critical to have adequate keratinized tissue to apically position flap
- In esthetically critical areas, recessions must be closely observed in the healing period & final impression in 4-6 months

Bragger et al. Surgical lengthening of the clinical crown. J Clin Periodontol 1992: 19: 58-63

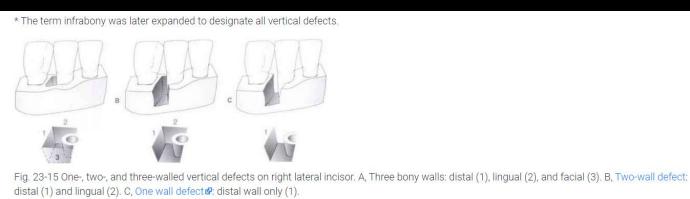
Surgical Therapy - PO ~ 3 weeks

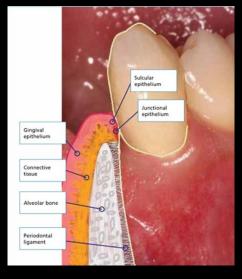




Always take good pictures for documentation, helps in all facets of communication

Surgical Therapy







Regeneration

- Additive more walls, better outcome
- Usage of materials such as bone graft, GTR or biologics
- Regeneration goals: formation of cementum, PDL & bone
- Used for correction of vertical defects, mobility lowers predictability

Surgical Therapy-Regeneration





						Furcation
						Plaque
			No.	antio.		Calc
B.B	888	888	8 8 B	888	888	BldS
111	11-1	444	444	444	444	CEJ-GM
244	455	749	555	422	212	CAL
0	0	2	0	0	0	Mobil
355	356	8 5 10	665	533	323	PD
27	26	25	24	23	22	
436	635	113 4	434	523	333	PD
000	000	4-1-1	1-1-1	-100	0.00	CEJ-GM
436	635	102 3	325	423	333	CAL
В	888	8 8	B B B	В		BldS
						MGL
	1.1.5	1.1.0			4 - 1	Plaque
				Z. IIII	9	Calc
						Furcation

"I can't afford implants, and I know I have deep pockets on my lower teeth"

Options?

Surgical Therapy





Etiology.....

Malocclusion, Root Proximity, Occlusal trauma, Plaque/Calculus

Regenerative

Buccal



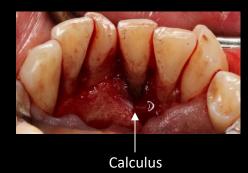






Lingual









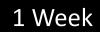
- Allograft used along w/ EMD (Enamel Matrix Derivative) derived from porcine teeth
- Aids in stimulation of periodontal regeneration & cementum formation

Follow Up









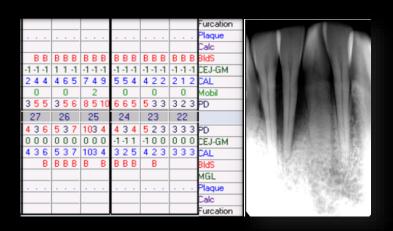


1 Month

Follow up ~ 2 years











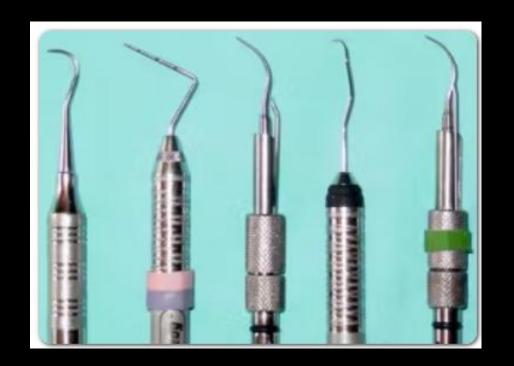
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433	3 4 4	335	4 4 3	232	333	CAL	经验证据
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333	363	333	335	323	223	CAL	
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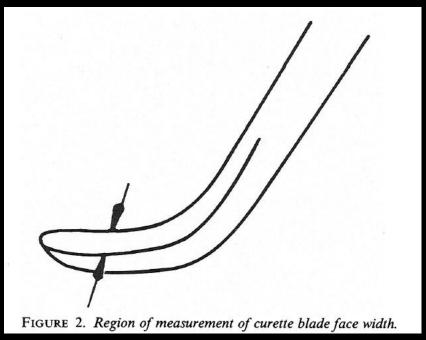
Regenerative - Furcation

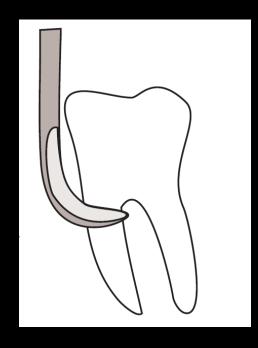










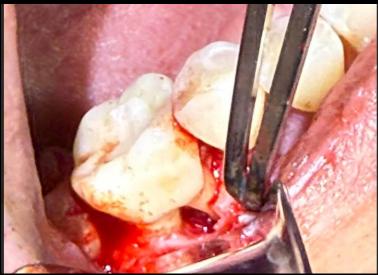


Bower (1979 B) - investigated if furcation morphology may influence instrumentation using curettes

- 81% of furcation have an orifice ≤ 1mm & 58% of time ≤0.75mm, blade width of most perio curettes is 0.75-1.0mm. UNLIKELY to clean furcation entrance
- Ultrasonic (smaller) tip is better option than Gracey curette in grade II or III furcation

Regenerative - Furcation

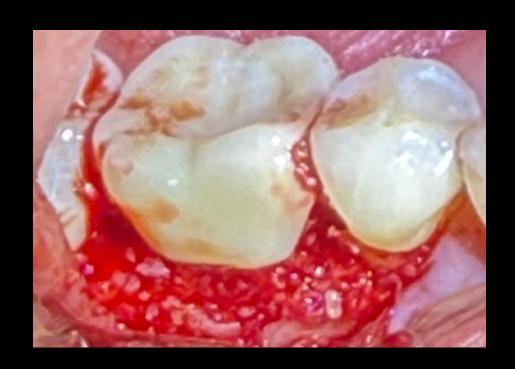






- Furcation defects show extreme granulation tissue accumulation
- Site serves as a "plaque" trap

Regenerative - Furcation





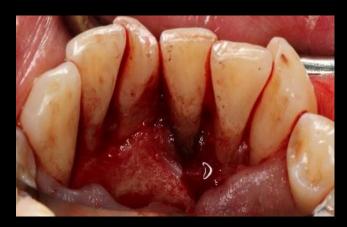




ative

Regenerative with Biologics





- EMD aids in regeneration along with angiogenesis
- Placing a membrane extremely challenging in narrow sites, case-by case scenario
- Utilize biologics for their properties

J Periodontol • October 2014

Efficacy of Enamel Matrix Derivative With Freeze-Dried Bone Allograft or Demineralized Freeze-Dried Bone Allograft in Intrabony Defects: A Randomized Trial

Shigeki Ogihara* and Dennis P. Tarnow

Background: Promising clinical outcomes have been reported with the combination of enamel matrix derivative (EMD) and allograft materials. Direct comparison between EMD with a freeze-dried bone allograft (FDBA) and a demineralized FDBA (DFDBA) was evaluated in one case series study. To date, no randomized controlled trial has been reported. Therefore, a well-controlled randomized clinical trial was conducted to determine the relative efficacy of EMD/FDBA versus EMD/DFDBA when managing intrabony defects.

Methods: A randomized parallel trial was conducted in a private practice from April 2004 to October 2011. Sixty-nine patients were randomly assigned to one of three groups: EMD/FDBA (EF) intervention group (n = 23), EMD/FDBA (ED) intervention group (n = 23), and EMD alone without graft material (E) as a negative control group (n = 23). All of the grafting material had minocycline added. Each patient had an intrabony defect. The primary outcomes were the absolute change in probing depth (PD) reduction and clinical attachment level (CAL) gain from baseline to 1- and 3-year follow-up. Intrabony defects were surgically treated with EMD/FDBA, EMD/DFDBA, or EMD alone.

Results: Sixty-seven patients (EF, n=21: ED, n=23; E, n=23) were analyzed. All groups demonstrated significant improvement in PD reduction and CAL gain from baseline. The changes for PD were as follows (mm, 95% confidence interval [CI]): at 1 year: EF (4.4 mm, 4.0 to 4.7), ED (3.7 mm, 3.4 to 4.0), and E (control) (3.3 mm, 3.0 to 3.6); at 3 years: EF (4.4 mm, 4.1 to 4.8), ED (3.7 mm, 3.4 to 4.0), and E (3.1 mm, 2.8 to 3.4). The changes for CAL were as follows (mm, 95% CI): at 1 year: EF (4.1 mm, 3.8 to 4.5), ED (3.5 mm, 3.0 to 4.0), and E (3.0 mm, 2.5 to 3.6); at 3 years: EF (4.2 mm, 3.7 to 4.7), ED (3.6 mm, 3.1 to 4.1), and E (3.0 mm, 2.5 to 3.5). The intervention groups (EF and ED) showed better treatment outcomes than the control group at 1 and 3 years. Statistically, the two bone-graft groups were not significantly different from each other at 1 and 3 years.

Conclusions: Both EMD/FDBA and EMD/DFDBA interventions resulted in greater soft tissue improvement at 1 and 3 years of follow-up compared to EMD alone. Both graft materials worked well in managing deep intrabony defects when combined with EMD. J Periodontol 2014;85:1351-1360.

KEY WORDS

Allografts; bone and bones; clinical trials, randomized; enamel matrix protein; regeneration; tissues.

Private practice, Tokyo, Japan.

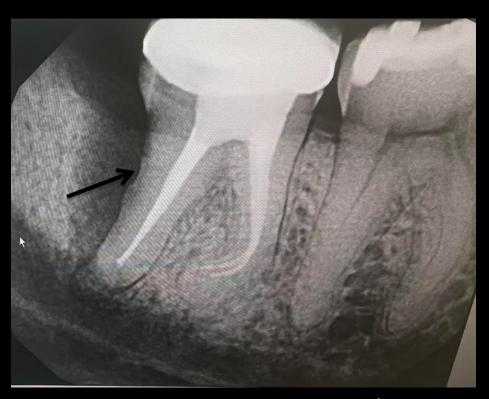
[†] Department of Periodontology, Columbia University College of Dental Medicine, New York, NY.

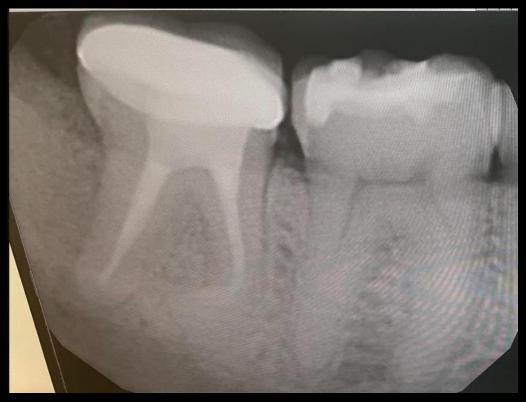


c/c "I don't want to have implants; can you save my tooth"

Primarily endo-perio lesion, endo always done FIRST

REGENERATIVE - VERTICAL DEFECTS





- Possible subgingival calculus / third molar etiology, other option is ext, implant OR do nothing
- Regenerative cases work well in acute angle, narrow defects (2 wall or deep 2-wall)











3/5/25



4/15/ 25 (surgery date)

c/c "Can you save my tooth, I know if I get an implant, I will need sinus surgery and I have sinus issues"





7/1/25 11/4/25







			В	-1	2		3		4	2	6				
		Ť	В	0	4	1	4	2	4	2	6	В	•		
		Ť	В	-1	4		5		5	2	7	В	•	_	
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	ï			3	6	1	3	5	3	3	6				
		_	В	1	6		5		5	3	8	В			

C/C "I have discomfort on my upper RHS, it is very sensitive, can we try to save my tooth"

- Generalized horizontal bone loss, vertical defect #2
- Obtuse defect NOT ideal for regeneration
- Second molars do not respond well to periodontal regenerative attempts

Surgery









- Patient on periodontal maintenance for over 5 years, site ignored
- Soft tissue follows bone topography, 1- wall defect distal aspect, difficult regeneration case
- Prognosis questionable hopeless, must be informed prior to surgery possible complications





1 week follow up





1 month follow up

Periodontal Surgery Trauma





- Poor esthetic outcome (Black triangle)- recommend minimal invasive surgery
- Nerve damage- lingual flap, vertical near mental, distal wedge in soft tissue
- Post-operative sensitivity-excessive gingival tissue removal
- Excessive crown exposure poor crown/root ratio

Tissue sloughing& post-operative prolonged bleeding



• Long-term food impaction & root caries



Creation of secondary tooth mobility



Periodontal Maintenance (PMT)



- Patients having periodontal treatment MUST be placed on a stringent PMT
- Periodontal maintenance plan does not mean prophy ONLY!

Periodontitis patients should be on 3–4-month intervals

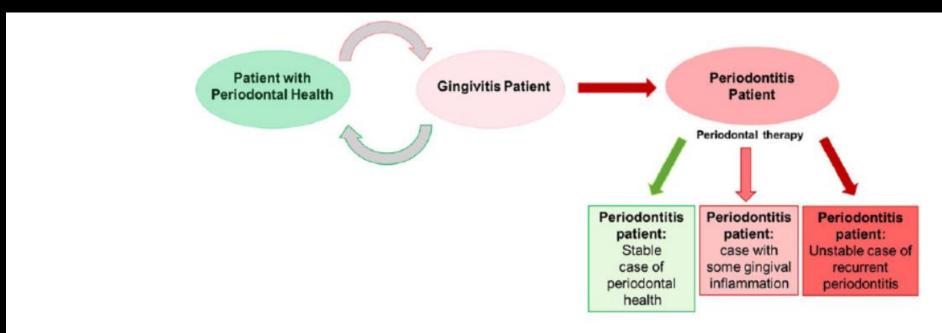
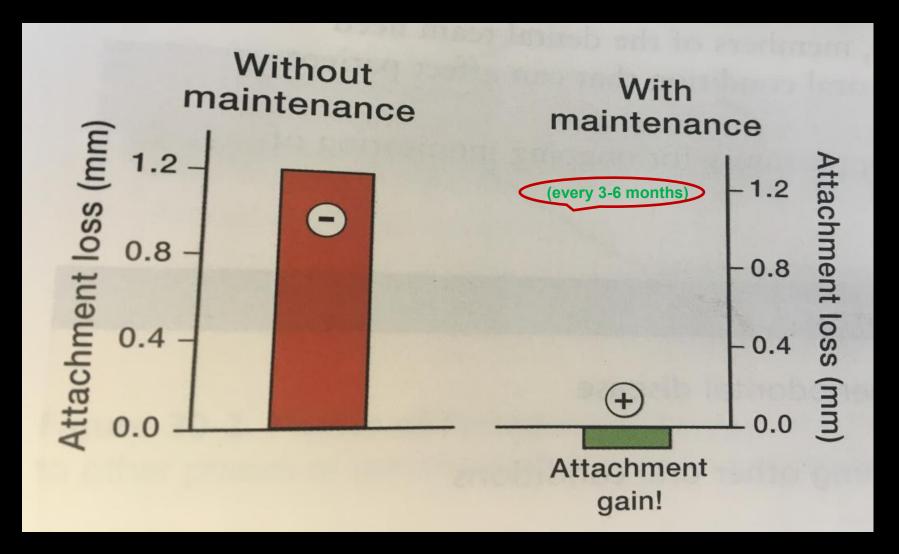


FIGURE 1 The transition from periodontal health to gingivitis is reversible following treatment that resolves gingival inflammation. The transition to periodontitis results in attachment loss which, at the present time is irreversible. More importantly, it signposts patients who are at lifelong high risk of recurrent periodontitis. Optimal periodontal therapy can restore gingival health on a reduced periodontium, or may result in mild marginal gingival inflammation at shallow probing pocket depths (≤ 3 mm). However, a history of periodontitis places patients at high risk of recurrent periodontitis and such patients require careful site-specific monitoring during periodontal maintenance programs

Chapple et al. JP 2018

Periodontal patients are like diabetic patients, classification stays same

Periodontal Maintenance



The efficacy of a periodontal maintenance care program to prevent the recurrence of disease in patients treated for advanced periodontitis. - Axelsson P, Lindhe J. 1981)

Biopsies



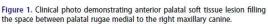




PG PGCG POF

- Soft tissue lesions should be evaluated for size, color and shape
- Remember 3P's- Pyogenic granuloma (PG), Peripheral Ossifying Fibroma (POF),
 Peripheral giant cell granuloma (PGCG)











c/c "I have a lesion on my palate that comes and goes & has started to get bigger over the few months"

- Lesion description: firm, 8mm irregularly circumscribed, round, yellow-tan to red pink papule
- DD: Neurofibroma, POF, Langerhans cell histiocytosis, Granular cell tumor
- Biopsy: Excisional biopsy done; membrane used, specimen sent to pathology
- Diagnosis: Juvenile Xanthogranuloma, oral lesions are rare w/ ~ 30 histological cases

Xanthogranuloma of the Palate in an Adult: A Case Report with Differential Diagnosis

Hardev M. Singh, Jeffrey A. Elo, Yoon-Jeong Kim & Ho-Hyun (Brian) Sun Journal of the California Dental Association







c/c "I have a bump on my front tooth that isn't going away"

- DD Radicular cyst, Chronic apical granuloma, Sinus tract secondary to fracture
- IF lesion clears after endo retx or ext NO need for biopsy
- After 6-12 months if lesion persists DO biopsy after 6-12 months

- 2017 World Workshop defined term "periodontal phenotype"
- Term based on gingival thickness (GT) & keratinized tissue width (KTW) & thickness
 of buccal bone plate per Kim et al.
- Periodontal phenotype can be altered by environmental factors & clinical interventions such as overhanging restorations, orthodontics or gingival grafting procedures per Jepsen et al.







- Thin scalloped biotype in which there is a greater association with slender triangular crown, subtle cervical convexity, interproximal contacts close to the incisal edge and a narrow zone of KT, clear thin delicate gingiva, and a relatively thin alveolar bone.
- Thick flat biotype showing more square-shaped tooth crowns, pronounced cervical convexity, large interproximal contact located more apically, a broad zone of KT, thick, fibrotic gingiva, and a comparatively thick alveolar bone.
- Thick scalloped biotype showing a thick fibrotic gingiva, slender teeth, narrow zone of KT, and a pronounced gingival scalloping.

Cortellini et al. 2017







Why are phenotypes important?

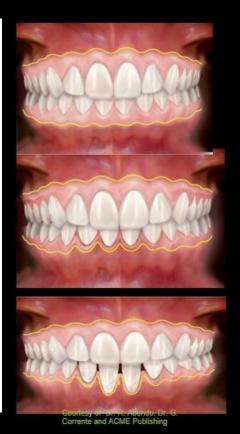
- Maxillary bone is much more delicate & keep this in mind
- Be gentle with restorations in thin scalloped phenotypes especially packing cord
- In patients with high smile lines this is even more critical!

Mucogingival Deformity

Schematic illustration of a natural healthy mucogingival line

Schematic illustration of a shifted mucogingival line with reduced keratinized tissue

Schematic illustration of a shifted mucogingival line with reduced keratinized tissue and gingival recessions



What does this term mean

 An altered relationship between the MGJ & GM that are either associated w/ progressive gum recession or do not allow for the control of inflammation

GRAFTING SOURCES

FREE GINIGIVAL GRAFTS (FGG)

Lamina propria

Lamina propria

Lamina propria

Full thickness gingival graft

Submucosa (fat or glands)

FGG – used in cases primarily where lack of KT & epithelial layer of palate (0.75-1.25mm)



CTG-used in cases for root coverage, it is taken from the middle layer of the palate "thicker layer"





Can we change phenotypes if needed

Soft tissue grafts surgeries allow an increase in KT and to improve recession coverage













Pre-op 1-Week 1-year







(RESIDENT CASE)







1-week PO 1-month PO 4-month PO





"I have a hard time cleaning my lower teeth, and feel like I cannot talk properly, I don't want you to use my palate for grafting"













- Geistlich Mucograft indicated for gain of keratinized tissue, alternative to FGG
- Benefits include no harvest-site morbidity, less pain, less surgical chair time vs autogenous grafts
- Natural soft tissue color & texture which matches and blends with adjacent tissues
- Early vascularization and soft tissue ingrowth, accelerated wound healing

Phenotypes





Pre-op Post-op

Smile Line

One of the most critical factors in the esthetically conscientious patients

• Important to know how to identify the different smile lines of a patient

 High smile line patients needs appropriate intraoral pictures, documentation, realistic expectations & risks and all benefits

If you feel like you cannot meet patient expectations, REFER!

High, Low or Average Smile Line?

Classification of Smile:

ACCORDING TO ANTHONY H.L.TJAN, GARY D.MILLER AND JOSEPHINE G.P. -

open smiles were divided into 3 types-

- High smile- reveals the total cervicoincisal length of the maxillary anterior teeth and a contiguous band of gingiva.
- Average smile- reveals 75% to 100% of the maxillary anterior teeth and the interproximal gingiva only.
- Low smile- displays less than 75% of the anterior teeth.













- Take a picture of your patient in repose, and at a natural smile in esthetic cases
- Pictures help with complex cases and serve as a reference point
- Majority of patients will be average smile line

Alveolar Post-Extraction Ridge Resorption





- Soft tissue fills socket site in cases where buccal plate is lacking
- Ridge Augmentation will be needed to get an ideal outcome
- Esthetic cases are extremely complex & minimal trauma to the site is critical



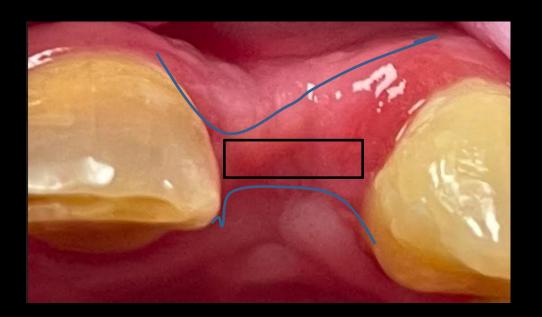




- Traumatic tooth extraction causes severe ridge deficiencies
- Use periotomes and ridge preservation techniques

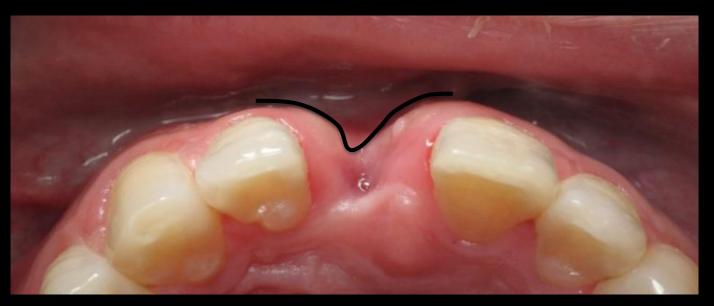


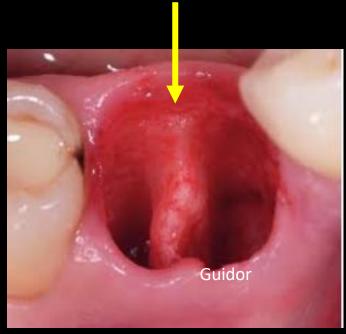




- If buccal bone NOT preserved there will be challenges in treatment planning
- Remember soft tissue follows hard tissue
- Think ahead of how to prevent this from the extraction appointment

Intact Buccal plate





- Goal is to preserve buccal plate & achieve minimum trauma to soft tissue
- Healing and future prosthesis placement will be ideal by preventing ridge collapse
- Using atraumatic methods with ridge preservation

Ridge Preservation with Freeze-Dried Bone Allograft and a Collagen Membrane Compared to Extraction Alone for Implant Site Development: A Clinical and Histologic Study in Humans

John M. Iasella,* Henry Greenwell,[†] Richard L. Miller,[‡] Margaret Hill,[†] Connie Drisko,[§] Aziz A. Bohra,[∥] and James P. Scheetz[¶]

Background: Tooth extraction typically leads to loss of ridge width and height. The primary aim of this 6-month randomized, controlled, blinded, clinical study was to determine whether ridge preservation would prevent post-extraction resorptive changes as assessed by clinical and histologic parameters.

Methods: Twenty-four patients, 10 males and 14 females, aged 28 to 76 (mean 51.5 ± 13.6), requiring a non-molar extraction and delayed implant placement were randomly selected to receive either extraction alone (EXT) or ridge preservation (RP) using tetracycline hydrated freeze-dried bone allograft (FDBA) and a collagen membrane. A replaced flap, which did not completely cover the sockets, was used. Following extraction, horizontal and vertical ridge dimensions were determined using a modified digital caliper and an acrylic stent, respectively. Prior to implant placement, a 2.7×6.0 mm trephine core was obtained and preserved in formalin for histologic analysis.

Results: The width of the RP group decreased from 9.2 ± 1.2 mm to 8.0 ± 1.4 mm (P<0.05), while the width of the EXT group decreased from 9.1 ± 1.0 mm to 6.4 ± 2.2 mm (P<0.05), a difference of 1.6 mm. Both the EXT and RP groups lost ridge width, although an improved result was obtained in the RP group. Most of the resorption occurred from the buccal; maxillary sites lost more width than mandibular sites. The vertical change for the RP group was a gain of 1.3 ± 2.0 mm versus a loss of 0.9 ± 1.6 mm for the EXT group (P<0.05), a height difference of 2.2 mm. Histologic analysis revealed more bone in the RP group: about $65\pm10\%$ versus $54\pm12\%$ in the EXT group. The RP group included both vital bone (28%) and non-vital (37%) FDBA fragments.

Conclusions: Ridge preservation using FDBA and a collagen membrane improved ridge height and width dimensions when compared to extraction alone. These dimensions may be more suitable for implant placement, especially in areas where loss of ridge height would compromise the esthetic result. The quantity of bone observed on histologic analysis was slightly greater in preservation sites, although these sites included both vital and non-vital bone. The most predictable maintenance of ridge width, height, and position was achieved when a ridge preservation procedure was employed. *J Periodontol* 2003;74:990-999.

KEY WORDS

Alveolar ridge; bone resorption/prevention and control; clinical trials, controlled; clinical trials, randomized; collagen/therapeutic use; follow-up studies; membranes, barrier; tooth extraction/adverse effects.

- * Private practice, Yakima, WA.
- † Graduate Periodontics, School of Dentistry, University of Louisville, Louisville, KY.
- Oral Pathology, University of Louisville.
- § Previously, University of Louisville; currently, Dental School, Medical College of Georgia, Augusta, GA.
- Private practice, Phoenix, AZ.
- Statistics, School of Dentistry, University of Louisville.

- Width of RP sites from 9.2 mm to 8.0 mm Vs non-RP sites from 9.1 mm to 6.4 mm
- Vertical (height) shows Gain 1.3 mm in RP VS non-RP sites where loss ranged from 0.9 mm-1.6 mm
- Increased bone quantity in RP sites

lasella JM, Greenwell H, Miller RL, et al. Ridge preservation with freeze-dried bone allograf and a collagen membrane compared to extraction alone for implant site development: A clinical and histologic study in humans. J Periodontol 2003; 74: 990-999.

©Singh DMD,MS

Ridge Resorption





- Atrophic ridge (LHS) with NO ridge preservation compared to RHS after ridge preservation
- Ridge preservation maintains bone volume with future grafting less likely
- Ridge preservation at extraction makes it 14X less likely you will need GBR later Cardaropoli D, et al. Int J Periodontics Restorative Dent. 2012 Aug; 3 2 (4):421-30.

CLINICAL ORAL IMPLANTS RESEARCH

Fabio Vignoletti Paula Matesanz Daniel Rodrigo Elena Figuero Conchita Martin Mariano Sanz

Surgical protocols for ridge preservation after tooth extraction. A systematic review

Authors' affiliations:

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Key words: bone grafts, bone regeneration, bone substitutes, dental implants, ridge preservation, systematic review, tooth extraction

Objective: This systematic review aims to evaluate the scientific evidence on the efficacy in the surgical protocols designed for preserving the alveolar ridge after tooth extraction and to evaluate how these techniques affect the placement of dental implants and the final implant supported

Material and methods: A thorough search in MEDLINE-PubMed, Embase and the Cochrane Central Register of controlled trials (CENTRAL) was conducted up to February 2011. Randomized clinical trials and prospective cohort studies with a follow-up of at least 3 months reporting changes on both the hard and soft tissues (height and/or width) of the alveolar process (mm or %) after tooth extraction were considered for inclusion

Results: The screening of titles and abstracts resulted in 14 publications meeting the eligibility criteria. Data from nine of these 14 studies could be grouped in the meta-analyses. Results from the meta-analyses showed a statistically significant greater ridge reduction in bone height for control groups as compared to test groups (weighted mean differences, WMD = -1.47 mm; 95% CI [-1.982, -0.953]; P < 0.001; heterogeneity: P = 13.1%; $\chi^2 P$ -value = 0.314) and a significant greater reduction in bone width for control groups compared to the test groups (WMD = -1.830 mm; 95% CI [-2.947, -0.732]; P = 0.001; heterogeneity: $I^2 = 0\%$; $\chi^2 P$ -value = 0.837). Subgroup analysis was based on the surgical protocol used for the socket preservation (flapless/flapped, barrier membrane/no membrane, primary intention healing/no primary healing) and on the measurement method utilized to evaluate morphological changes. Meta-regression analyses demonstrated a statistically significant difference favoring the flapped subgroup in terms of bone width (metaregression; slope = 2.26; 95% IC [1.01; 3.51]; P = 0.003).

Conclusions: The potential benefit of socket preservation therapies was demonstrated resulting in significantly less vertical and horizontal contraction of the alveolar bone crest. The scientific evidence does not provide clear quidelines in regards to the type of biomaterial, or surgical procedure, although a significant positive effect of the flapped surgery was observed. There are no data available to draw conclusions on the consequences of such benefits on the long-term outcomes of implant therapy.

dependent structures that will undergo signif- remodelling after tooth extraction that evenicant structural changes whenever the teeth tually lead to a reduction on the overall ridge are lost. The dynamics and magnitude of these changes have been investigated in the dog model (Kuboki et al. 1988; Devlin et al. 1997; Cardaropoli et al. 2003; Araujo & Lindin humans (Amler et al. 1960; Evian et al.

The alveolar processes in the jaws are tooth- the key processes of tissue modelling and dimensions with significant changes in both the buccal and lingual bone crests.

2008). These investigations have identified Schropp et al. 2003), to radiographic analysis

The amount of vertical and horizontal resorption of the socket walls has been inveshe 2005; van Kesteren et al. 2010) as well as tigated with different methods, ranging from studying and measuring cast models (Pietro-1982; Devlin & Sloan 2002; Trombelli et al. kovski & Massler 1967; Johnson 1969;

Surgical protocols for ridge preservation after tooth extraction. A systematic review 2011

Fabio Vignoletti, Paula Matesanz, Daniel Rodrigo, Elena Figuero Conchita Martin, Mariano Sanz

Conclusion: The potential benefit of socket preservation therapies was demonstrated resulting insignificantly less vertical & horizontal contraction of the alveolar bone crest.

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There are no data available to draw conclusions on the consequences of such benefits on the long-term outcomes of implant therapy.

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Accepted 26 August 2011

Vignoletti F, Matesanz P, Rodrigo D, Figuero E, Martin C, Sanz M. Surgical protocols for ridge preservation after tooth extraction. A systematic review. Clin. Oral Impl. Res. 23|Suppl. 5|, 2012, 22-38 doi: 10.1111/j.1600-0501.2011.02331.x

Graft Material Options

Code is D7953

Autogenous

Allograft

Xenograft

Alloplast

Biologic Process of Bone Grafts

- Osteogenesis formation of new bone from osteocompetent cells (autograft only)
- Osteoconduction formation of new bone through a scaffold (bone graft) from the host's osteocompetent cells
- Osteoinduction formation of new bone from the differentiation and stimulation of mesenchymal cells by the bone-inductive protein

Properties Of Bone Grafts

	Osteoconductive	Osteoinductive	Osteogenic
Autograft	+	+	+
Allograft	+	+/-	-
Xenograft	+	-	-

Klokkevold, PR, Jovanovic, SA (2002). "Advanced Implant Surgery and Bone Grafting Techniques". In Newman, Takei, Carranza: *Carranza's Clinical Periodontology* (9th ed.). Philadelphia: W.B. Saunders. pp. 907–8

What material should I use & why?

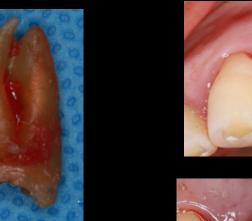
- Allografts high resorption rate but inconsistent volume stability, osteoconductive scaffold & slight osteoinductive potential
- Xenograft- slower resorption rate with higher volume stability, osteoconductive
- Autograft- gold standard, both osteoinductive & osteoconductive, high morbidity in larger quantities















1-week post-op

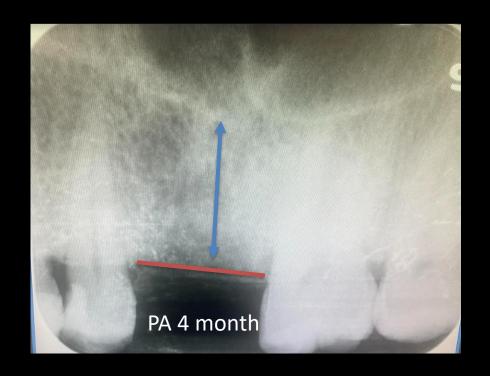




Tooth Needing Extraction

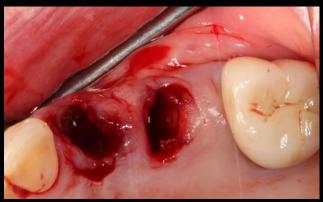
Grafted Immediately After Extraction



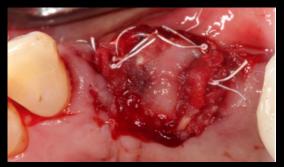


PO site have good crestal level for future implant site









- Referral for ext and implant placement in future
- Recurrent decay on existing PFM's, short clinical crowns, lack of ferrule, preps angulation?
- Conventional bone grafting and membrane done





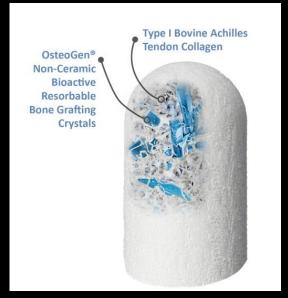


- Good bone fill seen after 4 months, implant placement #11-13 Straumann BLT
- Surgical guide created for optimal placement

OsteoGen® Plug: Critical Components for Bone Formation

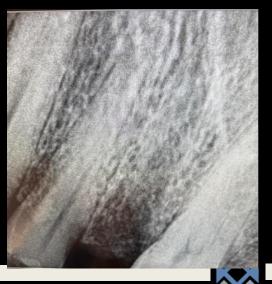
• The **non-ceramic** OsteoGen particulate graft inside the OsteoGen Plug is a unique bioactive and resorbable calcium phosphate-based crystal graft that helps control the migration of connective tissue

 Collagen carrying bone graft absorbs & delivers blood to the graft during resorption via bone forming cells (osteoblasts)



• **Resorption Time:** Over 3-5 months, the graft is replaced by host bone tissue.

During resorption, graft turns from radiolucent to radiopaque - indicating readiness for implant placement



The Science Behind OsteoGen® Crystal Clusters

Advanced Properties for Enhancing Bone Regeneration

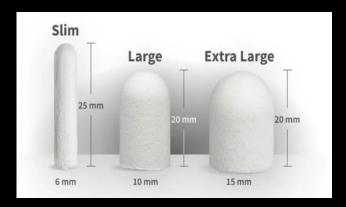


- What is OsteoGen:
 - Bioactive Resorbable Calcium Phosphate Crystal Clusters
 - Unique Ca:P ratio that mimics the composition of human bone mineral
- OsteoGen is a calcium phosphate-based graft composed of relatively rectangular or hexagonal crystals
- The hydrophilic clusters intertwine to create a porous scaffold, that supports blood absorption, angiogenesis and bone regeneration

*Bioactive materials are designed to elicit a desired therapeutic or beneficial response (Jada Foundational Science, Emerging Science Vol2, 100-122 2023 Bioactive dental Materials-Developing promising Confusing, J Ferracone et al.)



OsteoGen® Plug Provides the Foundation for True Bone Regeneration



- Easy and cost-effective way to deliver a bone graft
- Simple all-in-one solution graft and collagen are combined, eliminating conventional techniques
- Radiolucent at placement and radiopaque in three-to-five months demonstrating bone regeneration
- The **non-ceramic** OsteoGen particulate graft inside of the OsteoGen Plug is a unique bioactive, porous and resorbable calcium phosphate-based crystal graft
- **Type I collagen** stabilizes the clot, and delivers blood flow to the resorbing graft by way of bone forming cells (critical for the initiation of bone formation and early angiogenesis)



OsteoGen® Crystal & Crystal Clusters: Bioactive

- **Composition**: Highly crystalline, non-ceramic calcium phosphate, which mimics the composition of human bone
- Osteoconductivity: Supports the growth of new bone by acting as a scaffold
- **Resorption**: Resorbed and replaced by the patients' own bone over time
- **Hydrophilicity**: Absorbs blood and promotes cellular proliferation, critical for bone formation and early angiogenesis
- **Radiopacity**: Initially radiolucent and becomes radiopaque within 4-6 months as it is resorbed and replaced by host bone

*Blue vial: 6cc, Green Vial: 3 cc, Red Vial: 1.5cc



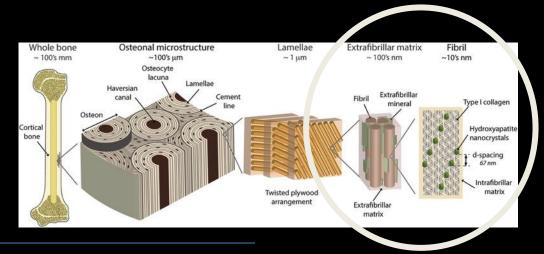




OsteoGen[®] Plugs Designed to Mimic Human Bone Composition

Physiologic Bone:

Mineralized Collagen Composite Material



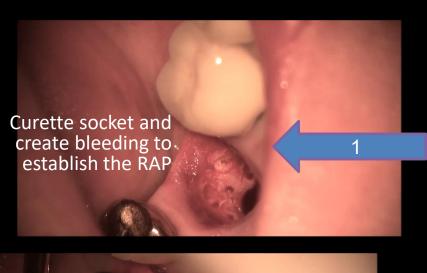
OsteoGen Plug, Strip, and Block:

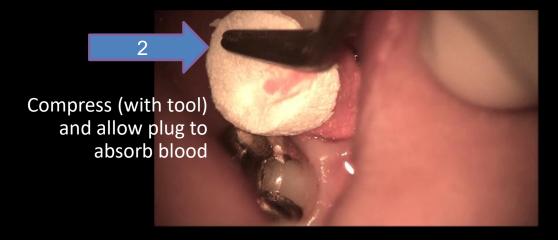
Mineralized Collagen Composite Material

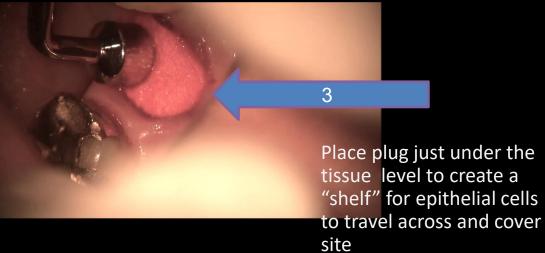


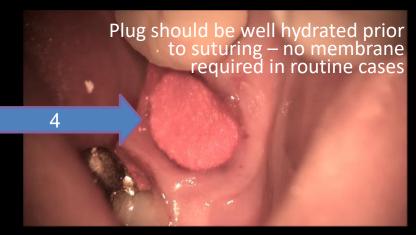


The OsteoGen® Plug in Use











Identifying Bone Regeneration via X-Ray







Images courtesy of: Dr. Robert Miller

- At placement, the OsteoGen Plug, Strip and Block are radiolucent & as bone regenerates it turns radiopaque: meaning true bone regeneration
- When to re-enter? 3-5 months depending on many variables including technique, location and patient specific factors
 Use the CBCT or X-ray as a guide





Re-Entry: Dense, Well Vascularized Bone with sufficient volume to provide stability for implant



Clinical Case









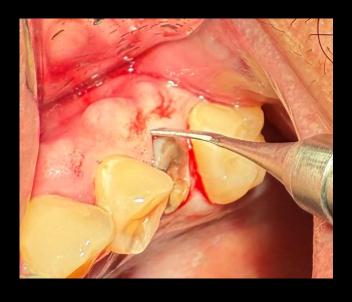
- Recommend using Osteogen plugs
- Ease of use and handling along with different sizes
- Pay attention to buccal plate and keep it intact

Clinical Case









- Extracted #13, periotome used, always preserve buccal plate
- Good surgical technique leads to predictable result









- Always put bone graft in a bleeding socket for better vascularity
- PA will show nice even bone fill

Socket Preservation Materials Comparison

This reference chart summarizes the composition, resorption characteristics, handling, and clinical use cases of three commonly used socket preservation graft materials: OsteoGen® Plug, Puros® Allograft (FDBA/DFDBA), and Creos™.

Material	Composition	Resorption	Behavior	Use Case
OsteoGen® Plug	Bovine type I collagen + crystalline calcium sulfate	Rapid to moderate resorption (weeks to months)	Hemostatic, easy to place, resorbable, not space- maintaining	Simple socket preservation, vital bone quickly; not for esthetic ridge maintenance
Puros® Allograft (FDBA/DFDBA)	Human cadaveric bone (mineralized or demineralized)	Slower resorption (4–9 months depending on particle size/density)	Space- maintaining scaffold; DFDBA offers more osteoinductive potential	Implant-driven sites, esthetic areas, cases requiring ridge contour maintenance
Creos™ (Allograft)	Human allograft (FDBA/DFDBA) with optional carriers	Variable; FDBA slower, DFDBA faster	Predictable handling, strong scaffold, maintains ridge volume	Implant sites in esthetic or load-bearing areas; delayed implant placement



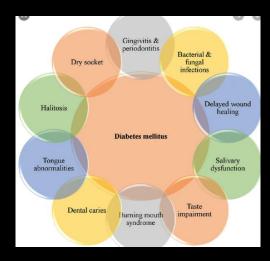




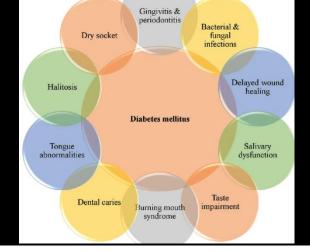
Contributing factors of periodontitis







- Risk factors-characteristics of an individual placing them at an increased risk of contracting a disease
- Diabetes and Smoking are risk factors for periodontal disease
- Numerous studies have shown a strong and direct relationship b/w both
- Grossi et al. smokers have 18X more periodontal pathogens vs nonsmokers & 3x > bone loss and attachment loss in diabetic patients



J Periodontol. 2017 Jan;88(1):17-25. Epub 2016 Aug 26.

Influence of Periodontal Disease on Changes of Glycated Hemoglobin Levels in Patients With Type 2 Diabetes Mellitus: A Retrospective Cohort Study.

Costa KL¹, Taboza ZA¹, Angelino GB², Silveira VR², Montenegro R Jr³, Haas AN⁴, Rego RO^{1,2}.

- Progression of periodontitis associated with increase in HbA1c in patients with Type 2 DM
- Always ask patients for their updated HbA1 C
- Periodontal treatment may improve glycemic control of patients with DM2 by eliminating periodontal infection

The Link Between Periodontal Disease & Systemic Inflammatory Diseases: A Risk Continuum

Host Response **Bacterial** Periodontal Chronic Infection/ Exaggerated Challenge Disease Hyperinflammatory Iatrogenic Factors Response Crowded Teeth Poor Oral Hygiene Increased Risk for: Exacerbates Atherosclerosis On-Going Smoking

- Diabetic Complications
- Adverse Pregnancy Outcomes
- Respiratory Diseases
- Neurodegenerative Diseases



Medications

Diabetes

Genetics

Obesity

Stress

Compromised Immunity

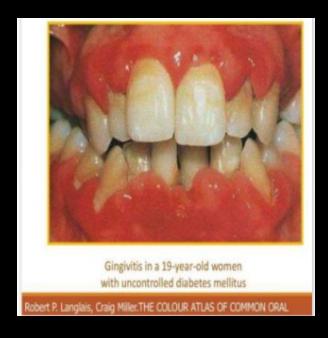
Inflammation in

Distant Organs

Low Grade

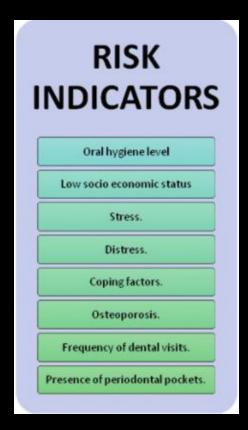
Inflammation





Risk Factors

- Local risk factors are defined as anything that can influence the periodontal health status @ a site or sites w/ NO known systemic effects per Matthews et al. (2004)
- Plaque accumulation necessary to induce gingival inflammation is variable in individuals'
- Factors such as local risk factors & systemic risk factors have an integral role in disease progression





- Risk Indicators are possible risk factors that have been identified in cross sectional studies but not confirmed via longitudinal studies
- Risk indicators are probable factors but lack long term data to back up evidence

Periodontal Risk Factors

- Certain individuals more prone to periodontal disease regardless of systemic issues
- Factors such as stress, genetics & cytokines are also important in the host response
- Certain anatomical features of teeth are plaque retentive
- Studies have shown 50% of the variance in disease in the population is attributed to genetic variance

Evidence of a substantial genetic basis for risk of adult periodontitis

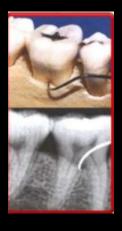
B S Michalowicz ¹, S R Diehl, J C Gunsolley, B S Sparks, C N Brooks, T E Koertge, J V Califano, J A Burmeister, H A Schenkein

Local Risk Factors

Furcation- anatomic area of a multirooted tooth where roots diverge, essentially "PLAQUE TRAPS"

Glickman (1953) classification based on extent of horizontal bone loss, "subjective terms"

- Grade I- Incipient furcation, suprabony pocket, intact interradicular bone
- Grade II- cul-de-sac, horizontal component & loss of interradicular bone
- Grade III-communicating or through and through furcation, bone not attached to dome of furca
- Grade IV through and through furcation w/ soft tissue recession w/visible furcation





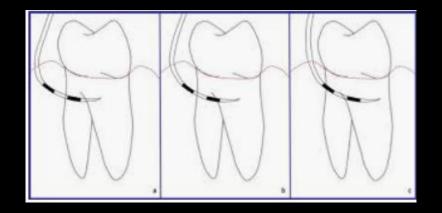


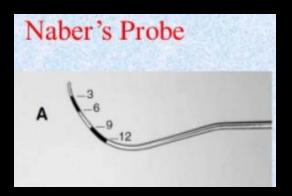


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Hamp Furcation Index (1975) classification based on actual loss of horizontal involvement

- Degree I Horizontal loss of periodontal tissue support < 3mm
- Degree II Horizontal loss of support >3mm
- Degree III –Horizontal "through & through" destruction of periodontal tissue in furcation

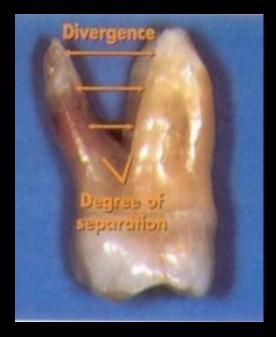


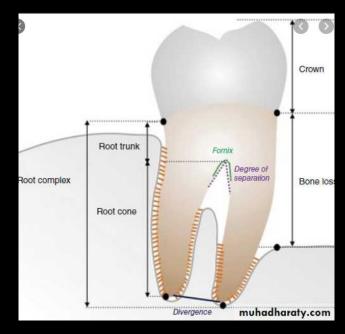




Treatment- Degree I furcation: SRP, Degree II furcation: SRP/furcation sx, Degree III furcation: extraction

Furcation & Root Anatomy







- Root complex-portion of tooth that is located apical of the CEJ. Fornix is roof of the furcation
- Furcation is an area of COMPLEX anatomic morphology (Bower 1979)
- Difficult or in some cases impossible to debride routine periodontally instrumentation (Metzler 1991)
- Shorter root trunks + Wider root divergence give better regeneration outcomes



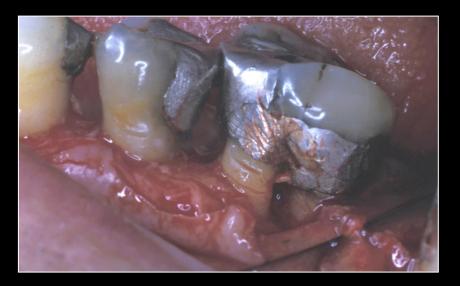


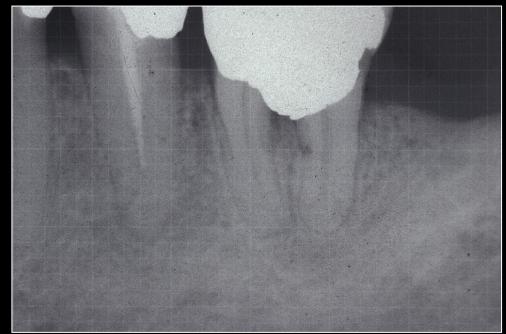


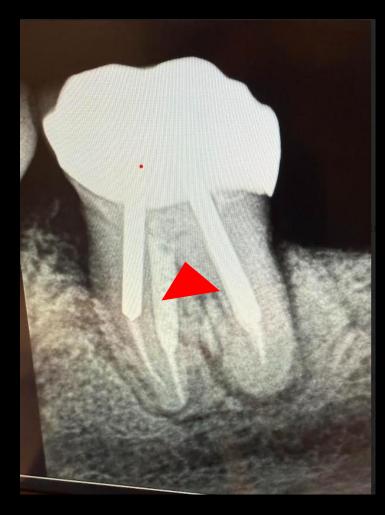
Grade 3 furcation

- Avoid placing restorations at furcation, plaque traps cause tooth loss
- Shorter root trunk allows for better instrumentation





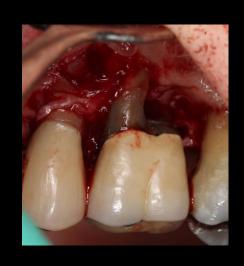






C/C "I was referred to you because my hygienist said I am losing bone "



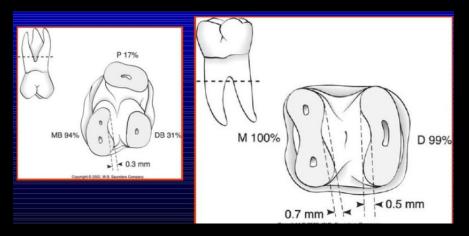


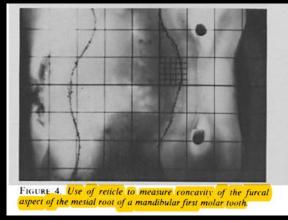


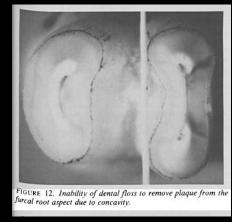
c/c "I want to save my tooth because I spent a lot of money, I don't want an implant"

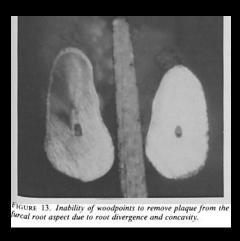
- Granulation tissue seen, lack of buccal bone seen. Etiology- PLAQUE
- Prognosis #14: hopeless

Local Risk Factors - Root Concavities









Bower 1979A (2-part study)

Study done to investigate which morphologic features might influence plaque control

Maxillary Molars (114 examined)

Concavities in 94% MB root (0.3mm concavity depth), 31% DB roots (0.1mm deep) & 17% P root (0.1mm deep)

Mandibular Molars (103 examined)

- Concavities in 100% Mesial root (0.7mm concavity depth) & 99% distal root (0.5mm deep)
- Both concavities makes area difficult to clean in removing all plaque with floss

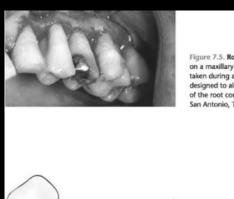


Figure 7.5. Root Concavity. The mesial root concavity on a maxillary first premolar. This photograph was taken during a periodontal surgical procedure designed to allow better visualization and treatment of the root concavity. (Courtesy of Dr Ralph Arnold, San Antonio. TX.)

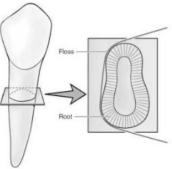


Figure 7.6. Flossing a Tooth Surface with a Concavity. Note that even if floss is closely adapted to the tooth surfaces, the floss will not dislodge the plaque biofilm in the base of the concavity.



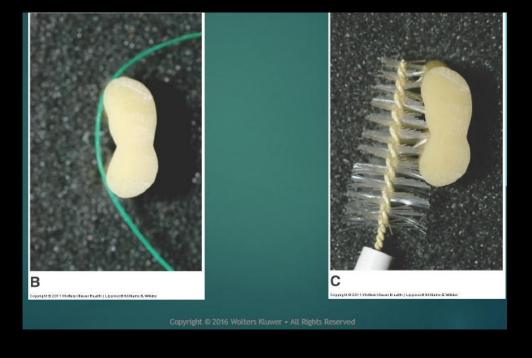
Maxillary first premolar

Booker et al.- showed complexity of the anatomy of max first PMs

- Results show concave surfaces make plaque removal extremely challenging
- Concavity more prominent in 2 rooted PM's & 100% on mesial aspect
- Failure to remove plaque is almost certain if PD >3mm

Root Concavities





How to clean sites

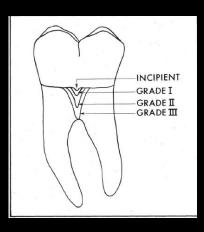
- Due to concavity, floss cannot penetrate or remove any plaque
- Interdental brushes or proxy brushes ideal

Anatomical Risk Factors- Cervical Enamel Projections (CEP)









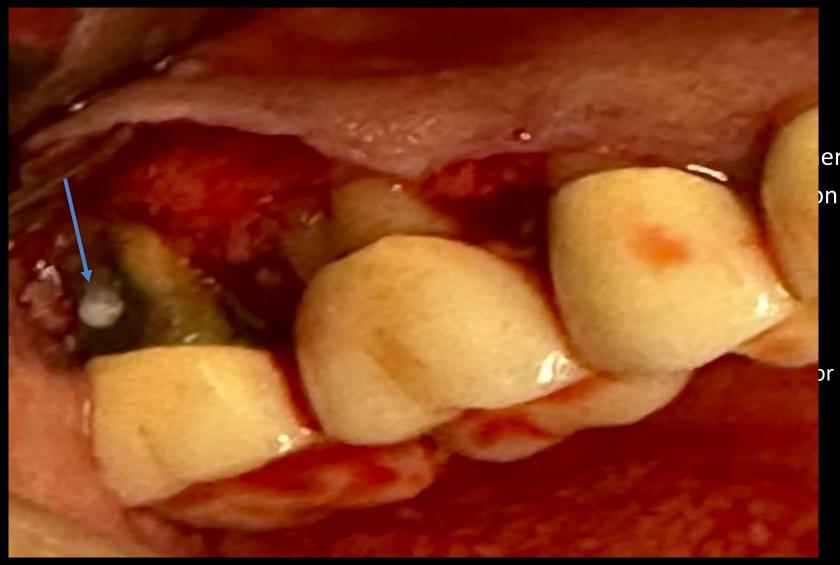
• An apical extension of ectopic enamel apical to CEJ level, Existence of CEP inhibits CT attachment - Blieden et al.

Masters and Hoskins (1964) classified CEP's

Grade I: slight extension from CEJ of the tooth to furcation entrance

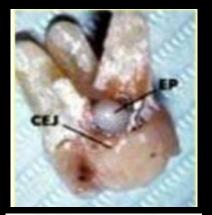
Grade II: approaches entrance but does not enter the furcation (no horizontal component)

Grade III: extends horizontally into furcation



ent

or calculus.





 $\label{eq:Figure 1: Gingival abscess and suppuration in the premolar area.}$



FIGURE 2: Radiograph of tooth 44. The presence of a radiopaque structure can be observed around the cervical region.



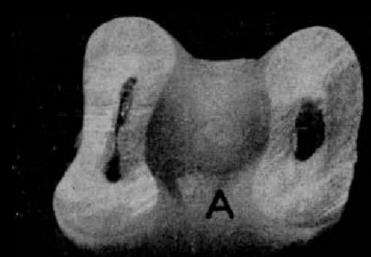
FIGURE 3: Surgical exploration. The presence of EP associated with extensive bone loss can be observed.



FIGURE 4: Assessment of the remaining supporting tissues.

©Singh DMD,MS

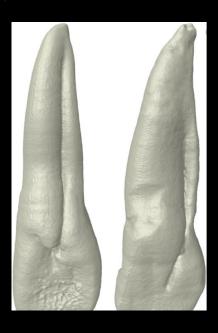
Intermediate Bifurcation Ridge (IBR)



- Everett (1958) first to describe incidence of bifurcation ridges
- IBR connects mesial & distal roots, composed primarily of cementum per Matthews et al.
- Considered a cemental anomaly, appears as a distinct ridge
- IBR offers a good location for retention of subgingival dental plaque, difficulties in debridement

Palatoradicular Grooves (PRG)





Sakkir et al. Combined endo- surgical management of a palatogingival groove in a maxillary lateral incisor with two canals

- Developmental anomaly, defined as "developmental groove present on palatal aspect of max incisor"
- Oehelers 1958 condition as radicular invagination in upper lateral incisor in Chinese female patients
- 2.5-8.5% located on lingual surface of #7,10 with grooves extending over cingulum & continue apically to root -Schwartz et al.

PRG





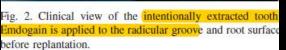






Fig. 4. Four-year follow-up, periodontal probing depth showed substantial reduction from 13 mm to 3 mm.

- Grooves act as "funnels" for plaque retention b/c area difficult to clean for pt. & clinician.
- Al-Hezaimi et al. (2009)-case report on 15 y.o pt. complaining of pus discharge
- PRG detected from crown to gingival sulcus w/ PD 13mm
- Treatment involved endodontics, intentional replantation & emdogain therapy . PD at 5-year f/u 3mm

Cemental Tear (CeT)



Figure 3. A. (left) Radiograph taken in January 1987 revealing the cemental tear (arrow) on the mesial aspect of the maxillary left central incisor. B. (right) Another thin fragment (arrow) detached from the mesial aspect of the right incisor in August 1992.

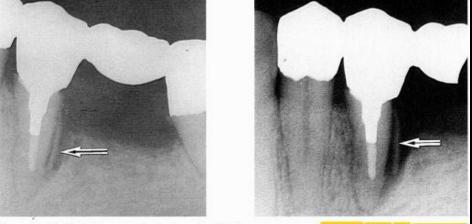
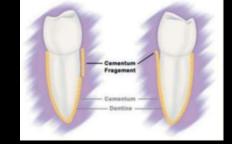


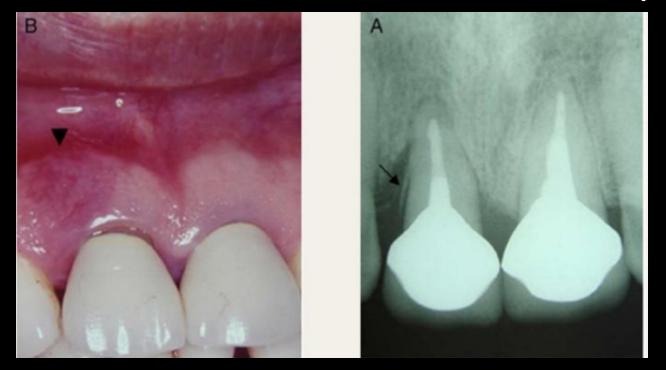
Figure 5. A. (left) Radiograph taken in December 1993 revealing a severe intrabony defect and the cemental tear (arrow) on the distal aspect of the mandibular left second premolar. B. (right) The fragment of cementum (arrow) was located apart from the root surface completely in February 1994.

- Defined as a detachment of cementum from root, cementum separation can be complete or incomplete
- Complete separation: displacement of a fragment into the PDL Incomplete separation: cementum fragment partially attached to root surface



Apicocoronally location of cemental tear noted using PA's- Ishikawa et al., all patients in study > 50 years

Cemental Tear (CeT)





- Ishikawa (1996) -CeT associated w/localized attachment loss due to aging /occlusal strain
- CeT are painless, detected clinically w/ localized deep PD & PA w/ localized radiolucency surrounding a "prickle-like body", mistaken for calculus
- Clinical characteristics associated w/ CeT: tissue swelling, localized deep pockets & PAP
 TX: Apical Surgery, Extraction & Intentional Replantation

Cemental Tear

Clinical finding	Predisposing factor	
Deep periodontal pocket	Age	
Rapid attachment loss	Occlusal overloading/trauma	
Vertical bony defect	Impaired tissue repair	
Prior endodontic treatment	Failure of endodontic treatment	
Sinus tract	Marked attrition	
	Thicker cementum	

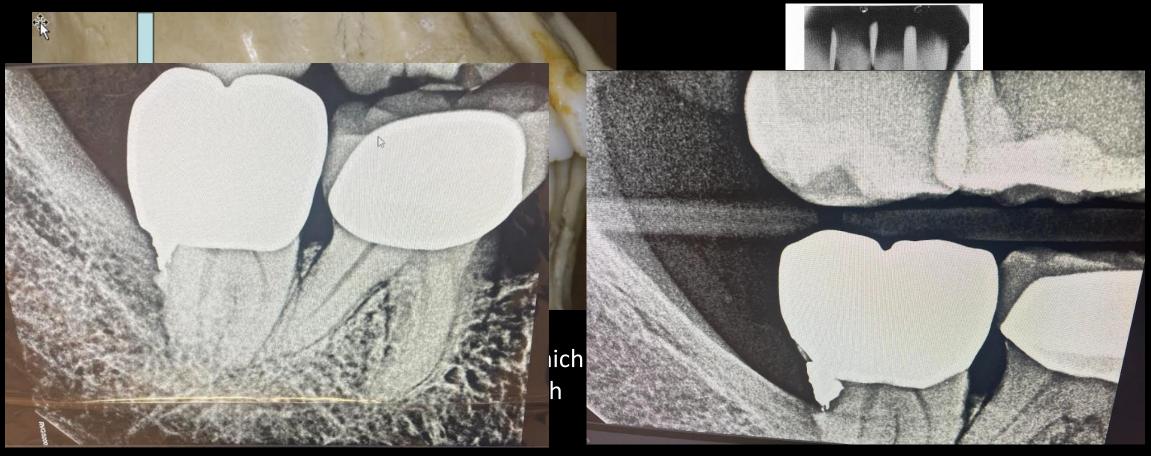






- Lin et al. (2011) report that unnecessary RCT can be avoided if proper vitality test & PAs are evaluated along w/ knowledge of CeT pre-disposing factors
- Max or Mand incisors (76.1%), men (77.5%) & pts older than 60 yo most affected

Root Proximity (RP)



RP determinations: Favorable > 1mm bone b/w roots OR Unfavorable <1mm

Malocclusion & Crowding



Fig. 1. Grade I furcation involvement of maxillary second molar, grade II furcation involvement of first molar. The root proximity between these teeth makes access extremely difficult.

- Maloposed teeth, crossbite & crowding of Max & Mand anterior sextant seen w/ > plaque retention, > PD, gingivitis, bone loss & CAL per Artun et al. (1987), Ainamo (1972), Matthews et al. (2004)
- However if interproximal spaces are reduced b/c crowding, root proximity may occur
- Patients with excellent plaque control showed NO relationship b/w crowding & bone loss

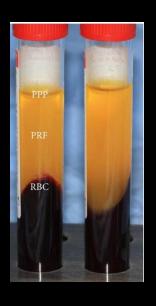
Third Molars



- Partially impacted 3rd molars exposed to oral environment have more susceptibility to periodontal infection and higher attachment loss
- Kugelberg et al.- periodontal healing of 2nd molars after 3rd molar removal comes w/ infrabony defects & deep PD in pts > 26 y.o with mesioangular or horizontal impactions









- Camps-Font et al. (2018) regenerative techniques studied for prevention of periodontal defects after 3rd molar extractions & compared these procedures w/ spontaneous healing of the socket. NO LONG-TERM STUDY
- Lack of consensus of favorable outcomes with regen materials, use of biomaterials have greater infection risk especially areas with NO adequate wound closure
- Platelet concentrate MAY have some benefit in lowering complications such alveolar osteitis & improved soft tissue healing



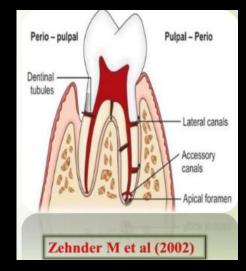
#1,16 – non-functional occlusion with or without decay

#17,32 – mesially-tipped PBI

#18,31 – deep distal decay extending to pulp & sub gingivally; distal periodontal pocket

Accessory Canals

- Inflammatory process influenced & maintained by bacterial by products that can reach the periodontium via accessory canals
- Gutman (1978)- Accessory canals seen in the furcation region in 102 extracted molars with 29.4% in mand & 27.4% in max molars
- Communication b/w the pulp chamber noted via dentinal tubules
 Literature consensus shows great deal of intercommunication b/w pulp & periodontium via accessory canals

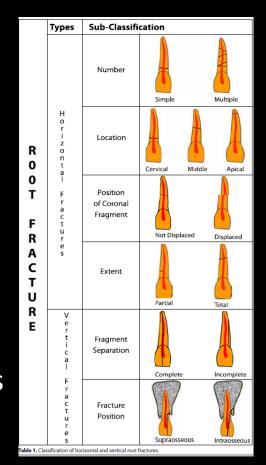


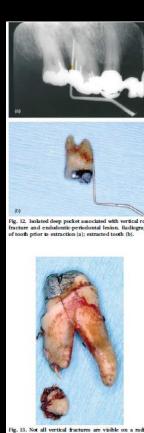




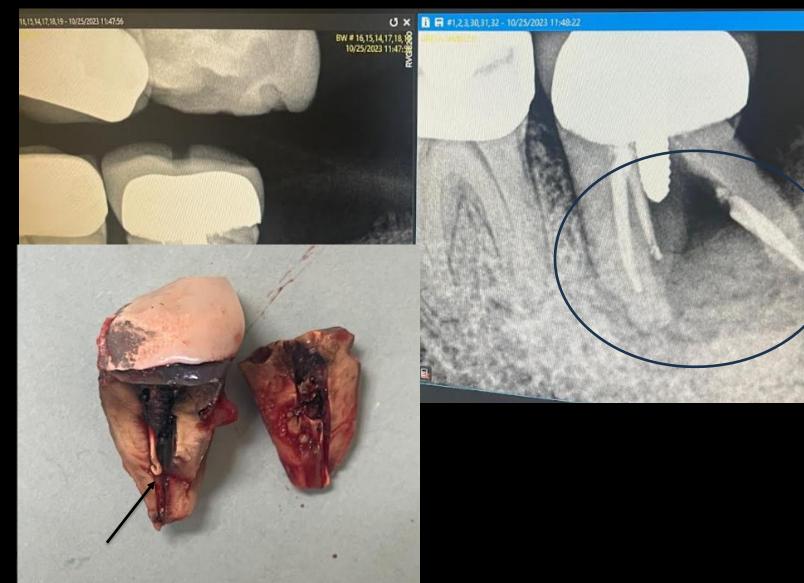
Vertical Root Fracture (VRF)

- VRF are longitudinal fractures that might begin on the internal canal wall & extent outward to external root surface- Ercoli et al. 2018
- Fractures located at cervical 1/3 rd. root act as PLAQUE RETENTIVE b/c of greater colonization of subgingival plaque- poor prognosis
- Fractures at midroot & apical region favorable prognosis

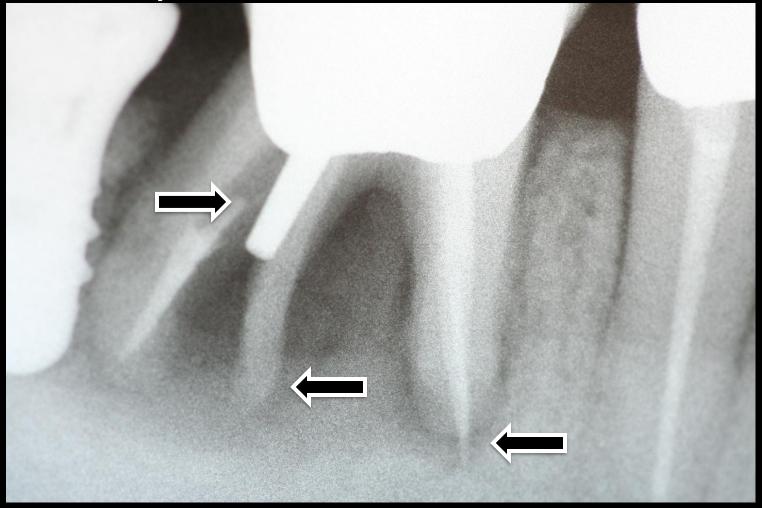




Endodontic Tx & Periodontium



Pulp & Periodontium Intertwined



Missed Canal, Perforating Post, Overfilled Canals lead to bone loss

Risk Factors Summary

Individual Risk Factors		
Modifiable Risk Factors	Nonmodifiable Risk Factors	Local Risk Factors
Smoking	Age	Root proximity
Diabetes	Genetics	Tooth malposition
Obesity	Gender	Enamel pearls and cementoenamel projections
Others such as stress, osteoporosis, alcohol consumption, nutritional deficiencies	Ethnicity	Root abnormalities such as palatoradicular grooves, cemental tears
		Others such as subgingival restorations, open contacts

Periodontium & Restorative Relationship



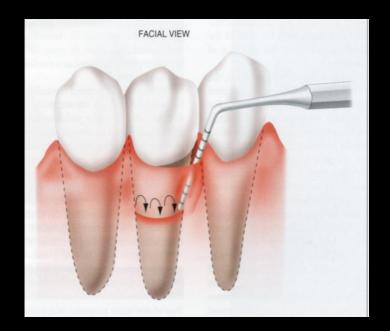
- Restorative & periodontal therapy collaborate frequently
- Ideal periodontium foundation leads to successful restorative therapy
- GP & periodontist need to work together for best pt. results
- If there is any doubt in a tx plan good rapport will provide optimal results
 "Teamwork makes the dream work"

Periodontium & Restorative Relationship

What are we trying to do

- To predictably coordinate gingival & crown margins (esthetics, hygiene) long-term
- To achieve optimal soft-tissue & porcelain color
- To facilitate procedures (preparations, impressions & cementation) by restorative dentist
- Basic principle- inflammation/trauma must be eliminated prior to any restorations





How can we recognize & measure inflammation trauma?

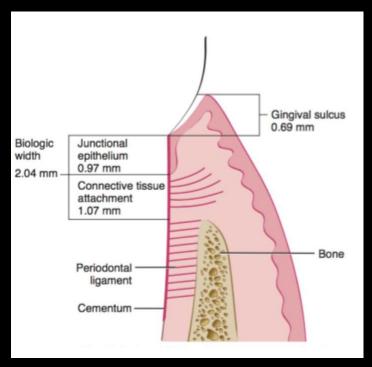
- Complete examination provides accurate diagnostic information
- Probe areas, look at tissue color and texture
- Formulate a sequenced treatment plan
- Avoid restorative therapy UNTIL periodontal therapy addressed

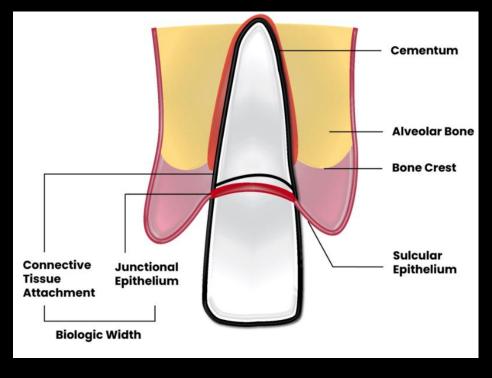




- "I did a crown prep on #3, but I see bone loss on #3. Can you help me
- Inspect your PA's thoroughly, look at the distal of #2, severe RBL
- Avoid tunnel vision, examine entire quadrant

Restorative Factors - Biological Width (BW)





- "Physiological dimension of supracrestal gingival dimension (dentogingival component) composed of JE (0.97mm) & supracrestal connective tissue attachment SCTA (1.07mm)"
- Gargiulo-cadaver study, most constant average dimension was SCTA & most variable JE
- Ercoli et al. 2018- BW dimensions can only be assessed by histology & methods such as transgingival probing

Restorative Factors - Subgingival Margins





- Subgingival margins can cause negative effects on periodontium if margins violate SCAT (BW)
- Clinically sites will look inflamed and erythematic
- Patients will report "redness wont go away even with me flossing"





Nitin Khuller N. Sharma

How do we help patients

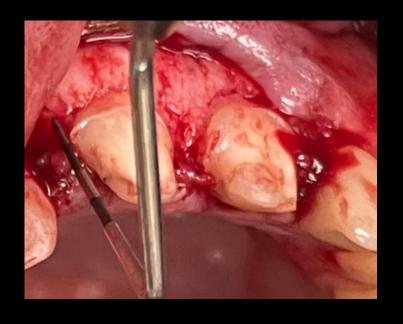
- Ideally, explain to the patient what CL is in layman terms (gum shortening, tooth longer)
- Prepare ideal margin as best as possible & then refer to periodontist w/ provisional
- New bone level adapted per your existing margin

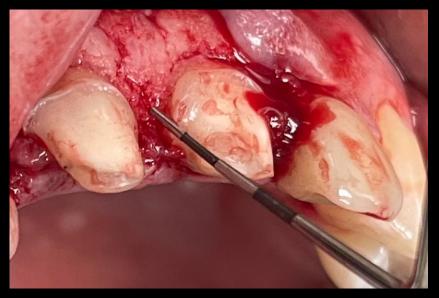




Why is this patients gums so inflamed?

- OH, is good, possible B/W violation
- Gingival health & texture looks healthy after crowns removed







Excessive gingival tissue needs to be removed and from margin ~ 3mm ostectomy done





How do you know if procedure works

- Color of gingiva looks coral pink & no inflammation
- Anterior cases should have final impressions 4-6 months per phenotype
- Don't rush, always a chance of rebound





- Referral from restorative dentist for short clinical crowns with excessive gingival tissue
- Lack of retention and no detailed margin design noted











PO 3-weeks

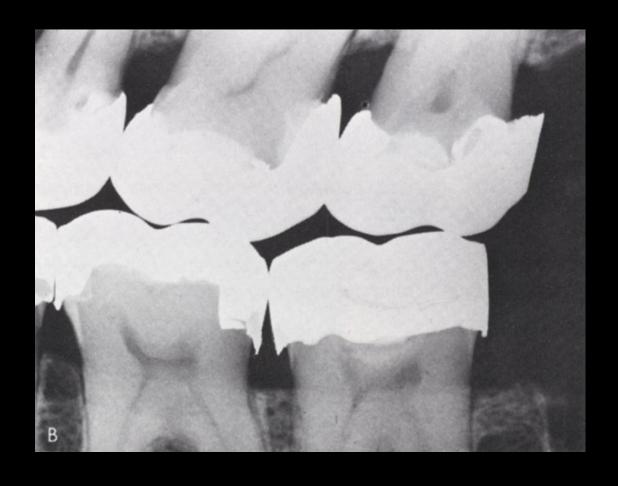
Restorative Factors- Overhanging dental restorations



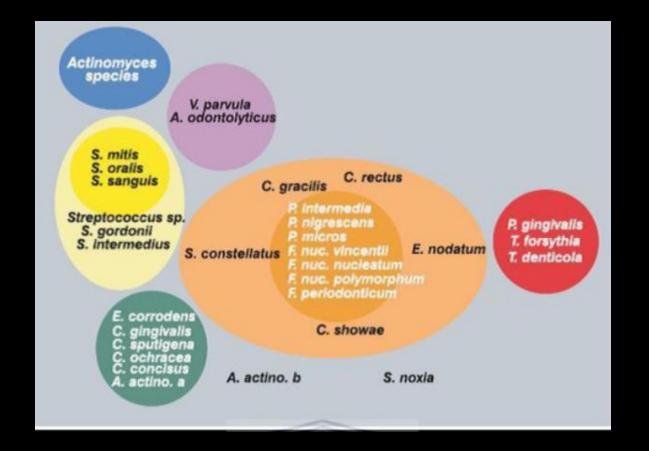


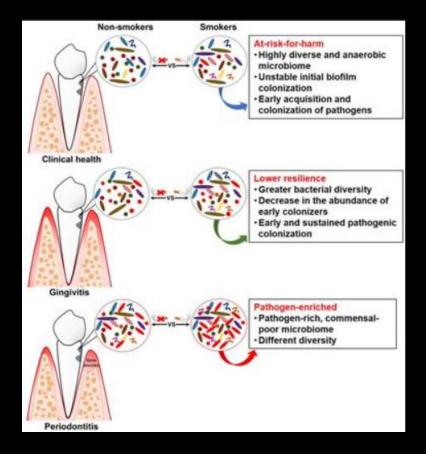
- Seen in Cl II restorations b/c difficult access for cleansibility in patients with good oral hygiene
- Matthews et al Higher periodontal attachment loss associated w/ overhangs & more plaque formation & shift in microbial composition (health to perio pathogen)
- Overhangs may cause damage by impinging on interdental embrasure & BW
- Sensitive tactile instrument along w/ radiographs to aid in detection





• Defective indirect and direct restorations





- Lang et al. (1983) placement of subgingival restorations w/ overhanging restoration leads to changes in subgingival microflora
- Overhangs lead to more sub-G pathogenic bacteria (anaerobes & black pigmented Bacteroides species) & flora resembling chronic perio disease
- Concluded that the subgingival microflora after placement of overhang restorations leads to possible changes in periodontal pathogens









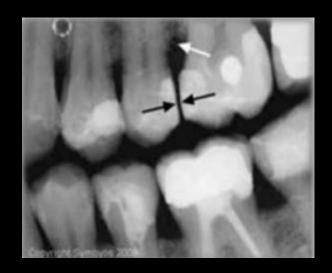


"I want to save all my teeth because I never have had an extraction"

- #31 deep pockets, after flap overhang more than 3mm #30 PFM
- Plaque retentive factor must be eliminated & fluted margins
- Without flap hard to tell overhang extent

Restorative Factors - OPEN CONTACT





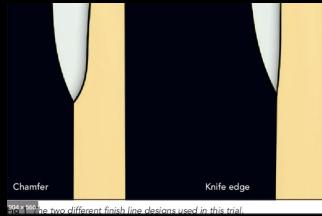
- Ercoli et al.- Open contacts allow food impaction in b/w teeth
 Greater occurrence of food impaction at sites with open contacts associated with greater PD
- Jernberg et al.- Greater prevalence of food impaction and occlusal interferences at open contact sites were statistically significant. Max posterior teeth primary concern

Do NOT cement a restoration with an open contact! Plaque trap

Restorative Factors - Subgingival margins

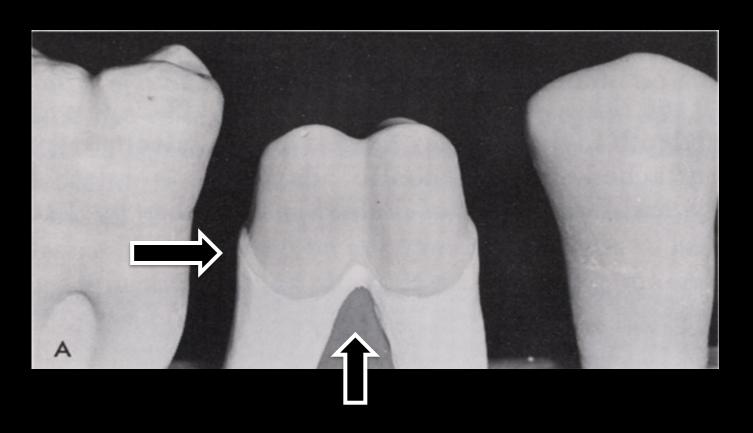






Paniz et al. (2016) - determined if placement of a single restoration w/ subgingival margin on a tooth in max anterior zone would affect periodontal soft tissue parameters. Deep chamfer vs. feather edge preparations compared

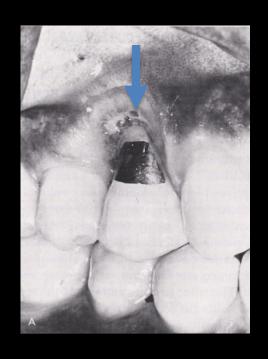
- Statistically significant difference at baseline & 12-month follow up n terms of BOP w/with feather edge more bleeding than chamfer
- Concluded that feather edge might be preferred because less recession However higher patient comfort noted w/ deep chamfer margin design



Flute your margins if needed

Courtesy of Dr. Hyman Smukler

Restorative Factors - latrogenic Damage







Courtesy, R. Yuodelis

• Soft-tissue damage by improper use of a rubber dam clamp





Courtesy, M. Maveli

- FPD with gingival encroachment, poor marginal fit & closed embrasure spaces results in inflammation
- Do NOT cement restorative work that will lead to periodontal issues
- Need to check contacts aggressively prior to cementation





Courtesy, M. Maveli

- latrogenic effects leads to gingival irritation, inflammation & higher levels of plaque build up
- Keep in mind patient and providers time when cases fail
- Repeated removal of restorations can cause pulpal damage

Orthodontic latrogenic Effects

 Inadequate office or patient maintenance during orthodontic care may result in periodontal inflammation

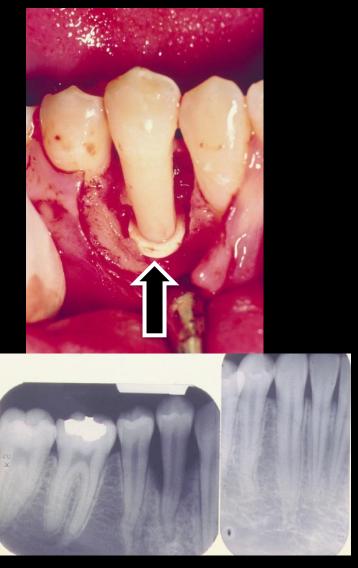
Instruct patient to use water pick

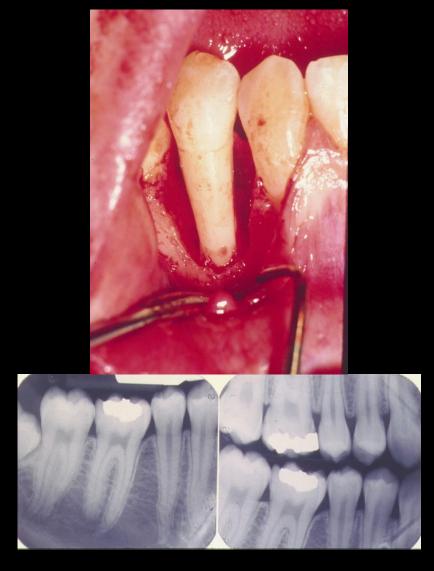




- Gingival overgrowth related to plaque around orthodontic appliances
- Need for supportive hygiene therapy on a higher recall phase while bands in place
- Soft tissue damage results

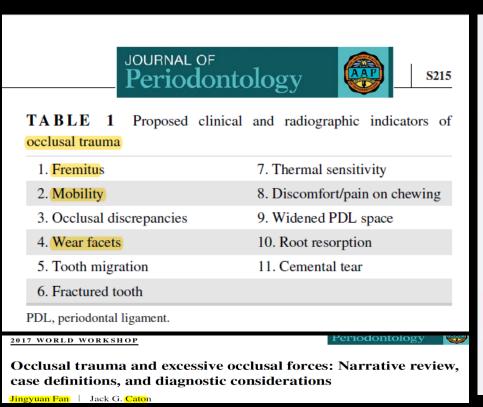


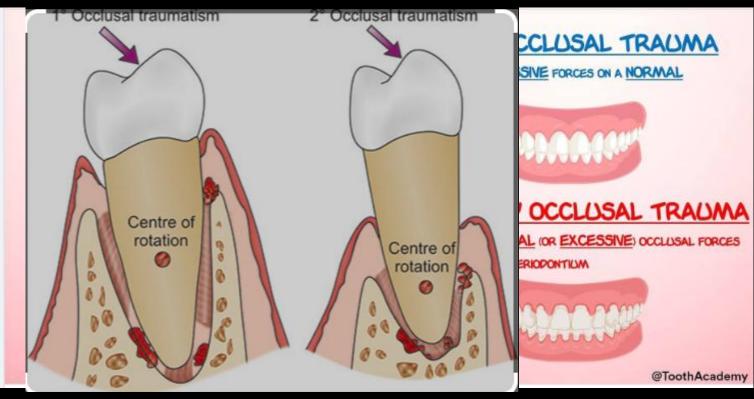




- Hard tissue damage seen from retained residual elastic band
- Removal of the orthodontic elastic rids the cause but healing the effect is not predictable

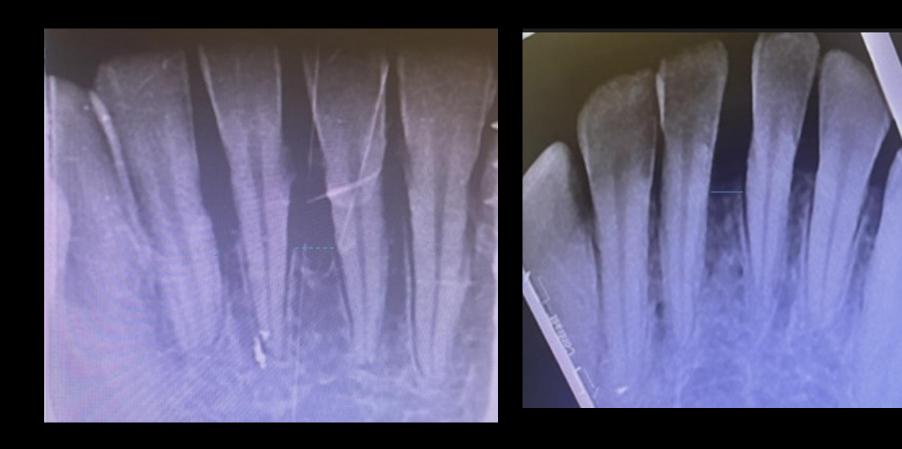
Restorative Factors- Occlusal trauma





• Always look for occlusal trauma, helps in educating patient

Relationship of Occlusion & Periodontitis



• Occlusion needs to be adjusted as needed, widened PDL seen in PA's

Should I Save or Extract





Tarnow et al. presented factors when to extract/save teeth

Extract

- Tooth (w/ existing crown) will need a new RCT, crown lengthening, post & new crown
- Lack of tooth structure above the crest i.e., lack of adequate "ferrule"
- High chance of decay & poor OH in the mouth
- Perio surgery will cause high esthetic issues w/ significant papilla loss & mobility
- Grade III or greater mobility & furcation involvement





Case where C/L is not recommended

 Short roots for ideal outcome, prefer ratio of 1:2, furcation involvement, compromise adjacent bone



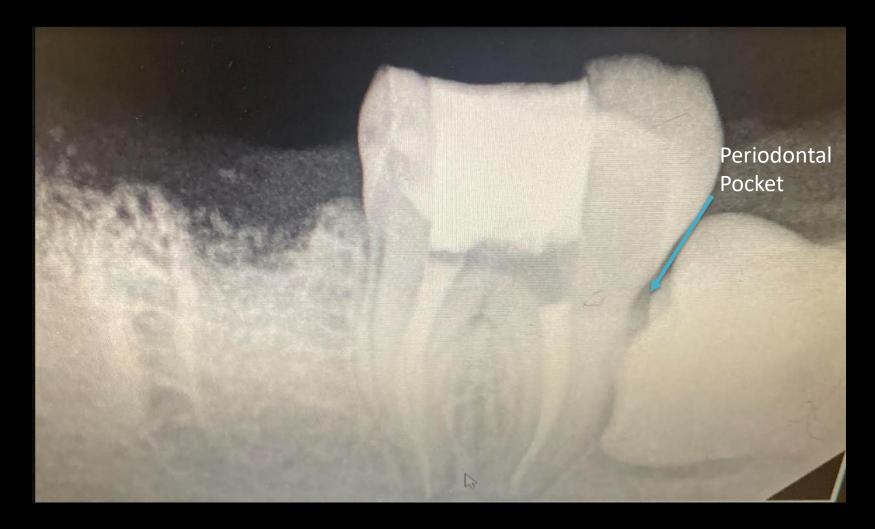








- Supraeruption noted, poor OH, keep patients in first molar occlusion
- Remove both second molars, poor treatment planning leads to complications





- Can you do c/l on #18 please, patient has seen endo
- The distal of #18 has severe bone loss, treatment planning 101!

<u>Save</u>

- Intact dental arch
- Functional restorations
- Sufficient tooth structure above the alveolar crest
- Low caries rate
- Little to low periodontal disease
- Tooth is NOT in the esthetic zone (Black Triangles)
- Emotional pt wanting to saving tooth at all costs







- "I want to keep my teeth, and I don't want implants"
- Let's examine case from #22-27











Summary

- Thorough evaluation of all disease factors should be done to determine the etiology of the disease
- Understand complex & unique anatomy of teeth with all plaque retentive features
- Restorations should always be placed supragingival, subgingival margins should be done with care
- Minimize all overhangs & open contacts so periodontal health maintained
- Open communication is key b/w restorative dentist & specialist

THANK YOU



Feel free to email me at hdsingh1891@gmail.com for any questions