

PERIO 430 STUDY REVIEW

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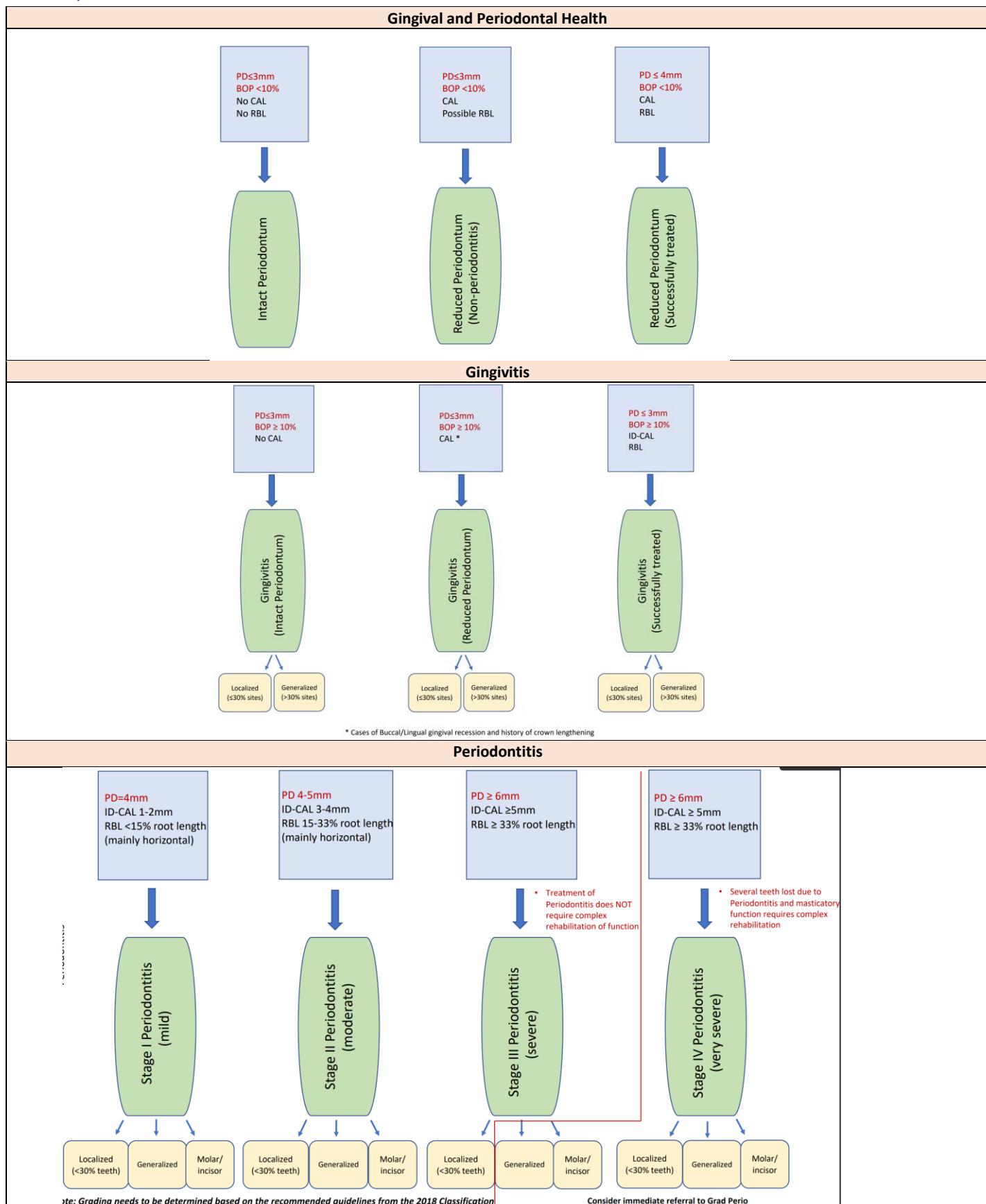
IMPLANT SITE DEVELOPMENT**75**

SOCKET GRAFTING
SINUS GRAFTS

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IMPLANT RISK FACTORS**77**

A tasty Perio Dx Review



Staging:

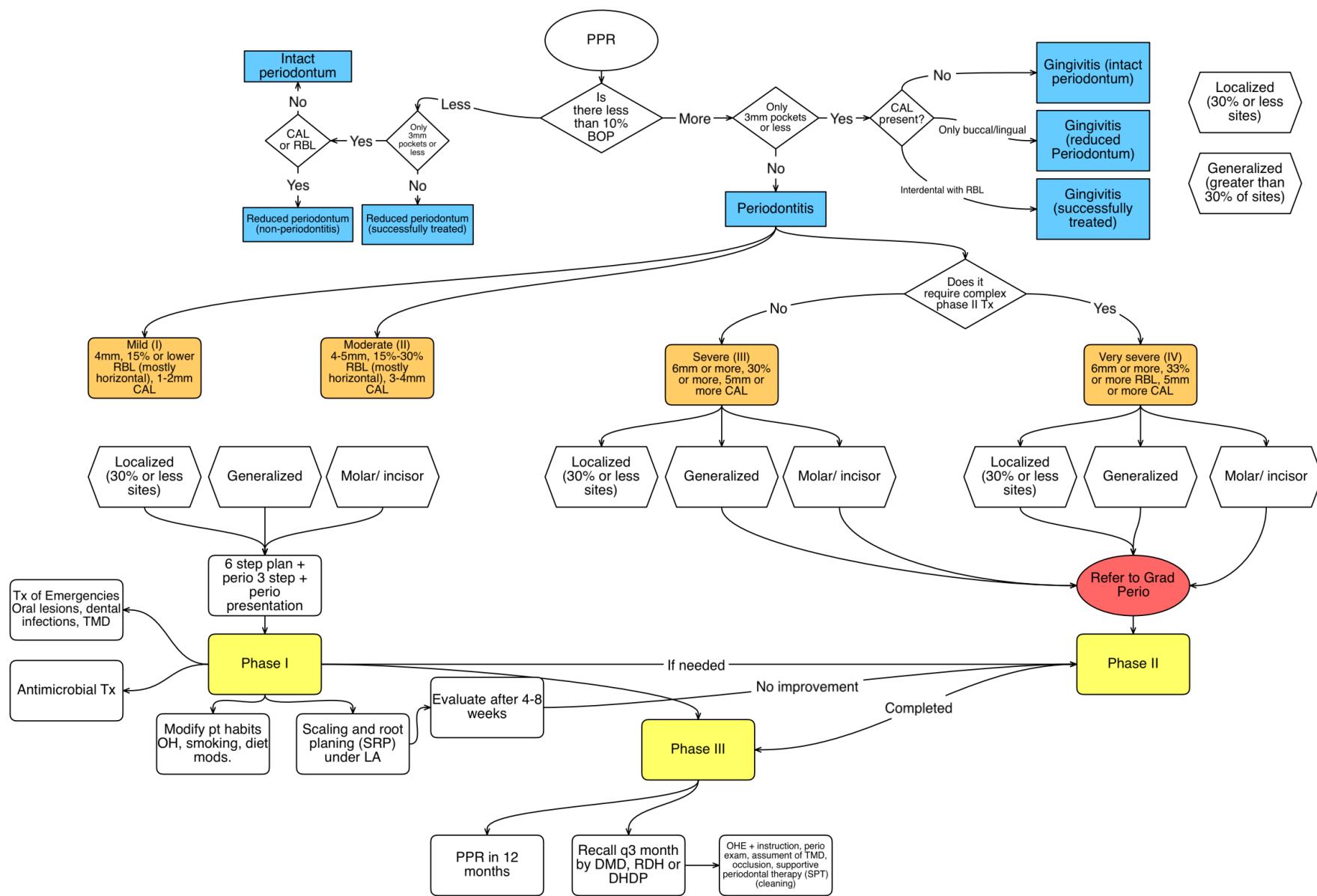
	Periodontitis Features	Stage I	Stage II	Stage III	Stage IV
Severity	Interdental CAL	1-2mm	2-4mm	≥ 5mm	≥ 5mm
	Radiographic Bone Loss (RBL)	<15% (Coronal 1/3)	15-30%	>30% (Middle 3 rd +)	>30% (Middle 3 rd +)
	Tooth Loss (from perio)	No Tooth Loss		≤ 4 teeth	≥ 5 teeth
Complexity	Local	-Max probing ≤ 4mm -Horizontal Bone loss	-Max Probing ≤ 5mm -Horizontal Bone loss	-Probing ≥ 6mm -Vertical Bone loss ≥ 3mm -Class II or III Furcation -Moderate ridge defects	<i>Rehab due to:</i> -Masticatory dysfunction -Tooth Mobility Stage II+ -Drifting/flaring teeth -<20 remaining teeth
Extent	Add to stage as descriptor	Localized Generalized or Molar/Incisor pattern			

Grading:

	Progression Factors	Grade A (Slow Rate)	Grade B (Moderate Rate)	Grade C (Rapid Rate)
Primary Criteria	<i>Direct evidence of progression</i>	Radiographic bone loss or CAL	No loss over 5 years	<2mm over 5 years
	<i>Indirect Evidence of progression</i>	% Bone loss/Age	<0.25	0.25-1
Grade Modifier	<i>Risk Factors</i>	Case Phenotype	Heavy biofilm w/ low destruction	Destruction correlates to biofilm thickness ↑ destruction for the amount of biofilm thickness
		Smoking	Non-smoker	< 10 cigs/day
		Diabetes	No diabetes	Well controlled Diabetes
				Not controlled diabetes

** Start with grade B as default -> W/ further analysis can move to grade A or B**

Follow this flow for clinical success (Brought to you by Daniel Su)



Ok...Now that you are a periodontist, lets talk specifics

Principles of Periodontal Surgery

Perio Surgery = techniques that *intentionally* sever or incise the gingival tissues

- At the end of Phase I Tx (Perio Re-eval) we assess whether we can move to phase III Maintenance or if we need to do Phase II Surgical Tx
 - o Only go to surgery if Pt is motivated and have good plaque control

Purpose of Perio Surgery	<ul style="list-style-type: none">- Accessibility of instruments to the root surface -> Root cleaning/debridement- Control or eliminate inflammation- Correct anatomic conditions favoring progression of disease ->Pocket elimination- Regenerate periodontal apparatus- Resolution of mucogingival problems- Placing implants
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Types of Perio Surgery

Pocket Reduction Surgery	
Purpose	<ul style="list-style-type: none">- Eliminate Pocket wall- Create Stable, <i>easy</i> to maintain area- Promote regeneration
Types	Resective <ul style="list-style-type: none">- Gingivectomy- Apically displaced flap- Undisplaced flap w/ w/o osseous resection
	Regenerative <ul style="list-style-type: none">- Flaps w/ <i>grafts, membranes</i> etc
Correction of Anatomic Defects	
Purpose	<ul style="list-style-type: none">- Eliminate factors causing <i>progression</i> of disease- Improve <i>esthetics</i>- Resolve <i>mucogingival</i> problems
Types	<u>Plastic Surgery</u> (Widen attached gingiva) <ul style="list-style-type: none">- Free gingival grafts -> band-aid grafts <u>Esthetic Surgery</u> <ul style="list-style-type: none">- Root Coverage- Recreation of papillae <u>Preprosthetic Techniques</u> <ul style="list-style-type: none">- Crown Lengthening- Ridge Augmentation- Vestibular deepening <u>Site development for implants</u> <ul style="list-style-type: none">- Guided bone regeneration (GBR)- Sinus grafting

General Outline of Periodontal Surgery

1. Pre-operative Tx

- Remove plaque and supragingival Calculus
- 0.12% CHX rinse
- Consider anti-inflammatory meds.
- **Antibiotic prophylaxis for Endocarditis risk Pt's**

2. Determine and setup surgical instruments

Excisional/Incisional	- Periodontal Knives - Interdental Knives - Surgical Blades
Surgical Curettes	Used to remove granulation tissue, fibrous interdental tissues and tenacious C
Periosteal Elevators	Used to reflect and move the flap after incisions are made
Surgical Chisels and Dem Hoes	Used to reshape and remove bone as needed
Surgical Files	Smoothen bony ledges
Scissors + Tissue Forceps	Holds flaps during suturing and position flaps after they have been reflected Scissors remove tissue tabs, trim margins and enlarge incisions in abscess debridement
Needle Holders + Sutures	Used in conjunction to close the flap -> The most important and delicate step in most perio surgeries

3. Take measures to prevent transmission of infection

- Always wear PPE
- Cover un-sterilizable things with **aluminum foil** (Light handles, Unit syringes etc)
- **No aerosol-producing devices (Cavitron)** w/ pt's with suspected infection

4. Sedation and Anaesthesia

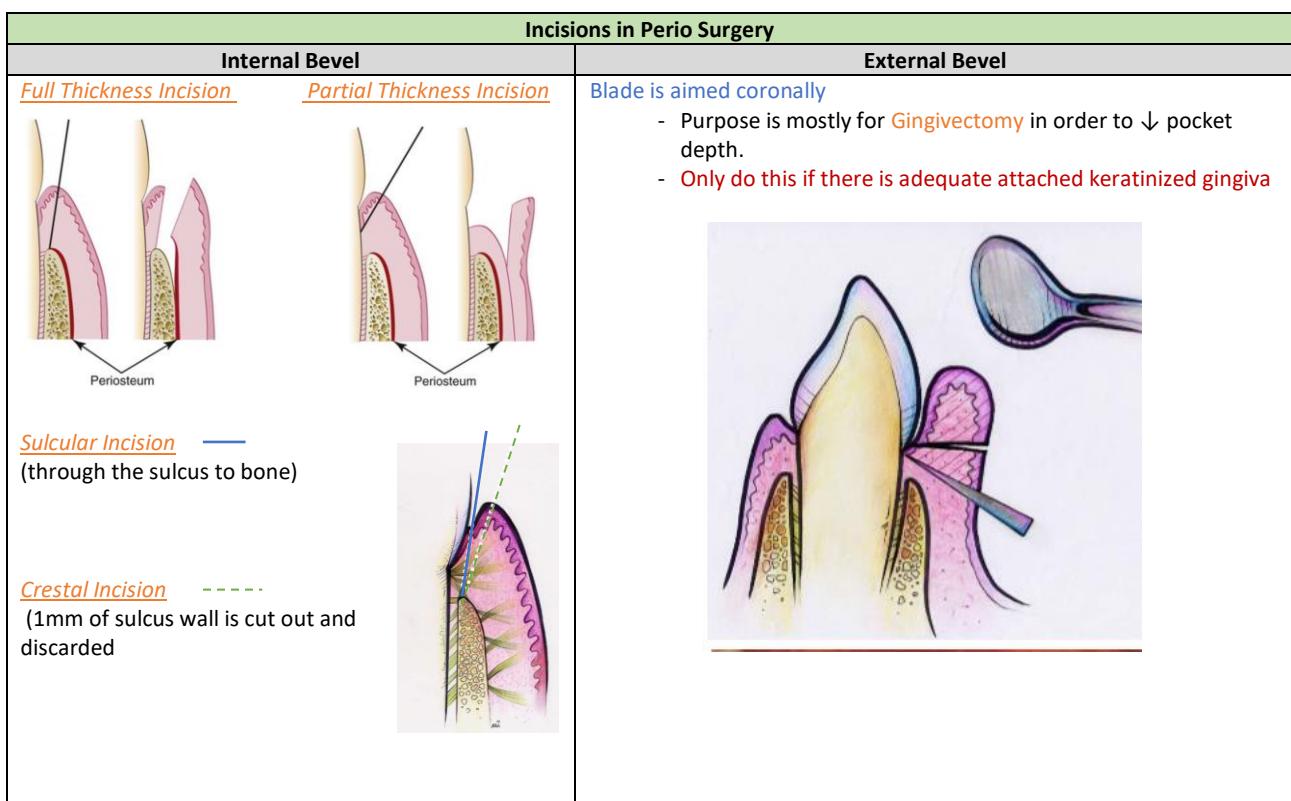
- Apprehensive pt's can have sedation (inhaled, oral or IV) -> **Benzos, Nitrous, IV sedation**

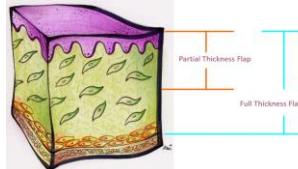
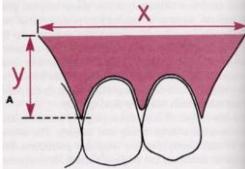
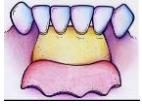
5. Tissue management

- Be gentle and careful, no rushing
- Risk patient discomfort and delayed healing if you go fast and fuck up
- Make sure all instruments are hella sharp

6. Flap and Incision Design

- **Sharp blade** with no repeated strokes (firm, continuous pressure)
- **Know your anatomy** and don't cut arteries or nerves
- If you plan on putting a flap back, **cut perpendicular to the epithelial surface**



Flaps and Flap Design		
Full Thickness vs partial thickness		Partial thickness for Free Gingival Grafting <ul style="list-style-type: none"> - Leave periosteum and some tissue above the bone - Want bleeding surface for graft integration and healing
Flap Design	 Envelope Flap  Flap w/ 1 releasing incision  Flap w/ 2 releasing 	Flaps should have sides that run parallel or converge from the base to the apex <ul style="list-style-type: none"> - Apex is never wider than the base -> Major tear risk, and ↓ blood supply - Releasing incisions made at line angles of the teeth (maintain papilla)

7. Scaling and Root Planing

- Key part of Phase I periodontal therapy

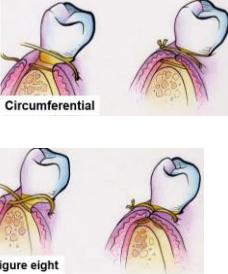
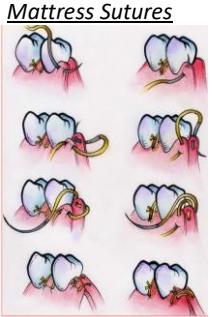
8. Hemostasis

- Initial Local Anesthesia (w/ epinephrine) + Aspirator used by assistant throughout the surgery
- Bleeding happens mostly with initial incision -> once flap is raised, and granulation tissue removed it basically stops
- Can use Surgicel (Oxidized Cellulose), Gelfoam (Gelatin sponges) or Hemostatic Collagen to help

9. Suturing

- Provides adequate tension of wound closure w/o dead space but loose enough to avoid ischemia
- Maintains hemostasis
- Allows 1° wound closure w/ proper flap positioning
- Supports tissue margins during initial healing
- ↓ post op. pain
- Prevent bony exposure

Common Suture Materials	Silk	Vicryl
	<ul style="list-style-type: none"> - Needs to be removed after 7 days (non-resorbable) - Moderate tensile strength - Good handling 	<ul style="list-style-type: none"> - Polyglactin 910 (copolymer) - ↑ tensile strength w/ mild tissue reaction - Good for long lasting suture -> prevents bacterial from moving along suture into deep tissue (Wicking) - Lasts several days - Good handling
	Plain Gut	
	<ul style="list-style-type: none"> - Collagen from mammals (sheep) - Least tensile strength - Last a few days (resorbs) 	
Knot Typing Principles	<ol style="list-style-type: none"> 1. Tight and firm to prevent slippage 2. Avoid "wicking" of bacteria -> Place knot away from incisions 3. Small knots with short ends (2-3mm) 4. Not too tight or you will get necrosis 5. Remove Atraumatically 6. Remove within 1-2 weeks regardless of material 	
	This is an awkward space that I couldn't format away.... Keep scrolling for Suturing Techniques

<p>Suturing Techniques</p> 	<p>Start buccally 3-4mm from tip of papilla</p>	<p>Mattress Sutures</p> 	<p>↑ flap security + placement control Recommended for bone regen.</p>
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10. Periodontal Dressings

- Cover surgical area to: Protect tissue, ↓ hemorrhage

Coe-Pak	Zinc-oxide (non-eugenol) <ul style="list-style-type: none"> - Mix 2 tubes together and pack it on the healing tissue (buccally and lingually so they interlock and it doesn't fall out) <p>DON'T USE if Pt has peanut allergy...it has peanuts in it...for real</p>	
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Restorative Interrelationships

There is a tight relationship between periodontal health and teeth restorations: Periodontium needs to be healthy for long term survival of teeth and restorations just be designed well to create periodontal health

With a healthy periodontium 😊:

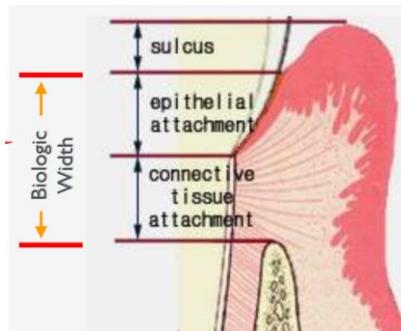
- ↓ bleeding during tissue manipulation -> Better accessibility and esthetics of resto's, ↓ risk of failure from lack of isolation or poor marginal integrity

With Unhealthy periodontium 😞:

- Persistent inflammation = bone loss -> Eventual tooth loss
- ↓ esthetics

Biologic Width

What is it?	Barrier acting as a protective physiological seal around teeth <ul style="list-style-type: none"> - Natural distance from bottom of gingival sulcus to Alveolar crest (Junctional Epithelium + Connective Tissue Attachment)
What is the Width?	<p>Average = 2.04mm</p> <ul style="list-style-type: none"> - 0.97mm Junctional Epithelium + 1.07mm Connective Tissue - + Average Sulcus Depth of 0.69 (I don't know why this is here..it's not involved really) <p>**Minimum of 3mm coronal to the alveolar crest is needed to allow healing and proper restoration of the tooth -> Any less and inflammation will begin to affect the bone.**</p> <ul style="list-style-type: none"> - 2mm BW + 1-2mm for restorative finish line = 3-4mm supracrestal tooth structure is needed for restorations
Restorative Margin Placements	
Supragingival	<ul style="list-style-type: none"> - Safest for Periodontium and easiest to prepare, cleanse, detect recurrent decay, take impression -> Basically everything is great - Usually reserved for non-esthetic areas (although new materials are making supragingival margins in esthetic areas ok)
Equigingival	<p>Used to be the worst option</p> <ul style="list-style-type: none"> - ↑ plaque retention than supra OR sub ging. Margins -> ↑ inflammation, ↑ recession <p>It's a little better now with new materials and finishing techniques -> Still not ideal</p>

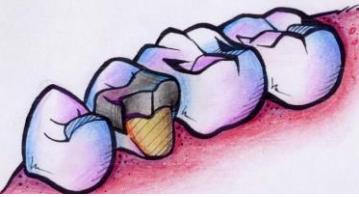
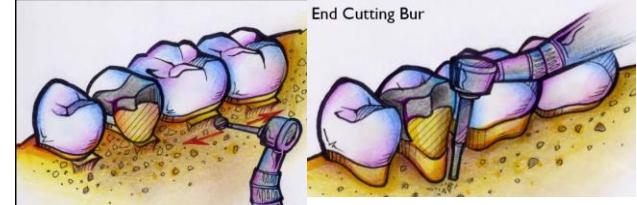


<p>Subgingival</p> <p>Sometimes it's needed to mask a restorative margin for esthetics</p> <ul style="list-style-type: none"> - If too deep and violating biologic width -> Gingival inflammation (Especially in sites with KT <2mm) <p>Associated with ↑ microflora, ↑ plaque, ↑ inflammation, ↑ pocket formation and GCF</p> <ul style="list-style-type: none"> - Hard to finish margins, take impressions, and perform good OH <p>Reasons Why you might be dastardly enough to try this:</p> <ul style="list-style-type: none"> - Create adequate retention - Prevent root sensitivity - Create significant contour alterations b/c of caries or other tooth deficiencies - Esthetics <p>**IF you need to do this, place margins NO MORE than 0.5mm into sulcus so they can be cleansed still**</p>	<p>Invading BW</p> <ul style="list-style-type: none"> - Resto Margins within <2mm of alveolar crest - Resto margins placed too far below gingival crest -> Impinges on gingival apparatus - No other etiologic factors <p>Results</p> <ul style="list-style-type: none"> - Bone Loss + Gingival Recession -> Body attempts to re-create space for tissue reattachment by running away OR - Gingival Tissue Response -> No bone loss, but persisting gingival inflammation and sensitivity <p>Evaluating Violations</p> <p>Clinical</p> <ul style="list-style-type: none"> - Tissue discomfort when probing to assess margins -> VIOLATION - Bone sounding under LA (subtract sulcus depth) -> if <3mm = V.I.O.L.A.T.I.O.N <p>Radiographs</p> <ul style="list-style-type: none"> - Interproximal BW violations (not Buccal, Lingual though...so not perfect) <p>Signs</p> <ul style="list-style-type: none"> - Chronic, progressive gingival inflammation around resto (BOP, Hyperplasia, Recession, Pocket formation, CAL) <p>** Take note of variations! BW can be as narrow as 0.75mm or as tall as 4.3mm**</p> <p>(BW is 3mm in this case, gives you more lee way when placing sub. G margins)</p>
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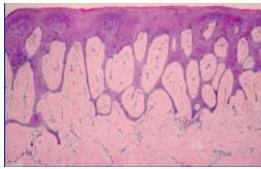
Crown Lengthening or Teeth Extrusion

Kinda the procedure of choice for correcting BW violations

Crown Lengthening	
Objectives (exam Q)	<ol style="list-style-type: none"> 1. Enabling the restorative Tx w/o impinging on BW 2. Aiming for good marginal seal w/ retention for restoration 3. Access for removal of subgingival caries 4. Esthetic improvement 5. Correction of occlusal plane 6. ↑ access to furcation for OHE
Indications	<ul style="list-style-type: none"> - Clinical crown too short or blown out for adequate retention of crown - Placement of Subg. Margins - Excessive gingival levels (unaesthetic) - Teeth with ↑ ↑ wear - Altered passive eruption - Supra-erupted teeth with inadequate interocclusal space - Prevent Violation of BW
Contraindications	<ul style="list-style-type: none"> - Deep caries or fracture - Post-surgery creating unaesthetic outcomes - Inadequate C:R ratio - ↑ risk of creating furcation involvement (that wasn't previously there) - Unreasonable dental compromise just for esthetics - Unreasonable compromise to alveolar bone

<p>There are some things to consider</p>	<p>Etiologic Factors:</p> <ul style="list-style-type: none"> - Caries - Trauma - Endo perforation or External root resorption - Altered passive eruption/excessive gingiva - Restorative req. <p>Limiting Factors:</p> <ul style="list-style-type: none"> - C:R ratio - Maintainability - Esthetics - Location of furcations - Predictability - Comparison of adjacent periodontium - Anatomic constrictions - Level of KT gingiva 	<p>Resto Factors:</p> <ul style="list-style-type: none"> - Esthetics - Form - Function - Retention - Marginal Seal <p>Alternative Options for Tx:</p> <ul style="list-style-type: none"> - Ortho Extrusion - Root Resection (Molars) - Extraction + RPD, FPD, Implant
<p>So you have decided to Crown Lengthen...</p>	<p><u>How much bone am I actually going to remove?</u></p> <ul style="list-style-type: none"> - Generally, 3mm of sound tooth structure must be exposed at time of surgery <p><u>What if I am doing a Post and Core on an endo tooth?</u></p> <ul style="list-style-type: none"> - Go for more! You need to account for ferrule...so 4-5mm clearance is needed 	
<p>Healing Time</p>	<p>4-6 Months recommended (b/c removing bone) -> Not really a realistic timeframe though</p> <ul style="list-style-type: none"> - Actual wait time is 6 weeks for Posterior teeth, 4 months for anterior <p>**Tissue rebound might be significant and up to 6-12 months post surgery**</p> <ul style="list-style-type: none"> - Might also get black triangles, root hypersensitivity or tooth mobility 	
<p>Procedure</p>	<p>Subgingival Fractured cusp</p>  <p>----> Raise a flap and assess</p> <p>Vertical Grooving happens</p>  <p>-----> Then Inter-radicular blending</p> <p>Recontour the bone around the adjacent teeth</p>  <p>-----> No more BW Violation!</p>	
Forced Orthodontic Eruption	Non-surgical Tx option -> Orthodontic tooth movement to cause extrusion of a tooth	
<p>New procedure who dis?</p>		
<p>SLOW extrusion</p>	<ul style="list-style-type: none"> - Bone and gingiva follow the tooth -> Go until bone is coronal to ideal level (then you can shave it down) - Tooth is stabilized in new position and surgery is performed to correct bone and gingival levels 	
<p>FAST Extrusion</p>	<p>Orthodontic movement + weekly fiberotomy to aid in fast eruption</p> <ul style="list-style-type: none"> - Bone and gingiva do not follow. - Tooth is stabilized for 12 weeks in new position and gingivectomy corrects gingival levels (if needed) 	

Drug-Induced Gingival Overgrowth

Characteristic Findings (Exam Q)	<ul style="list-style-type: none"> - More in <i>Anterior Gingiva</i> - ↑ Prevalence in <i>younger patients</i> - Onset within 3 months (of taking the drug) - Found in <i>papillary region</i> mostly - Compounding effects if taking <i>multiple drugs</i> associated with overgrowth! - There seems to be a dose-response relationship, but studies both confirm and deny this. <p>Features:</p> <ul style="list-style-type: none"> - Starts as <i>painless enlargement</i> of facial, lingual and papillary gingiva - Surface appears <i>nodular or lobular</i> - Firm and <i>Pale Pink</i> lesions - Chronic and slow growth -> Spontaneous <i>disappearance</i> when drug is discontinued - OHE becomes <i>difficult</i> -> <i>Secondary inflammation</i> can aggravate - Recurs after surgical removal 😞 	
Risk Factors	<ol style="list-style-type: none"> 1. Periodontal factors -> Plaque 2. Drugs -> Concomitant drugs ↑ severity 3. Age 4. Gender -> Males ↑ severity b/c circulating androgens 5. Genetics -> ↑ Severity w/ HLA 37 gene 	
Histology	<ul style="list-style-type: none"> - Acanthosis - Enlarged rete ridges - Hyperkeratosis and Parakeratosis - Epithelial Thickening - Fibrotic CT w/ ↑ cells and collagen - ↑ proteoglycans 	
Treatment	<ul style="list-style-type: none"> - Good OH -> Most important factor! - Debridement - Gingivectomy (or flap procedure) -> Provides better access for OH and ↑ esthetics - Frequent SPT - 0.12% CHX rinse - Change meds? Consult with physician and prepare for them to laugh and say no 	
Classic Drugs <i>(Also classic exam Q's)</i>		
Anticonvulsants - Phenytoin (Dilantin) - Valproic Acid (Depakene)	<p>MOA</p> <ul style="list-style-type: none"> - Used to control epilepsy and other convulsive disorders - Very pale pink enlargement <p>Facts:</p> <ul style="list-style-type: none"> - 50% prevalence of overgrowth with Phenytoin - ↑ in younger ppl and starts 3 months after drug taken 	
Immunosuppressants - Cyclosporin (Sandimmune) - Azathioprine (Imuran)	<p>MOA</p> <ul style="list-style-type: none"> - Cyclo. Used mostly to ↓ graft rejection in organ transplantation Other uses: - Type I DM, Psoriasis, Rheumatoid arthritis, erosive lichen planus, Ulcerative colitis, Crohn's diseases -> Immunological mediated conditions <p>Facts:</p> <ul style="list-style-type: none"> - Cyclosporin inhibits subpopulations of T-lymphocytes by inhibiting IL-2 mostly (but also IL-1, IL-3, IFN-Y, etc) - Incidence ranges from 13%-81% - Gingiva appears hyperemic, edematous, lobulated vs anticonvulsants features 	
Calcium Channel Blockers - Nifedipine (Adalat, Procardia)	<p>MOA</p> <ul style="list-style-type: none"> - Used to treat angina and hypertension - ↓ influx of Ca into cells -> this ↓ Myocardial cell contractility and O₂ consumption + relaxation of coronary vascular smooth muscle, dilation of coronary and peripheral arteries. - Blocks breakdown of ATP by Calcium dependent ATPase -> ↓ High energy Phosphate consumption, mechanical tension and O₂ demands <p>Facts:</p> <ul style="list-style-type: none"> - 6.4% - 44% prevalence - 1-2 months after administration - ↑ in >50 yrs old, 3x ↑ in Males vs females 	

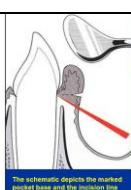
Pathogenesis	
Role of Fibroblasts	If genetically the person has ↑ activity fibroblasts will have ↑ growth vs people with low activity fibroblasts
Role of Plaque	Proinflammatory cytokines: IL-1, IL-6, TNF α -> ↑ fibroblast activity = overgrowth
Role of Drugs	CCB -> Calcium activated collagenases. When Ca blocked collagenases can't work to recycle excess collagen and tissue turnover ↓

Gingivectomy + Gingivoplasty

Frequently done at the same time

Gingivectomy		Gingivoplasty
Excisional removal of gingival tissue		Reshaping of gingiva to attain a more physiologic contour
<ul style="list-style-type: none"> - Used to remove soft tissue wall of perio pockets for pocket reduction or elimination 		<ul style="list-style-type: none"> - Contouring for gradual rise of tissue interproximally and fall on the labial and lingual surfaces
Indications	<p>Used to be done all the time -> now with new flapping methods its less common</p> <ol style="list-style-type: none"> 1. Eliminate Suprabony pockets (providing there is enough Keratinized tissue) 2. Eliminate gingival enlargements 3. Non-esthetic or asymmetrical gingival topography (providing biologic width is not violated) 4. Establish physiologic gingival contours post NUG 	
Contraindications	<ul style="list-style-type: none"> - If there is little or no Keratinized attached tissue - Infrabony Pockets (Vertical bone loss) - Highly inflamed or edematous tissue - ↓ OH - Thick bony ledges or exostoses - Areas of esthetic compromise 	
Advantages	Disadvantages	
<ol style="list-style-type: none"> 1. Predictability of morphology 2. Simplicity (pretty easy to do) 3. Favorable esthetic results (if you select the case right) 4. Probing depths ↓ 	<ol style="list-style-type: none"> 1. Secondary Intention healing (↑ discomfort) 2. Post Op. Bleeding 3. Loss of KT 4. Cannot treat underlying osseous deformities 	

The Procedure

1. Presurgical	Reduce gross inflammation and remove local factors (Calculus, Plaque, Overhangs etc)  → After SRP
2. Pocket Marking	Use pocket marker or perio probe to outline the base of the pockets (series of small bleeding points) <ul style="list-style-type: none"> - Delineate the pocket wall to be removed 
3. Incisions/Excisions	Cut the line marked in a 45° beveled angle <ul style="list-style-type: none"> - ALWAYS within attached tissue, never approach the mucogingival line (otherwise remove too much KT)  
4. Gingivoplasty	Final contouring of tissues, smoothen out sharp edges 
5. Post Op.	Periodontal Dressing is placed to protect the wound -> Stays on for 7-10 days <ul style="list-style-type: none"> - Granulation tissue will mature into normal CT and cover with thin epithelial layer - New epithelium attached begins to form on root surface 

Osseous Resection

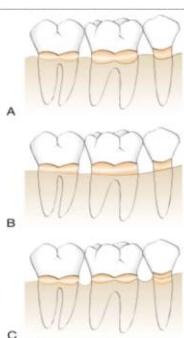
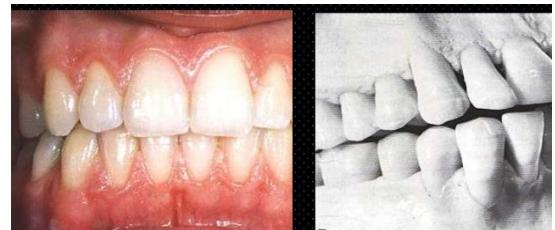
Resective Surgery = includes soft tissue procedures AND combined soft/hard tissue procedures

- Idea is to eliminate pockets and re-establish shape and form of bone around the teeth so pt can maintain their OHE

Types of Resective procedures	
Soft Tissue Resective	<ul style="list-style-type: none"> Gingivectomy Open flap curettage (w/ Modified Widman Procedures) Electrosurgery, Laser gingivectomy Wedges
Combined Soft/Hard Resective	<ul style="list-style-type: none"> Flap access and osseous resection -> Osteoplasty, Ostectomy Flap access and osseous resection w/ regenerative therapy

Bony Architecture

- Underlying bony architecture mimics the gingival form: Bone and gingiva move up at interdental and furcation areas, and are lower at radicular areas (Scalloped)



Positive architecture

Flat bony architecture

Reserved/Negative bony architecture

-> Flat architecture can be ok sometimes. Its not ideal but is better than reverse so we can deal

Soft Tissue Contours	<ul style="list-style-type: none"> Scalloped, parabolic contour Pyramidal shape w/ conical papilla interdentally In posteriors interdental papilla become flatter and broader
Positive Bony architecture	<ul style="list-style-type: none"> Similar scalloped parabolic contour as gingiva Bone higher interprox. than buccally or lingually <p>We may need to remove bone to create this contour in the case of a Pt who presents with reverse architecture</p> <ul style="list-style-type: none"> Seems counter intuitive (will cause some recession), but it prevents fast recurrence of pocketing and makes the area easier to maintain for the Pt
Variations in Bone	<p>Thin biotype -> Leads to recession and bone loss</p>   <p>Thick Biotype -> Thick buccal ledges; creates crater trough like lesion around the teeth</p>
Reverse Architecture	<p>The opposite of what is normal/what we want</p> <ul style="list-style-type: none"> Interdental and interradicular bone levels are low -> Hard to clean Buccal and Lingual plates are low Radicular bone is high (different from INTER radicular bone) <p>**This is a disease state! No one can properly maintain this so pt is prone to repocketing**</p> 
Flat Architecture	Interdental bone is at the same level as the radicular and inter radicular bone

The whole rationale behind Osseous Resection is to create a positive architecture -> Remove osseous deformities and create physiologic parabolic contour

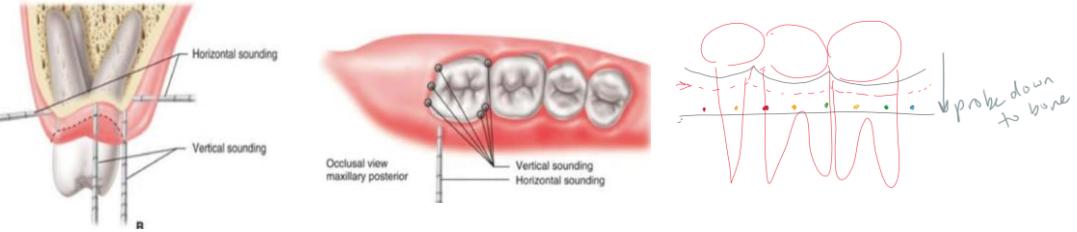
- Osseous form will mimic final gingival contour = ↓ pockets 😊

Osteoplasty + Ostectomy

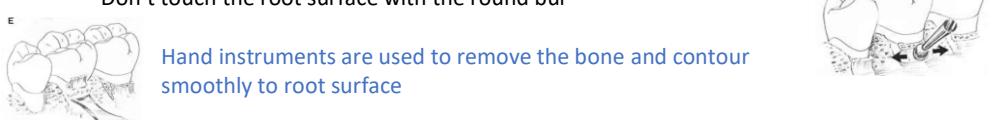
Osteoplasty	<p>= Plastic procedure where <i>non-supporting</i> bone is reshaped to achieve physiologic gingival and osseous contour</p> <ul style="list-style-type: none"> - No Loss of attachment (because the bone is non-supporting) -> No PDL attachment on the bone that is removed <p>Ex: Tori, etc, things not immediately next to teeth</p> <ul style="list-style-type: none"> - Block our access to teeth <p>Indications</p> <ul style="list-style-type: none"> - Pocket Elimination - Tori/Exostoses reduction/removal - Infrabony defect adjacent to edentulous ridge - Reduction of thick ledges (bony margins) - Shallow osseous craters - Blunted interdental septa 	
Ostectomy	<p>Reshaping of <i>supporting</i> bone (provides PDL attachment)</p> <ul style="list-style-type: none"> - Radicular and interradicular bone <p>Indications:</p> <ul style="list-style-type: none"> - Removal of interdental craters - Infrabony defects not amenable to osseous regeneration - Horizontal bone loss w/ irregular marginal bone height - Combination of defects <p>IMPORTANT CONSIDERATIONS -> Consultation with patient will be essential</p> <ul style="list-style-type: none"> - Might create recession and further attachment loss -> This is better long term though for maintenance - Recession and sensitivity is <i>VERY</i> likely, but in the end it will be better than pockets - Esthetic compromise -> Not really indicated for esthetic areas, reserve for posterior spots 	
Pre-Op (thick buccal ledges + circumferential defect)		
	 <p style="text-align: center;">↓</p> <p>Osteoplasty</p>  <p>Start with Osteoplasty</p> <ul style="list-style-type: none"> - Clear and smoothen the ledges or tori that are in your way for the ostectomy procedure - Blend in the bone and make it all run nice and smooth <p style="text-align: center;">↓</p> <p>Ostectomy</p>  <p>Ostectomy is needed because we discovered reverse architecture</p> <ul style="list-style-type: none"> - DON'T remove the bone around the furcation, this is precious - Ideal is to perform as little ostectomy as possible in order to create positive or flat architecture (↓ recession) <p style="text-align: right;">BONE AROUND THE FURCATION</p> 	

Examination and Tx Planning

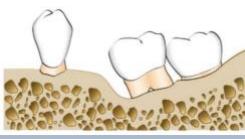
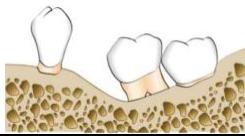
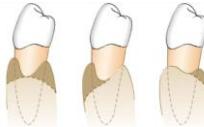
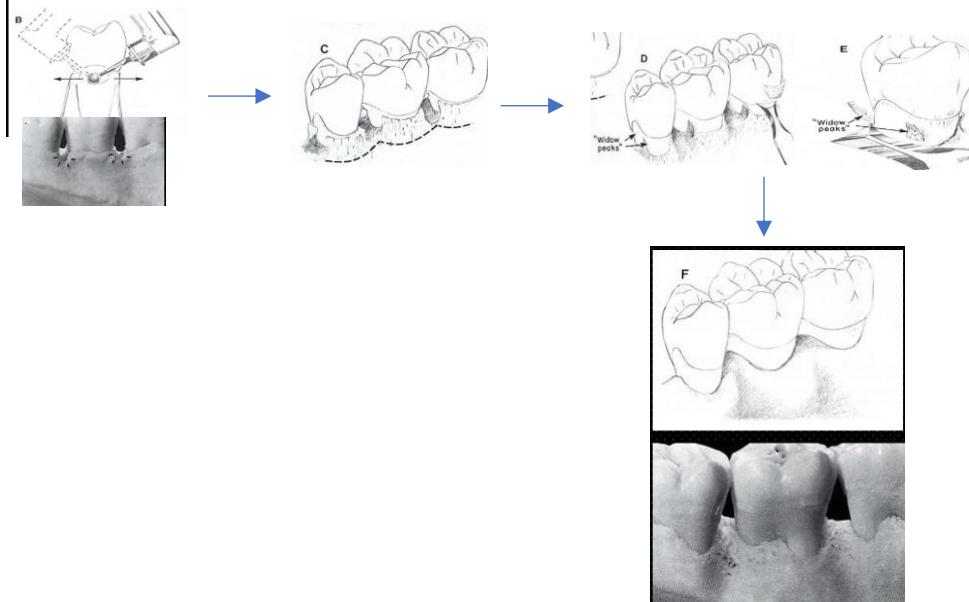
Things to evaluate	<ul style="list-style-type: none"> - Pocket Depth (Gingival sulcus) - Base of pocket -> MGJ and attachment of adjacent teeth - # of bony walls - Presence of furca defects - Extent and configuration of intrabony defects - Extent of interdental bone loss - Angular bone loss - Caries - Root trunk length - Root morphology
---------------------------	--

<p>Bone Sounding - Horizontal + Vertical</p>	<p>FREEZE THE PATIENT BEFORE YOU DO THIS</p> <ul style="list-style-type: none"> - Maps out the pocket/defect before you raise the flap -> Make a series of bleeding points w/ horizontal sounding the base of the pocket (vertical sounding) <ul style="list-style-type: none"> - Vertical sound with 1 probe -> at that depth/location penetrate the gingiva horizontally to create a bleeding dot  <p>For super deep pockets -> thin out the papilla/ gingiva by removing tissue half way between top of gingiva and bleeding points (usually only done on the palatal, not buccal)</p> <ul style="list-style-type: none"> - Try to save as much buccal gingival as possible by doing a sulcular incision
<p>Instrumentation</p>	 <p>**Use carbide bur before diamond bur**</p> <ul style="list-style-type: none"> - Carbide cuts faster (saves time) - Use diamond only for finishing off -> Creates more inflammatory mediators, so want to limit its use

Principles and Sequence of Osseous Resection Surgery

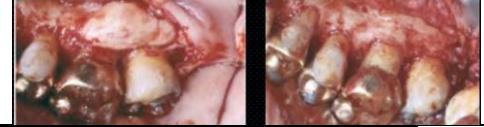
Steps	Description
<p>1. Vertical Grooving</p>	<p>Reduce the buccal & Lingual plate thickness interdentally -> ↑ root prominence on the radicular surface for better gingival architecture</p> 
<p>2. Radicular Blending</p>	<p>Follows vertical grooving to establish even-flowing, thin radicular surface rising over the root prominences and falls in the valleys that you created with the vertical grooving</p> <ul style="list-style-type: none"> - DON'T remove bone at furcation, tread carefully around that zone 
<p>3. Osteectomy - Scribing - Contouring</p>	<p>Scribing is used to outline the bone that is going to be removed with hand instruments</p> <ul style="list-style-type: none"> - Mark dot's with bur where you want to do the removal - Don't touch the root surface with the round bur  <p>Hand instruments are used to remove the bone and contour smoothly to root surface</p>
<p>4. Gradualizing marginal Bone</p>	<p>Smooth out the bone to gradually rise interdentally to conically shaped interproximal bone</p> <ul style="list-style-type: none"> - Scalloped bone = scalloped gingiva <p>Do Osteoplasty @ B and L Plates 1st then do interproximal</p> 
<p>5. Position the Flap</p>	<p>Sling Sutures at the buccal w/ interdental single interrupted just in case the sling fails</p> 
<p>6. Post Op Maintenance</p>	<p>Inform patient that sensitivity is expected and that it will go away over time</p> <ul style="list-style-type: none"> -> Can apply desensitizers and it should improve <p>Reinforce that patient MUST maintain oral hygiene</p>

Specific Osseous Reshaping Situations

Situation	Solution
One-wall hemiseptal defect 	<p>Reduce the most apical portion of the osseous defect and flow it into the adjacent contours as best as you can</p> <ul style="list-style-type: none"> - Not ideal, but makes it better than it was - Permanent solution is to replace the 6 
Exostoses, Malpositioned Teeth Surpaerupted teeth	
Interdental craters	<p>These typically introduce negative architecture (base of interproximal bone is below the buccal and lingual radicular surfaces)</p> <ul style="list-style-type: none"> - Very common 2 wall defects -> Can sometimes be very deep ($>3\text{mm}$ try to bone graft) <p>Options:</p> <p>Ramping -> Always away from buccal</p> <ul style="list-style-type: none"> - Mandibular ramps toward lingual - Maxillary Ramps towards palatal -> Preserve the buccal plate and ↓ risk of furcation exposure  <p>Horizontal Grooving:</p> <ul style="list-style-type: none"> - Small round bur placed interprox. At base of crater and flattens it in the BL direction - Osseous scribing is performed to help use of hand chisels in removing radicular bone - Widow Peaks are typically formed as a result of the hand chiseling. These create their own little crater M-D and need to be removed 

Contraindications for Osseous Resection

- Insufficient remaining attachment
- Osteotomy might unfavorably alter the prognosis of adjacent teeth
- Anatomic limitations (Prominent external oblique ridge or zygomatic arch)
- Esthetic Limitations (Anterior location, high smile line)
- Effective alternative Tx possible

Factors affecting the performance of osseous resection																				
Root form and root trunk		If Root trunk is short you will have less space to work with than if root trunk is long																		
Tooth Inclination Location and type of Infrabony defect - Classified by the # of remaining walls	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th><th>Classification</th><th>Dimension (CEJ to Furcation)</th></tr> </thead> <tbody> <tr> <td rowspan="3" style="text-align: center;">Maxillary</td><td>Short</td><td>3mm</td></tr> <tr> <td>Medium</td><td>4mm</td></tr> <tr> <td>Long</td><td>5+mm</td></tr> <tr> <td rowspan="7" style="text-align: center;">Mandibular</td><td>Short</td><td>2mm</td></tr> <tr> <td>Medium</td><td>3mm</td></tr> <tr> <td>Long</td><td>4+mm</td></tr> </tbody> </table>				Classification	Dimension (CEJ to Furcation)	Maxillary	Short	3mm	Medium	4mm	Long	5+mm	Mandibular	Short	2mm	Medium	3mm	Long	4+mm
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	Sometimes what looks like bone loss isn't actually -> Compare CEJ's to make sure Mand. Molars have a natural lingual inclination (15-20°) -> Ramp to the lingual to ↓ removal of buccal bone - Don't attempt to scallop, the lingual contour is usually flat																			
	Whenever possible, try to grow bone (Bone grafts) Bone grafts are hard in the following situations: - Shallow craters -> Nothing to hold the graft in - 1 walled defect -> Unpredictable results - Circumferential defects -> this is actually ok providing its contained																			
	Alveolar margin alterations																			
	Furcation involvements		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #a6c9e9; text-align: center; padding: 5px;">Class I</td><td style="text-align: center; padding: 5px;">≤3mm</td><td style="background-color: #d9e1f2; text-align: center; padding: 5px;">Can Bone graft (unless its very shallow)</td></tr> <tr> <td style="background-color: #ffd700; text-align: center; padding: 5px;">Class II</td><td style="text-align: center; padding: 5px;">>3mm</td><td style="background-color: #d9e1f2; text-align: center; padding: 5px;"></td></tr> <tr> <td style="background-color: #c00000; text-align: center; padding: 5px;">Class III</td><td style="text-align: center; padding: 5px;">Through and Through</td><td style="background-color: #d9e1f2; text-align: center; padding: 5px;">Too hard to bone graft</td></tr> </table>	Class I	≤3mm	Can Bone graft (unless its very shallow)	Class II	>3mm		Class III	Through and Through	Too hard to bone graft								
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Maxillary Palatal ramping important to not expose the buccal furcation																				
Vertical Defects		In anterior zone, Perio and pros have to work together - Buccal flaps will cause recession and be so bad for the patient - Usually try anything else other than osseous to avoid esthetic compromise																		

Systemic Effects in Periodontology

- Systemic conditions may have effects on periodontium -> and Periodontal disease may affect the system by ↑ inflammatory burden on vasculature.
 - There is a whole Category of these classifications in the new Guidelines

Systemic Modifiers

Medication Origin	
Drug-Influenced Gingival Enlargement	<ul style="list-style-type: none"> - There is variation on the extent that these drugs affect individuals - Gingival colour, contour and size is changed - ↑ in gingival exudate, ↑ bleeding - Not associated with attachment loss though 😊 <u>Prevalence:</u> 40-50%
	<u>Location</u> - Mostly Anterior gingiva, begins at interdental papilla <u>Onset</u> - Within 3 months <u>Tx:</u> Improve oral hygiene, consider alternative to the causative medications Meds that cause it: Phenytoin, Cyclosporine A, Calcium Channel Blockers (Nifedipine)
Genetic Origin	
Hereditary Gingival Fibromatosis	<ul style="list-style-type: none"> - Pretty rare - Pink, firm, leathery enlargement - Begins w/ eruption of 1° or 2° dentition <u>Cause:</u> Mutation in SOS-1 gene <u>Location:</u> Facial and Lingual surface of Max. and Mand.

Leukemia Associated Gingivitis	<ul style="list-style-type: none"> - Pronounced inflammatory response of gingiva in response to plaque deposition - ↓ plaque = ↓ lesion severity - Found mostly in acute leukemias <p><u>Observations:</u> Change in gingival colour and contour (and maybe size?) Bleeding on provocation <u>Location:</u> Begins in the interdental papilla</p>
Viral Origin	
Herpes Simplex (1 and 2)	<ul style="list-style-type: none"> - HSV-1 more commonly associated with oral infections - Contracted as young children (mostly) -> adults can contract it too though...stop sharing juice boxes! - Classically manifests as primary herpetic gingivostomatitis
Varicella-Zoster Virus (Chicken pox, shingles)	<ul style="list-style-type: none"> - Small ulcerations on tongue, palate and gingiva - Virus stays latent in the dorsal root ganglion -> reactivates with unilateral lesions following the affected nerve associated with severe pain - Gingival lesions initiate as vesicles

Manifestation of Systemic Diseases

Hematological Disorders	
- Regardless of the subtype, these patients exhibit severe destruction of periodontium	
Quantitative Leukocyte Disorders	<p><u>Neutropenia</u></p> <ul style="list-style-type: none"> - Cyclic, Chronic, Familial Benign <p><u>Leukemia</u></p> <ul style="list-style-type: none"> - Acute, Chronic, Lymphocytic, Myelocytic, Monocytic
Qualitative Functional Leukocyte Disorders	<p><u>Clediak-Higashi Syndrome</u></p> <ul style="list-style-type: none"> - Autosomal recessive (mutation in lysosomal trafficking gene – LYST) - Failure of bacterial killing by lysosomes - Associated with severe perio (and other infections) - Neutropenia is very common <p><u>Leukocyte Adhesion Deficiency Syndrome (L.A.D.)</u></p> <ul style="list-style-type: none"> - Autosomal recessive - Associated w/ severe inflammatory perio diseases in young patients -> Need to treat the LAD for perio treatment to work - Might be fatal
Other Blood Disorders	Clotting disorders will influence management and Tx of perio diseases -> There is no evidence of ↑ susceptibility to get them though
Associated with Genetic Disorders	
Papillon-Lefevre Syndrome	<p>= Autosomal recessive</p> <ul style="list-style-type: none"> - 1 in 3 million (pretty rare) - ↑ susceptibility to infection by 15-25% <p><u>Characteristics:</u></p> <ul style="list-style-type: none"> - Palmoplantar hyperkeratosis (Thick calluses all over palms and knuckles) - Severe generalized periodontitis -> Early loss of deciduous and permanent teeth
Clediak-Higashi Syndrome	See above under Leukocyte disorders
Hypophosphatasia	<p>= ↓ serum alkaline phosphatase</p> <ul style="list-style-type: none"> - Severe loss of alveolar bone - Premature loss of deciduous and permanent teeth
Kindler's Syndrome	<p>Extremely rare -> Characterised by skin blistering and scarring</p> <ul style="list-style-type: none"> - Mutation in Kindlin-1 (involved in integrin activation and cell adhesion) - Affects basement membrane cell adhesion to cause blistering <p>VERY rapidly progressing periodontitis</p>

<p>Diabetes Mellitus (Type 2 DM, 90% of all DM cases)</p> <p>This one is major</p>	<p>2.8x ↑ to have perio and 3.4x ↑ to have perio defined by radiographic bone loss</p> <ul style="list-style-type: none"> - Younger the patient is the ↑ the odds for getting perio - ↑ missing teeth and areas with deep pockets - ↑ ↑ risk of progressive bone loss <p>Poor wound healing</p> <ul style="list-style-type: none"> - ↓ collagen production by fibroblasts, ↑ collagenase production - ↑ Glycosylation of existing collagen at wound margins = ↓ solubility and delayed remodeling <p>↓ Collagen metabolism</p> <ul style="list-style-type: none"> - Glycation of Type I collagen (gingiva, PDL, bone) = ↑ collagen cross linking = ↓ turnover <p>Vascular Changes at basement membrane</p> <ul style="list-style-type: none"> - Hyperglycemia -> Glycation of collagen = ↑ thickness of basement membrane -> ↓ metabolic turnover within the tissue <p>↑ GCF Secretion of PGE₂, IL-β and TNF-α</p> <ul style="list-style-type: none"> - Serves as markers of periodontal disease severity and activity - 14x ↑ in Type 1 DM patients vs healthy. 6.6x ↑ vs severe perio non DM patients <p>Advanced Glycation End products (AGEs)</p> <ul style="list-style-type: none"> - Collagen synth, maturation and homeostasis are affected by glucose levels. In Hyperglycemia AGEs form <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #cccccc;"> <th style="text-align: center;">AGE Formation</th><th style="text-align: center;">AGE formation on collagen</th></tr> </thead> <tbody> <tr> <td style="padding: 5px;"> <ul style="list-style-type: none"> - Alter function of many ECM components - Modify matrix-matrix and cell-matrix interactions - Adverse effects on target (↓ collagen stability & vascular integrity) </td><td style="padding: 5px;"> <ul style="list-style-type: none"> - ↑↑ collagen crosslinking - ↓ stability and turnover </td></tr> </tbody> </table> <p>Receptors for AGEs (RAGES!!!!!!!!!!!!!!)</p> <ul style="list-style-type: none"> - AGE binding to macrophages and monocytes = ↑ IL-1, ↑ insulin-like growth factor, ↑ TNF-α = ↑ Inflammatory hyper responses - AGE binding to endothelial cells = Focal thrombosis, vasoconstriction <p>Its not all doom and gloom though 😊 If your DM is well controlled, the responses is similar to non-diabetic patients</p> <p>Poorly Controlled DM:</p> <ul style="list-style-type: none"> - ↑ prevalence of severe attachment loss with ↓ control - ↑ risk of severe bone loss and faster progression rate - ↑ incidence of multiple periodontal abscesses <hr/> <p>** Exam: Be able to explain bidirectional affects of DM and Perio and also the AGE and rAGE**</p> <p>4 Theories connecting DM to Perio</p> <ol style="list-style-type: none"> 1. ↓ PMN Function -> PMN are 1st line defense for Periodontitis. In DM patients they have ↓ chemotaxis, ↓ adherence and ↓ phagocytosis = ↑ susceptible for periodontitis 2. Collagen Metabolism -> Gingival fibroblasts ↓ collagen production and ↑ collagenase activity = ↓ tissue healing and remodelling 3. AGE Formation -> Hyperglycemia results in AGE formation. AGE formation on collagen causes crosslinking and ↓ the solubility of collagen = ↓ turnover 4. rAGE binding -> AGE binds to receptors (rAGE) on monocytes and macrophages = ↑ IL-1, Insulin like Growth factor and TNF-α = ↑ inflammatory response <p>**Studies have shown that Systemic Tetracycline use ↓ the glycosylated hemoglobin percentage which could help their perio**</p> <p>**Treatment of DM ↑ Perio health, and ↑ perio health ↑ DM control**</p>	AGE Formation	AGE formation on collagen	<ul style="list-style-type: none"> - Alter function of many ECM components - Modify matrix-matrix and cell-matrix interactions - Adverse effects on target (↓ collagen stability & vascular integrity) 	<ul style="list-style-type: none"> - ↑↑ collagen crosslinking - ↓ stability and turnover
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<p>Alterations in Sex Hormones</p>	<p>Hormonal Changes</p> <p>Puberty</p> <ul style="list-style-type: none"> - ↑ incidence of gingivitis in pre-pubertal children (not associated with bone loss though!) - Exacerbated responses of gingival tissues suggest that sex hormones alter the microbial environment -> Offers nutrients to anaerobic perio pathogens <p>Pregnancy</p> <ul style="list-style-type: none"> - Very very common for pregnant women to show reversible gingivitis <p>Oral Contraceptives</p> <ul style="list-style-type: none"> - Progesterone and Estrogen in contraceptives mimic a pregnant state in women - Progesterone ↑ permeability of gingival tissues and dilate capillaries = ↑ PMN #'s in sulcus and ↑ PGE₂ synthesis (when in combo with estradiol) = ↑ inflammation - Contraceptives ↓ effectiveness when taken with antibiotics, antihistamines, and anticonvulsants etc <p>Menopause</p> <ul style="list-style-type: none"> - Occasional incidence of hormonally induced menopausal or desquamative gingivitis 				

Necrotizing Ulcerative Perio vs Necrotizing Ulcerative Gingivitis

- NUP shares many clinical and etiologic features of NUG EXCEPT, NUP has CAL and Alveolar bone loss
- Patients predisposed to both NUG and NUP if they have immune dysfunction
- HIV patients with NUP and 20.8x more likely to have CD4 cell counts < 200 cells/mm³

Specific Effects of ↑ Inflammation

Inflammation in general has negative effects on lots of systemic things

Smoking and Perio

2.5-6x ↑ risk for developing perio (and ↑ severity)

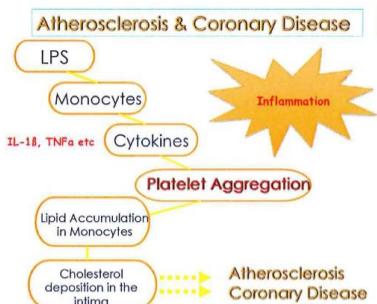
- Direct relationship btwn # of cigarettes smoked and perio risk and bone loss (10+ cigarettes per day)

Smoking ↓ healing of perio tissues after surgery -> Grafting may be compromised

Altered Inflammatory Response	16-30% ↑ in Systemic WBC (especially PMCs) in smokers <ul style="list-style-type: none"> - Their function is ↓ though, so they don't kill bacteria like they should, just explode and damage your own tissues like the assholes they are - ↓ Local Chemotaxis as well ↑ serum CRP levels (inflammatory marker) ↓ IgG ₂ serum levels <ul style="list-style-type: none"> - ↓ macrophage phagocytosis - ↑ proinflammatory cytokines released from macrophages ↓ T-cell and B-cell function
Clinical features	<ul style="list-style-type: none"> - Fibrotic gingiva - ↓ BOP - Poorly responding to Tx (90% of refractory perio cases are smokers)

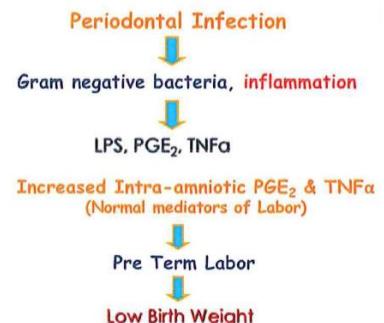
CVD and Perio

- Periodontitis doesn't CAUSE heart attacks -> However it ↑ the effects and risks
- ↑ Carotid artery thickness observed in pt with perio (↑ risk for myocardial infarction)



Inflammatory mediators are an important factor in the development of Atherosclerosis

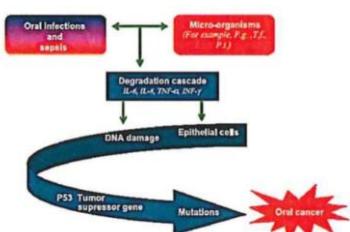
- ↑ markers found with perio 😞 this is likely the relationship



Preterm Low Birth Weight Babies (PLBW)

- Periodontitis is independent risk factor for Preterm birth weight in some studies (not all though)
- There is evidence that ↑ amniotic inflammatory markers can result in pre-term labour = low birth weight

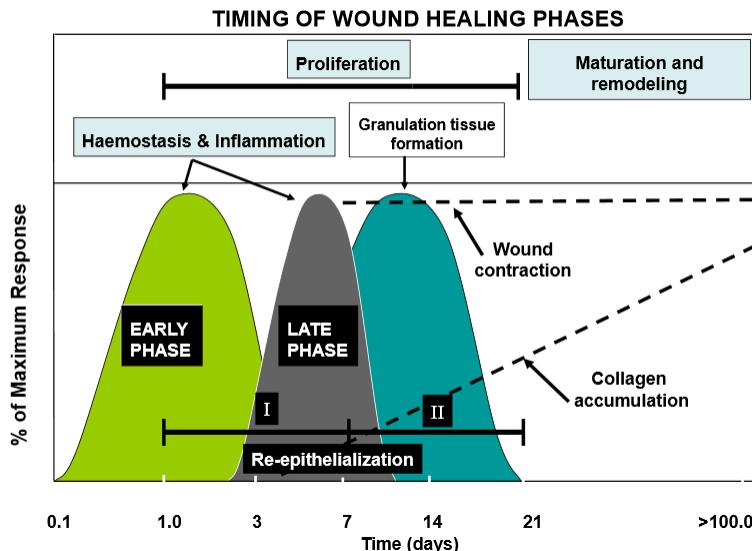
Perio and Cancer



- Infection and inflammation cause 10-15% of malignancies
- o Perio has been linked to Head and neck cancers, lung cancers, and breast cancer (the association is pretty weak right now though -> it's the thought that counts)

Soft Tissue Wound Healing

How do wounds heal?



The total time scale depends on the size of the wound

- Small wounds heal faster, and large wounds will heal slower (Dr. Matthew would say otherwise)

Stages overlap

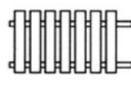
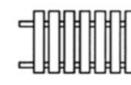
- Before 1 stage really finishes the other stage starts HOWEVER subsequent stages cannot begin until the stage before it has progressed to a certain level. -> If you have an issue in stage 1 everything will be delayed

Cell function is spatiotemporally regulated in 3 ways during healing

Soluble mediators released from Microbes, Host cells, Blood, ECM	<ul style="list-style-type: none"> - Cytokines - Chemokines - Growth Factors - Damage Associated Molecular Patterns (DAMP) - Pathogen Associated Molecular Patterns (PAMP)
Physical Factors	<ul style="list-style-type: none"> - \downarrow O₂ tension (Hypoxia) - pH
Structural ECM Molecules	<ul style="list-style-type: none"> - Cells recognize changes in composition of ECM molecules and can sense stiffness or straining forces acting on ECM

Steps	What Happens
1. Haemostasis and Inflammation	<p>Hemostasis</p> <p>Blood vessels are ruptured (usually) and a clot needs to form or you will bleed out and die</p> <ol style="list-style-type: none"> 1^o hemostasis: <ul style="list-style-type: none"> - Vascular Phase (Vasoconstriction) - Platelet Phase (Platelet aggregation) 2^o Hemostasis <ul style="list-style-type: none"> - Clotting is induced by intrinsic and extrinsic pathways <p>Prothrombin \rightarrow Thrombin Plasma fibrinogen \rightarrow Fibrin network \rightarrow Blood clot forms and bleeding stops in minutes</p> <p>Functions of the clot:</p> <ul style="list-style-type: none"> - Stop bleeding (obviously) - Scaffold for cell migration and proliferation - Reservoir for growth factors, proteases and protease inhibitors - Induces and modulates cell function - Platelets release chemotactic factors and growth factors (TGF β) -> Attracts and activates wound repair cells <p>**Medical History is the best indication for if a patient has a bleeding problem**</p> <ul style="list-style-type: none"> - Lab tests cannot simulate the entire clotting cascade so it might give you misleading results

	<p style="text-align: center;">Inflammation</p> <p>Through the open wound microbes can access tissues -> Fast inflammatory response is needed to eliminate microbes and prevent their growth (or you could die)</p> <p>**If microbial infection persists this phase is extended = delayed wound healing**</p> <p><u>Duration</u> -> 7-10 days after wound occurred (or until re-epithelialization is complete)</p>  <p style="text-align: right;">After 7 days inflammation is mostly gone</p> <p><u>Purpose</u></p> <ul style="list-style-type: none"> - Removes microbes and tissue debris - Produces cytokines and growth factors (stimulates wound healing cells) <p><u>Classic signs of inflammation</u></p> <ul style="list-style-type: none"> - Heat - Pain - Redness - Swelling - Loss of function <p><u>Early Inflammatory Phase (Day 0-3):</u> -> Polymorphonuclear Leukocytes (Neutrophils)</p> <ul style="list-style-type: none"> - Peak numbers of PMNs (Neutrophils) around 24-48hrs - Cleans wounded area of foreign material, destroys microbes -> Critical step in wound healing - w/ Excess microbes Neutrophils release enzymes and toxic oxygen products -> This damages tissues and delays wound healing <p><u>Late Inflammatory Phase (3-10)</u> -> Macrophages/Monocytes</p> <ul style="list-style-type: none"> - M1 Macrophages -> Comes from circulating monocytes in the blood = Pro-inflammatory Macro's - M2 Macrophages -> Comes from local tissues = Reparative and anti-inflammatory Macro's <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #90EE90;"> <th style="text-align: center; padding: 2px;">M1 Macro's</th> <th style="text-align: center; padding: 2px;">M2 Macro's</th> </tr> </thead> <tbody> <tr style="background-color: #D9EAD3;"> <td style="text-align: center; padding: 2px;"> <ul style="list-style-type: none"> - Debridement - Antimicrobial Action - Immune Cell Activation </td> <td style="text-align: center; padding: 2px;"> <ul style="list-style-type: none"> - Immunosuppression - Angiogenesis </td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 2px;"> **Prolonged accumulation of M2 causes excessive scar formation** </td> </tr> </tbody> </table> <p style="text-align: center;">Macrophages = link between innate and adaptive immunity during healing -> MUST switch from M1 (pro-inflammatory) to M2 (immunosuppressive) for optimal wound healing</p>	M1 Macro's	M2 Macro's	<ul style="list-style-type: none"> - Debridement - Antimicrobial Action - Immune Cell Activation 	<ul style="list-style-type: none"> - Immunosuppression - Angiogenesis 	**Prolonged accumulation of M2 causes excessive scar formation**	
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Prolonged accumulation of M2 causes excessive scar formation							
<p>2. Proliferation</p>	<p style="text-align: center;">Re-Epithelialization</p> <p><u>Purpose:</u> Cover wound to prevent further microbial access to the wound (preventing infection) ...or you will die</p> <p><u>Duration:</u></p> <ul style="list-style-type: none"> -> Starts 24hrs after wounding -> 7 days to cover wound surface (0.5mm/day) -> 21 days to differentiate and regenerate basement membrane = Fully restored barrier function  <p>Cytokines etc released from wound and inflammatory cells -> Activates epithelial cells at edge of wound to proliferate -> Migration into and under fibrin clot begins (migration THROUGH the clot, not ontop)</p> <p>During migration there is ↑ space between cells, there are no defined layers, and basement membrane is immature -> Still permeable</p> <ul style="list-style-type: none"> - Migration stops when cells all around the wound migrating to the center meet up (Approx day 7) <p style="text-align: center;">↓</p> <p style="text-align: center;">Keratinocytes then differentiate to form all layers of stratified squamous epithelium</p> <ul style="list-style-type: none"> - Mature cell-cell contact is re-established - BM regenerates <p style="text-align: center;">↓</p> <p style="text-align: center;">Barrier function is completely restored by day 21</p>						

	<p style="text-align: center;"><u>Granulation Tissue formation</u></p> <p><u>Duration:</u> Day 3-21</p> <p><u>Purpose:</u> Replace blood clot with CT and ECM</p> <ul style="list-style-type: none"> - Granulation tissue is a hypercellular, primitive version of CT <p>Cells involved:</p> <table border="1"> <tbody> <tr> <td style="background-color: #c8e6c9; vertical-align: top;">Endothelial Cells</td><td> Angiogenesis <ul style="list-style-type: none"> - Starts day 3, peaks day 7-10 - Formation of new blood vessels to provide O₂ and nutrients to cells in granulation tissue - If this doesn't happen (typical for diabetic wounds) = chronic, non-healing wound develops </td></tr> <tr> <td style="background-color: #c8e6c9; vertical-align: top;">Granulation tissue Fibroblasts</td><td> Surround edge of wound and produce collagen rich ECM to gradually replace blood clot and serve as template for mature CT formation <ul style="list-style-type: none"> - Type I collagen -> Unorganized, cannot resist tensile forces - Embryonic development molecules -> guide tissue formation and maturation <p>Come from: CT stroma around wound, Blood, Bone marrow derived stem cells</p> </td></tr> <tr> <td style="background-color: #c8e6c9; vertical-align: top;">Mesenchymal Progenitor cells</td><td>Participate in and modulate wound healing</td></tr> </tbody> </table>	Endothelial Cells	Angiogenesis <ul style="list-style-type: none"> - Starts day 3, peaks day 7-10 - Formation of new blood vessels to provide O₂ and nutrients to cells in granulation tissue - If this doesn't happen (typical for diabetic wounds) = chronic, non-healing wound develops 	Granulation tissue Fibroblasts	Surround edge of wound and produce collagen rich ECM to gradually replace blood clot and serve as template for mature CT formation <ul style="list-style-type: none"> - Type I collagen -> Unorganized, cannot resist tensile forces - Embryonic development molecules -> guide tissue formation and maturation <p>Come from: CT stroma around wound, Blood, Bone marrow derived stem cells</p>	Mesenchymal Progenitor cells	Participate in and modulate wound healing
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Mesenchymal Progenitor cells	Participate in and modulate wound healing						
3. Maturation and Tissue remodeling	<p style="text-align: center;"><u>Maturation</u></p> <p>Fill the gap in tissue with new tissues that are able to restore the strength and function of the area.</p> <ul style="list-style-type: none"> - CT under epithelium is reformed and converted from granulation tissue - Possible that a scar will form...which could look cool, but might not structurally and functionally be as good as the unwounded tissue <p>Step 1: Wound Contraction</p> <ul style="list-style-type: none"> - Start 5-7 days, peaks 10-14 days - Coincides with differentiation of fibroblasts into myofibroblasts -> Attach to new collagen and pull fibrils to align them perpendicular to wound edges = ↓ wound size and ↑ tensile strength <p>Step 2: Normalization of the Composition, Quantity, and Quality of CT</p> <table border="1"> <thead> <tr> <th style="text-align: center;">Quantity</th><th style="text-align: center;">Quality</th></tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> - Removal of certain ECM components (Phagocytose, and secrete ECM degrading proteases) - Down regulate ECM production (by ↓ M2 macrophages that are promoting ECM formation by fibroblasts) - ↓ number of ECM producing cells (Apoptosis of fibroblasts and endothelial cells) </td><td> <ul style="list-style-type: none"> - ↑ Cross-linking of collagen - Assembly of thicker collagen bundles Reorganization of collagen from parallel orientation into basket weave formation (↑ strength) </td></tr> </tbody> </table> <p>After 21 days -> Tensile strength is ~20%</p> <ul style="list-style-type: none"> - Takes 6 months for 95% strength -> Remodeling can continue for 1-2 years <p style="text-align: center;"><u>Scar Formation/Tissue Remodeling</u></p> <p>Occurs if the structure is not normalized during remodeling -> ↑ abnormally organized CT = Scar</p> <ul style="list-style-type: none"> - ↑ ECM (collagen), ↓ tensile strength <p>Injury</p>   <p>Regeneration</p>  <p>Mature Scar, but unorganized</p>  <p>Pathological scars</p>  <p>Pathologic scars (hypertrophic, keloids) = excessive accumulation of ECM</p> <div style="display: flex; justify-content: space-around;">   </div>	Quantity	Quality	<ul style="list-style-type: none"> - Removal of certain ECM components (Phagocytose, and secrete ECM degrading proteases) - Down regulate ECM production (by ↓ M2 macrophages that are promoting ECM formation by fibroblasts) - ↓ number of ECM producing cells (Apoptosis of fibroblasts and endothelial cells) 	<ul style="list-style-type: none"> - ↑ Cross-linking of collagen - Assembly of thicker collagen bundles Reorganization of collagen from parallel orientation into basket weave formation (↑ strength) 		
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Delayed Wound Healing and Chronic Wounds

Causes	<ul style="list-style-type: none"> - Infection - Continued trauma/pressure - Diabetes - Stress - Smoking Anemia - Bleeding disorders - Atherosclerosis - Tumors - Aging - Radiation Therapy
Signs	<ul style="list-style-type: none"> ↑ bleeding ↑ inflammation -> Persisting longer than 7 days Malodorous wounds (infection or necrosis) ↑ pus exudate Delayed re-epithelialization Maceration (softening/breaking down) of surrounding tissue -> poor circulation, infection, inflammation Wound Dehiscence (opening/breaking down of the wound) Presence of necrotic tissue

Oral Mucosal Healing

Factor	How it helps healing
Saliva	<ul style="list-style-type: none"> ↑ moisture ↑ ionic strength Contains growth factors
Bacteria	<ul style="list-style-type: none"> Stimulates macrophage influx Directly stimulate keratinocytes and fibroblasts
Phenotype of cells	<ul style="list-style-type: none"> Fetal-like fibroblasts Specialized epithelium Specialized CT ECM
↓ inflammatory response	Distinct expression of inflammatory and pro- and anti-fibrogenic cytokines
Angiogenesis	Tightly controlled

Periodontal Emergencies

The Overview List

Necrotizing Periodontal Diseases	<ul style="list-style-type: none"> - Necrotizing Gingivitis - Necrotizing Periodontitis
Viral Infections	<ul style="list-style-type: none"> - Herpetic Gingivostomatitis
Odontogenic/Dental Abscesses	<ul style="list-style-type: none"> <u><i>Periodontal Infections</i></u> <ul style="list-style-type: none"> - Gingival Abscess - Periodontal Abscess <u><i>Pericoronitis</i></u> <u><i>Pulpal Necrosis</i></u> <ul style="list-style-type: none"> - Dentoalveolar Abscess <u><i>Endo-Perio Lesion</i></u> <ul style="list-style-type: none"> - Endo-Perio Abscess <u><i>Other Abscesses</i></u> <ul style="list-style-type: none"> - Surgery - Trauma

Necrotizing Ulcerative Gingivitis (NUG)

AKA Vincent's Disease, Fusospirochetal gingivitis, Acute Necrotizing ulcerative gingivitis (ANUG)

- Can occur in a mouth that is free of any other gingival problems OR it may be superimposed on an underlying chronic gingival disease

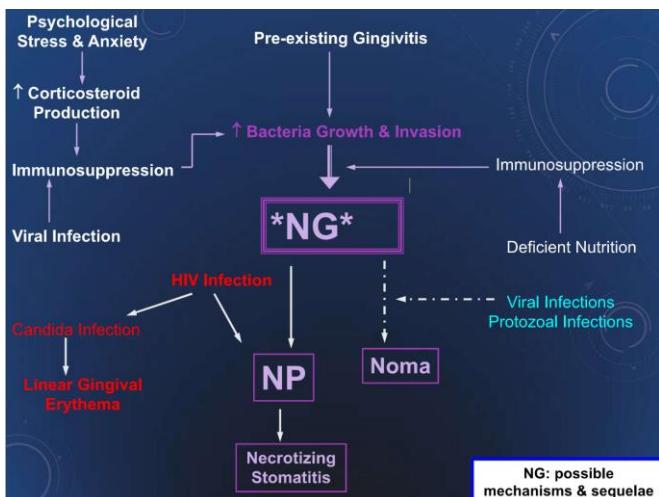
Pathogenic Microbes	Spirochetes P. Intermedia Treponema Selenomonas Species Fusobacterium Species										
Clinical Presentation	<p>3 Specific Characteristics (MUST be present to Dx)</p> <ol style="list-style-type: none"> Pain <ul style="list-style-type: none"> - Hallmark of NUG, quality is intense and is why the Pt is seeking Tx Interdental Gingival Necrosis <ul style="list-style-type: none"> - Self-limited to the interdental and marginal gingival only - There aren't many conditions that specifically attack this area Bleeding <ul style="list-style-type: none"> - Happens w/ little or no provocation at all <p>Others:</p> <ul style="list-style-type: none"> - Pseudomembrane formation - Halitosis - Adenopathy and Fever in children 										
Pathophysiology and Histology	4 Zones associated: <ol style="list-style-type: none"> Superficial Bacterial Zone <ul style="list-style-type: none"> - The outermost layer -> Bacterial mass w/ varying compositions Neutrophil-rich Zone: <ul style="list-style-type: none"> - Underneath the Bacterial Zone -> Contains many leukocytes w/ neutrophils Necrotic Zone <ul style="list-style-type: none"> - Disintegrating Cells & Many spirochetes Spirochetal Infiltration Zone <ul style="list-style-type: none"> - Tissue elements are well preserved, but are infiltrated by spirochetes 										
Predisposing Factors	<p>Psychological/Emotional Stress</p> <p>Immunosuppression</p> <ul style="list-style-type: none"> - ↑ Cortisol Levels associated w/ ↓ PMN function <p>Malnutrition</p> <p>Cigarette Smoking</p> <p>Pre-Existing gingivitis and Trauma</p> <p>Tobacco and Alcohol use</p> <p>Young Age</p> <p>Ethnicity</p> <p>Seasonal Variation</p> <ul style="list-style-type: none"> - Rainy Seasons for some reason <p>↓ Sleep</p>										
Treatment	<table border="1"> <tbody> <tr> <td>Initial Therapy</td> <td> <p>↓ microbial load</p> <p>Remove necrotic tissue</p> <ol style="list-style-type: none"> Mechanical Debridement <ul style="list-style-type: none"> - Remove local factors and microbial accumulation - NO Sub G. scaling or curettage yet (Too Painful) ↑ Pt OHE Chlorhexidine Rinses <ul style="list-style-type: none"> - Support plaque control during healing of damaged gingiva Systemic Antibiotics <ul style="list-style-type: none"> - As adjunct to debridement for Moderate/Severe cases (Amoxicillin, Erythromycin, Metronidazole) <p>**Postpone extraction or Perio surgery until Pt symptom free for 4 weeks**</p> </td></tr> <tr> <td>2nd Visit</td> <td>1-2 Days after initial <ul style="list-style-type: none"> - Scaling - Gingival shrinkage - Pain is usually ↓ or gone </td></tr> <tr> <td>3rd Visit</td> <td>5 days after 2nd visit <ul style="list-style-type: none"> - Should be all good by now 😊 </td></tr> <tr> <td>Local Surgery</td> <td>Recurrence occurs when deformities persist (Shelf like Gingival Margin) -> Reshape gingiva w/perio surgery</td></tr> <tr> <td>Pt Instructions</td> <td> <ul style="list-style-type: none"> - Avoid Tobacco, Alcohol, and Condiments - Rinse with 3% Hydrogen Peroxide and warm water (1:1) q2h and 2x daily w/ 0.12% CHX - Get lots of rest (Avoid excessive physical exertion) - Use ultrasoft toothbrush and only use it for surface debris - Take NSAID for pain - Bed rest for Pt w/ systemic complications or if they are on Antibiotics </td></tr> </tbody> </table>	Initial Therapy	<p>↓ microbial load</p> <p>Remove necrotic tissue</p> <ol style="list-style-type: none"> Mechanical Debridement <ul style="list-style-type: none"> - Remove local factors and microbial accumulation - NO Sub G. scaling or curettage yet (Too Painful) ↑ Pt OHE Chlorhexidine Rinses <ul style="list-style-type: none"> - Support plaque control during healing of damaged gingiva Systemic Antibiotics <ul style="list-style-type: none"> - As adjunct to debridement for Moderate/Severe cases (Amoxicillin, Erythromycin, Metronidazole) <p>**Postpone extraction or Perio surgery until Pt symptom free for 4 weeks**</p>	2nd Visit	1-2 Days after initial <ul style="list-style-type: none"> - Scaling - Gingival shrinkage - Pain is usually ↓ or gone 	3rd Visit	5 days after 2 nd visit <ul style="list-style-type: none"> - Should be all good by now 😊 	Local Surgery	Recurrence occurs when deformities persist (Shelf like Gingival Margin) -> Reshape gingiva w/perio surgery	Pt Instructions	<ul style="list-style-type: none"> - Avoid Tobacco, Alcohol, and Condiments - Rinse with 3% Hydrogen Peroxide and warm water (1:1) q2h and 2x daily w/ 0.12% CHX - Get lots of rest (Avoid excessive physical exertion) - Use ultrasoft toothbrush and only use it for surface debris - Take NSAID for pain - Bed rest for Pt w/ systemic complications or if they are on Antibiotics
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Necrotizing Periodontitis

= Infection characterized by necrosis of gingival tissue, periodontal ligament, AND alveolar bone

- Most commonly found in people with HIV, Malnutrition and/or immunosuppression
 - o HIV patients with NP are 20.8x more likely to have <200 CD4⁺ cells/mm³

Clinical Presentation	Presents with the same things as NUG -> Pain, Interdental gingival Necrosis, Bleeding <ul style="list-style-type: none"> - + it has Clinical Attachment loss and Alveolar bone loss at affected sites 
Etiology	Same as NUG
Tx	<p>Same as for NUG</p> <p>NOTE: If the Pt has AIDS they are already immunocompromised -> Use of systemic antibiotics may ↑ risk of opportunistic infections</p> <ul style="list-style-type: none"> - Depending on the systemic condition you may consider using antifungals or antivirals



Noma = Orofacial gangrene

- Occurs mainly in children with malnutrition, ↓ OH, and debilitating systemic conditions



YIKES

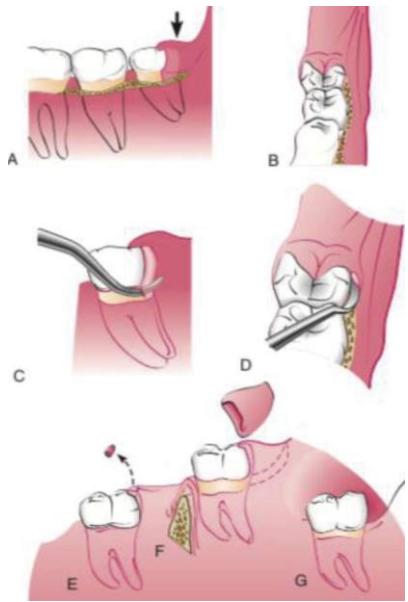
Acute Herpetic Gingivostomatitis

= Viral infection (Herpes Simplex Virus)

- Commonly found in children and young adults (20-25 yrs)

Clinical Presentation	<ul style="list-style-type: none"> - Fever - Painful swelling of lymph nodes <p><i>Intraoral</i></p> <ul style="list-style-type: none"> - Acute, painful gingivitis - Blister-like aphthae - Erosive lesions on attached gingiva, oral mucosa and lips 
Predisposing factors	Mechanical trauma Sun Exposure Malnutrition Hormonal disturbance Psychological trauma
Tx	<p>Usually spontaneously resolves in 1-2 weeks</p> <ul style="list-style-type: none"> - Palliative care until this happens <p>Remove plaque, food debris and superficial calculus -> ↓ gingival inflammation <i>Acyclovir</i> preps can be Rx for topical and systemic use</p>

Abscesses of the Periodontium

Gingival Abscess	
Tell me more tell me more	<p>Well, it's a localized purulent infection that involves the marginal gingiva or interdental papilla</p> <ul style="list-style-type: none"> - Usually acute inflammatory response to a foreign substance forced into the gingiva (Popcorn husk left there for a few days)
Clinical Features	<ul style="list-style-type: none"> - Localized, painful, rapidly expanding lesion - Involves marginal gingiva or interdental papilla <p>Initially:</p> <ul style="list-style-type: none"> - Red swelling w/ smooth shiny surface <p>After 24-48 hrs</p> <ul style="list-style-type: none"> - Fluctuant and pointed lesion. Surface orifice exudes pus <p>Longer time</p> <ul style="list-style-type: none"> - Spontaneous rupture leading to pulpal hypersensitivity 
Tx	<p>Under LA -> explore area for the foreign body (remove if you find it obviously)</p> <ul style="list-style-type: none"> - If no foreign body, Scale and Root plane thoroughly <p>Drain the Abscess by sticking a probe through it (under LA, unless you want a bad YELP review)</p> <ul style="list-style-type: none"> - If you didn't like that pun you can get out. 
Pericoronal Abscess	
And this one?	<p>AKA: Pericoronitis</p> <p>A localized purulent infection within the tissue surrounding the crown or a partially erupted tooth</p> <ul style="list-style-type: none"> - Occurs mostly in mandibular 3rd molar <p>This is the 2nd most prevalent infection demanding emergency Tx</p>
Clinical Presentation	<ul style="list-style-type: none"> - Gingival flap appears red and swollen - Infection may spread posteriorly into oropharyngeal area and medially to base of tongue -> May cause issues with swallowing
Tx	<ol style="list-style-type: none"> 1. Determine extent and severity of infection (Adjacent structure involvement) <ul style="list-style-type: none"> - If trismus -> antibiotics prior to further treatments 2. Flush gently with warm H₂O -> Removes superficial debris and surface exudate <ul style="list-style-type: none"> - Use LA, this could be painful 3. Gently elevate the flap from the tooth w/ curette -> Remove underlying debris and flush with CHX 4. Instruct Pt to rinse w/ CHX 2x/day and return tomorrow 5. After 24 hours if you see improvement: <ul style="list-style-type: none"> - Decide if you want to extract tooth, or surgically remove the flap  <p>→ Once acute symptoms have subsided, surgically remove flap</p> <p>Don't do E), this is insufficient removal. F is good and leads to G</p>

Periodontal Abscess					
And finally...	<p>This is a localized purulent infection within the tissues adjacent to the periodontal pocket</p> <ul style="list-style-type: none"> - May lead to destruction of the PDL and alveolar bone - Associated with tortuous perio pockets, furcation involvement, intrabony defects 				
Pathophysiology and Microbiology	<p>A) Bacterial invasion of soft tissue around perio pocket -> Inflammation -> CT destruction B) Encapsulation of bacterial infection and pus formation</p> <p>Microbes:</p> <ul style="list-style-type: none"> - <i>P. Gingivalis, P. Intermedia, T. Forsythia, AA, Fusobacterium nucleatum</i> etc. 				
Etiology	<p>Acute Exacerbation after different treatments:</p> <ul style="list-style-type: none"> - SRP (If you leave calculus at the bottom of a pocket but clean the top half -> gingival closes coronally to the calculus and an infection can fester and be locked in) - Perio Surgery -> If environment is not completely sterile during bone or gingival grafting - Systemic antimicrobial intake ↓ microbial balance and more pathogenic microbes can rise - Use of other drugs: Nifedipine = gingival overgrowth can trap debris and calculus <p><u>In Perio Patients</u></p> <p>A) Impaction of foreign bodies B) Harmful Habits C) Ortho factors D) Gingival enlargement E) Alterations of the root surface: <ul style="list-style-type: none"> - Minor to Severe anatomical alteration (Developmental grooves, invagination) - Iatrogenic damage (Perforations) - Severe root damage (Vertical root fracture) - External Root Resorption </p> <p><u>In non-Perio Patients</u></p>				
Signs and Symptoms	<table border="1"> <thead> <tr> <th>Acute Abscess</th> <th>Chronic Abscess</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> -Mild-Severe discomfort (Pressure in gums) -Localized red, ovoid swelling -Perio pocket -Mobility -Tooth elevation in socket -Tenderness to percussion -Exudation -↑ Temps -Regional lymph node involvement  </td> <td> <ul style="list-style-type: none"> -No pain (or dull pain) -Localized inflammatory lesion -Slight tooth elevation -Intermittent exudation -Fistula tract associated w/ deep pocket -Usually w/o systemic involvement </td> </tr> </tbody> </table>	Acute Abscess	Chronic Abscess	<ul style="list-style-type: none"> -Mild-Severe discomfort (Pressure in gums) -Localized red, ovoid swelling -Perio pocket -Mobility -Tooth elevation in socket -Tenderness to percussion -Exudation -↑ Temps -Regional lymph node involvement 	<ul style="list-style-type: none"> -No pain (or dull pain) -Localized inflammatory lesion -Slight tooth elevation -Intermittent exudation -Fistula tract associated w/ deep pocket -Usually w/o systemic involvement
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Is it a Periodontal or Pulpal Abscess?

Periodontal	Pulpal
<ul style="list-style-type: none"> - Associated w/ pre-existing perio pocket - X-Ray shows vertical bone loss and furcation involvement - Pulpal Test = Vital - Swelling of gingival tissue w/ possible sinus tract (if chronic) - Dull localized pain - Sensitive to percussion possible 	<ul style="list-style-type: none"> - Large Restoration or Cavity present - May have no Perio pocket (if there is one, it is only a narrow defect) - Pulpal Test = Non-vital - Swelling is localized to the apex w/ sinus tract - Pain is severe and hard to localize - Percussion sensitive

Endo-Periodontal Lesions

= Interaction between diseases of endodontic origin and Periodontal Diseases on a tooth

Etiology	<ul style="list-style-type: none"> - Endo and/or Perio infection - Trauma or iatrogenic Factors 					
Signs and Symptoms	<p>Deep Perio Pocket reaching close to (or completely to) the apex</p> <ul style="list-style-type: none"> - w/ Negative or altered response to Pulp vitality testing <p>Bone resorption in apical or furcation area</p> <p>Spontaneous pain</p> <p>Pain on palpation and percussion</p> <p>Purulent exudate</p> <p>Mobility</p> <p>Sinus tract</p> <p>Crown and gingival color alteration</p>					
Treatment	<p>Usually RCT will solve the problem</p> 					
Grading	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px; vertical-align: top;"> Endo-periodontal lesion in periodontitis patients </td> <td style="padding: 5px; vertical-align: top;"> <i>Grade 1</i> – narrow deep periodontal pocket in 1 tooth surface <i>Grade 2</i> – wide deep periodontal pocket in 1 tooth surface <i>Grade 3</i> – deep periodontal pockets in more than 1 tooth surface </td> </tr> <tr> <td style="padding: 5px; vertical-align: top;"> Endo-periodontal lesion in non-periodontitis patients </td> <td style="padding: 5px; vertical-align: top;"> <i>Grade 1</i> – narrow deep periodontal pocket in 1 tooth surface <i>Grade 2</i> – wide deep periodontal pocket in 1 tooth surface <i>Grade 3</i> – deep periodontal pockets in more than 1 tooth surface </td> </tr> </table>		Endo-periodontal lesion in periodontitis patients	<i>Grade 1</i> – narrow deep periodontal pocket in 1 tooth surface <i>Grade 2</i> – wide deep periodontal pocket in 1 tooth surface <i>Grade 3</i> – deep periodontal pockets in more than 1 tooth surface	Endo-periodontal lesion in non-periodontitis patients	<i>Grade 1</i> – narrow deep periodontal pocket in 1 tooth surface <i>Grade 2</i> – wide deep periodontal pocket in 1 tooth surface <i>Grade 3</i> – deep periodontal pockets in more than 1 tooth surface
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Postoperative Care

Postop. Instructions	<ul style="list-style-type: none"> - Immediately after surgery give instructions on self care for the healing period - Tell the patient: What they will experience, why and how to manage that - Include all verbal instructions as written instructions also in simple language - ALWAYS give a phone number that the Pt can call in case of emergency
Day of Surgery	Avoid Physical Exercise <ul style="list-style-type: none"> - ↑ blood flow to surgical site can promote bleeding post op.
Periodontal Dressing (Coe-Pak)	<p>Coe-Pak covers the surgical site and secures tissues in place</p> <ul style="list-style-type: none"> - Becomes firm within 1 hr -> Leave it until next appointment! - Provides a good physical barrier (nothing else, it helps speed up healing though) - Pack it on the buccal and lingual, the putty will interlock interdentally and stay in place (won't work if you pack only on one side) - Don't brush the area of dressing <p>**1 component comes from peanuts! Don't use for people with peanut allergy**</p>
Postop. Bleeding control	<ol style="list-style-type: none"> 1. Sutures re-approximate the flap edges -> Provides initial hemostasis 2. Periodontal dressing can be placed on top of sutures (not needed though) 3. Oozing is normal (might wake up with blood stains on pillow, or have blood mixes with saliva) 4. Don't rinse mouth vigorously for few hours (might disrupt the clot) 5. Avoid: Smoking, sucking, spitting for a few days (-ve pressure may dislodge the clot) <ul style="list-style-type: none"> - Also garlic, ginger and ginseng (Promotes bleeding) 6. No strenuous exercising (↑ BP) 7. Pt should contact you if bleeding is prolonged, or is bright red, or large clots are getting dislodged <p>Concerning Levels?</p> <ol style="list-style-type: none"> 1. Advise pt to keep head elevated and use compression with sterile gauze (we have provided it) or black tea bag for 20-30 mins <ul style="list-style-type: none"> - Important to show them in the office how much pressure to apply 2. Call Pt into office <ul style="list-style-type: none"> - Locate bleeding point: Retie sutures if needed, place additional blind sutures distal to the bleeding site and deep in the tissue if cannot find the bleeding point - Inject LA w/ 1:50k Epi
Ecchymosis	= oozing blood submucosally and subcutaneously <ul style="list-style-type: none"> - Typical in older pt's b/c ↓ tissue tone and weaker intercellular attachments - Not dangerous: no ↑ in infection or pain - Make sure Pt knows it's a possibility so they don't freak out
Edema (Swelling)	<p>Inform Pt's that this is expected and normal</p> <ul style="list-style-type: none"> - Max swelling = 48-72hrs - Keep head elevated, using several pillows for sleeping - Usually resolved after 1 week <p>To alleviate swelling:</p> <ul style="list-style-type: none"> - Ice pack outside face over surgical area (20mins on 20 mins off) for 1st 24 hours - On 3rd day, heat may help resolve swelling (but isn't needed) - If it persists after 3rd or 4th day -> Might have infection, contact us immediately
Complications	<p>Trismus</p> <ul style="list-style-type: none"> - Sometimes from multiple LA injections -> Inflammation in the muscles can cause trismus - Typically medial pterygoid muscle in Inferior Alveolar Block - No problem! Make sure Pt is aware of possibility <p>Paresthesia</p> <ul style="list-style-type: none"> - Incisive + Mental Nerve -> ↓ sensation of ½ lower lip and buccal gingival on same side - Inferior Alveolar Nerve -> ↓ sensation of lower lip, teeth and buccal gingival of same quad - Lingual Nerve -> ↓ sensation of lingual gingiva and anterior 2/3rds of tongue <p>**Usually nerve function will return in a few weeks -> but it could be 6+months as well**</p>
Nutrition	<p>Keep diet soft for few days</p> <p>Avoid spicy foods and hot things</p> <ul style="list-style-type: none"> - Everyone likes ice cream, milk shakes etc <p>Adequate nutrition helps healing</p> <p>Use opposite side of the mouth to chew</p>
Oral Hygiene Instruction	<p>After Surgery:</p> <ul style="list-style-type: none"> - Keeping teeth and mouth clean = faster healing - Continue brushing and flossing in all areas of mouth except the surgical area - CHX can be used to aid oral hygiene post-surgically (Causes staining, and dysgeusia with long use though -> worse when used w/ staining foods like coffee, tea, wine) <p>After 1st post-op visit:</p> <ul style="list-style-type: none"> - Remove Perio dressing (About 1 week after) - Advise soft diet and gentle brushing w/ extra-soft toothbrush <p>After 2nd-3rd week:</p> <ul style="list-style-type: none"> - Can use Rubber tip stimulator, Proxybrush and normal brushing technique - Restorative Tx can proceed at 4-6 weeks depending on type of surgery

Postop Pain	<p>Pain is expected after surgery</p> <ul style="list-style-type: none"> - Goal is MANAGEMENT, not elimination of all soreness (set realistic expectations) - Peaks within 24hrs <p>Pre-op. NSAIDS is advised (Both pain killing for when LA wears off, but also anti-inflammatory)</p> <ul style="list-style-type: none"> - 400-600mg Ibuprofen recommended - 500-1000mg of Acetaminophen q6h for Max. effect from non-narcotics <p>If stronger Drugs are needed:</p> <ul style="list-style-type: none"> - Toradol (Ketoralac) 10mg - Tylenol 3 (Codeine 30mg + Acetaminophen 300mg) <p>Possible that tooth mobility will ↑ after surgery</p> <ul style="list-style-type: none"> - Usually stabilizes after 4 weeks-1yr - No Tx needed
Control of infection	<p>Implant and Bone regeneration surgery</p> <ul style="list-style-type: none"> - Typical to Rx antibiotics immediately <p>Pts who need Antibiotic Prophy DON'T need additional Ab post surgically</p> <p>Pt w/ Hx of cold sores may develop a flair up in the area of trauma</p> <ul style="list-style-type: none"> - No specific management, just the usual stuff for HSV
Post op. Follow up	<p>Bring Pt back in in 1 week (sometimes 2 depending on the type of surgery)</p> <ul style="list-style-type: none"> - Remove sutures at this time
Daily record of Tx	<p>Put EVERYTHING down in writing that was discussed during each and every visit, phone call and text</p> <p>Include:</p> <ul style="list-style-type: none"> - Date - Pt name - Dx - Medical History - Vital signs - Oral Exam - Type and Amount of LA used - Steps of procedure - Sutures - Discharge instructions - Rx meds - Next visit

Mucogingival Problems

Categories of conditions/deformities

- a. **Gingival Phenotype**
 - Thick Biotype vs Thin Biotype
- b. **Gingival/Soft tissue Recession**
- c. **Lack of gingiva**
- d. **↓ vestibular depth**
- e. **Aberrant frenum/muscle position**
 - High frenum attachment becomes an issue if it causes blanching to the tissues
 - Frenectomy 1st -> Then do ortho to close the diastema (otherwise tissue becomes fibrotic)
- f. **Gingival excess**
- g. **Abnormal color**
- h. **Condition of the exposed root surface**
 - Caries, Abrasion, Abfraction, NCCL etc
 - For NCCL we can place composite resto, and then do a gingival graft overtop



Periodontal Plastic Surgery

Surgery to correct anatomical, developmental or traumatic deformities of gingiva and alveolar mucosa

- Functional AND esthetic concerns

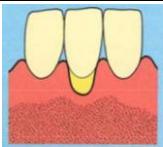
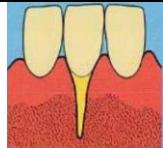
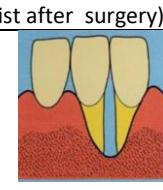
Mucosa and Gingiva

3 Types based on function:

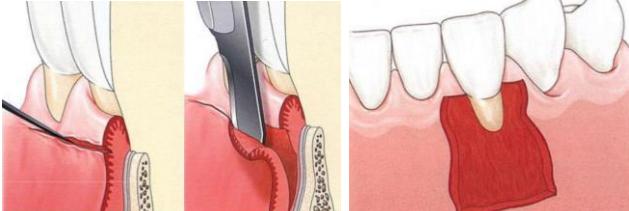
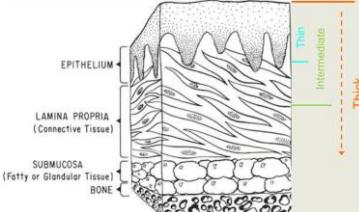
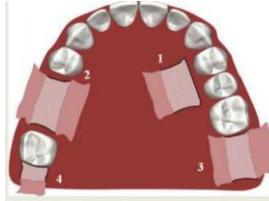
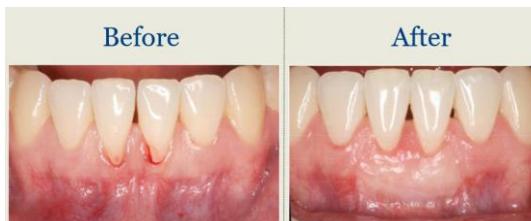
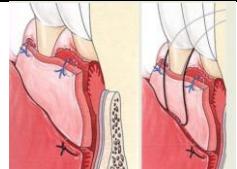
Specialized Mucosa	Mixed: Keratinized + Non-Keratinized <ul style="list-style-type: none"> - Taste buds on dorsum of tongue
Lining Mucosa	Non-Keratinized <ul style="list-style-type: none"> - Lips, Cheeks, FOM, Vestibule, Soft Palate
Masticatory Mucosa	Keratinized <ul style="list-style-type: none"> - Gingiva, Hard Palate
Keratinized Gingiva	<p>= <u>Free Gingiva + Attached Gingiva</u></p> <ul style="list-style-type: none"> - Beyond the mucogingival junction = Mucosa (Lining)  <p>**Attached gingiva is NOT the same as Keratinized gingiva**</p> <ul style="list-style-type: none"> - Keratinized includes the Free gingiva - Determine width of attached gingiva by subtracting the probing depth (free gingiva) from the Keratinized gingiva (KT-PD) <p>Function</p> <ul style="list-style-type: none"> - ↓ spread of inflammation and protects periodontium from injury <ul style="list-style-type: none"> - Pt w/ excellent oral hygiene can maintain gingival health with no attached gingiva w/o recession - Pt w/ insufficient oral hygiene and no attached gingiva = ↑ recession
Indications for increasing the amount of attached gingiva (grafting)	<p><1mm of attached gingiva AND any 1 of the following:</p> <ul style="list-style-type: none"> - Persistent Marginal Inflammation - Progressive Recession - SubG. Restorative margin - Removable appliance - Teeth undergoing ortho <p>KG ↓ the risk of peri-implantitis following the placement of an implant</p> <ul style="list-style-type: none"> - Less KG = ↓ the long term success of the implant 

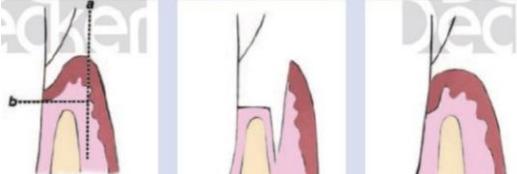
Miller Classification for Recession

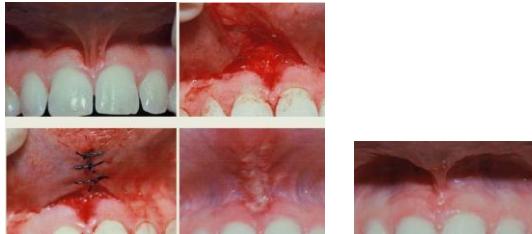
- There is a newer Cairo Classification, but we need to know Miller for now

Class I	Recession not to MGJ No Interproximal bone loss or papilla loss Tx Outcome: <ul style="list-style-type: none"> - 100% root coverage (w/ surgery) 	 
Class II	Recession to or past MGJ No Interproximal Bone or papilla loss Tx Outcome: <ul style="list-style-type: none"> - 100% root coverage 	
Class III	Recession past MGJ Interproximal bone or papilla loss -> Presence of black triangles Malposition Tx Outcome <ul style="list-style-type: none"> - Partial coverage (2mm of recession will persist after surgery) 	 
Class IV	Recession past MGJ Severe interproximal bone or papilla loss Malposition Tx Outcome: <ul style="list-style-type: none"> - No root coverage 	

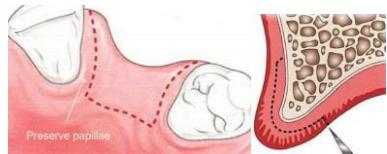
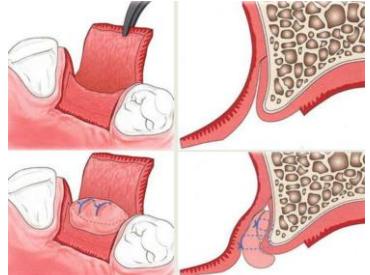
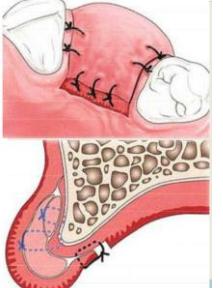
Surgical Procedures

<p style="text-align: center;">Free Gingival Graft</p> <p>= Completely detach from one site and transfer to different site</p> 					
Indications	<p>Minimum KT Frenum pull Shallow vestibule</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #90EE90; color: black;">Advantages</th><th style="background-color: #FF9999; color: black;">Disadvantages</th></tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> - Donor material is there and readily available - Procedure is fairly simple - Very predictable outcome in terms of graft acceptance </td><td> <ul style="list-style-type: none"> - Amount of root coverage is less predictable - 2 operative sites needed - Compromised blood supply (because you are severing it from the donor tissue) - Color mismatch - Poor hemostasis </td></tr> </tbody> </table>	Advantages	Disadvantages	<ul style="list-style-type: none"> - Donor material is there and readily available - Procedure is fairly simple - Very predictable outcome in terms of graft acceptance 	<ul style="list-style-type: none"> - Amount of root coverage is less predictable - 2 operative sites needed - Compromised blood supply (because you are severing it from the donor tissue) - Color mismatch - Poor hemostasis
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Contraindications	High esthetic demand				
Preparation of Recipient Site	<ol style="list-style-type: none"> 1. Incision below MGJ, parallel to alveolar process -> Create a partial thickness flap 2. Extend over 30% of defect size to compensate for contraction of graft 3. Extend about 3-5mm more apical to the most apical part of the exposed root 				
Preparation of Donor Site	<p>We want both Epithelium + CT</p>  <p>Thin: <0.75mm thick Intermediate: 0.75-1.25mm thick Thick: >1.25mm thick</p> <p>Donor Sites:</p> <ul style="list-style-type: none"> - Edentulous Ridges - Tuberosity - Palate (Distal to the rugae)  <p>**Once you have taken from the site cover with wound with medical grade glue OR create a Surgical Stent**</p> <ul style="list-style-type: none"> - Vacuform that covers the teeth and extends to the wound on the palate (acts as a bandaid) 				
Stabilization of Graft	<ol style="list-style-type: none"> 1. Apply firm finger pressure 2. Suture to hold graft in place and maintain pressure - Simple interrupted at the corners + Sling suture to contour around the root  				

Apically Positioned Partial Thickness Flap	
Indications	<ul style="list-style-type: none"> - To ↑ the attached gingiva - Eliminate periodontal pockets
Contraindications	<ul style="list-style-type: none"> - Thin gingival Biotype - Lack of KT at the gingival margin
Procedure	<ol style="list-style-type: none"> 1. Crestal incision is made along the long axis of the tooth, partial thickness 2. Flap is raised by sharp dissection (periosteum is retained over the bone) 3. Flap is apically positioned and sutured into place at or below the alveolar crest 

Frenectomy	
Frenum = small band of mucosal membrane (w/ muscle fibers) that attaches the lips and cheeks to the alveolar process	
High Attachments?	Causes Diastema, Gingival recession, Periodontal Disease 
What is a frenectomy?	Complete removal of the frenum (including its attachment to the underlying alveolar process) <ul style="list-style-type: none"> - Performed separately or as a part of other procedures to ↑ attached gingiva 

Surgical Reconstruction of Alveolar Ridge (Ridge Augmentation w/ soft tissue grafts)									
Classification of Ridge Defects	Based on available ridge volume (horizontal and vertical)								
	<table border="1"> <thead> <tr> <th>Seibert Classification of Site</th><th>Allen Classification of Extent</th></tr> </thead> <tbody> <tr> <td><u>Class I</u> -> B-L loss w/ normal height </td><td><u>Mild</u> -> <3mm <u>Moderate</u> -> 3-6mm <u>Severe</u> -> >6mm</td></tr> <tr> <td><u>Class II</u> -> Apicocoronal loss w/ normal width </td><td></td></tr> <tr> <td><u>Class III</u> -> Buccolingual AND Apicocoronal loss </td><td></td></tr> </tbody> </table>	Seibert Classification of Site	Allen Classification of Extent	<u>Class I</u> -> B-L loss w/ normal height 	<u>Mild</u> -> <3mm <u>Moderate</u> -> 3-6mm <u>Severe</u> -> >6mm	<u>Class II</u> -> Apicocoronal loss w/ normal width 		<u>Class III</u> -> Buccolingual AND Apicocoronal loss 	
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Onlay Grafts	Advantages	Disadvantages
	Increases KG	↓ Blood supply to graft Color mismatch ↑ post op pain
		-> De-epithelialization to get a bleeding surface and graft
Subepithelial Connective tissue graft	Advantages	Disadvantage
	<ul style="list-style-type: none"> - ↑ vascularization of graft - Smaller wound on palate - Color match 	- Technically demanding
		Cut partial thickness flap (preserving the papilla) and reflect flap buccally
		Place wedge of CT that you harvested from the hard palate and suture it into place
		Reposition the flap to cover the donor tissue

Root Coverage

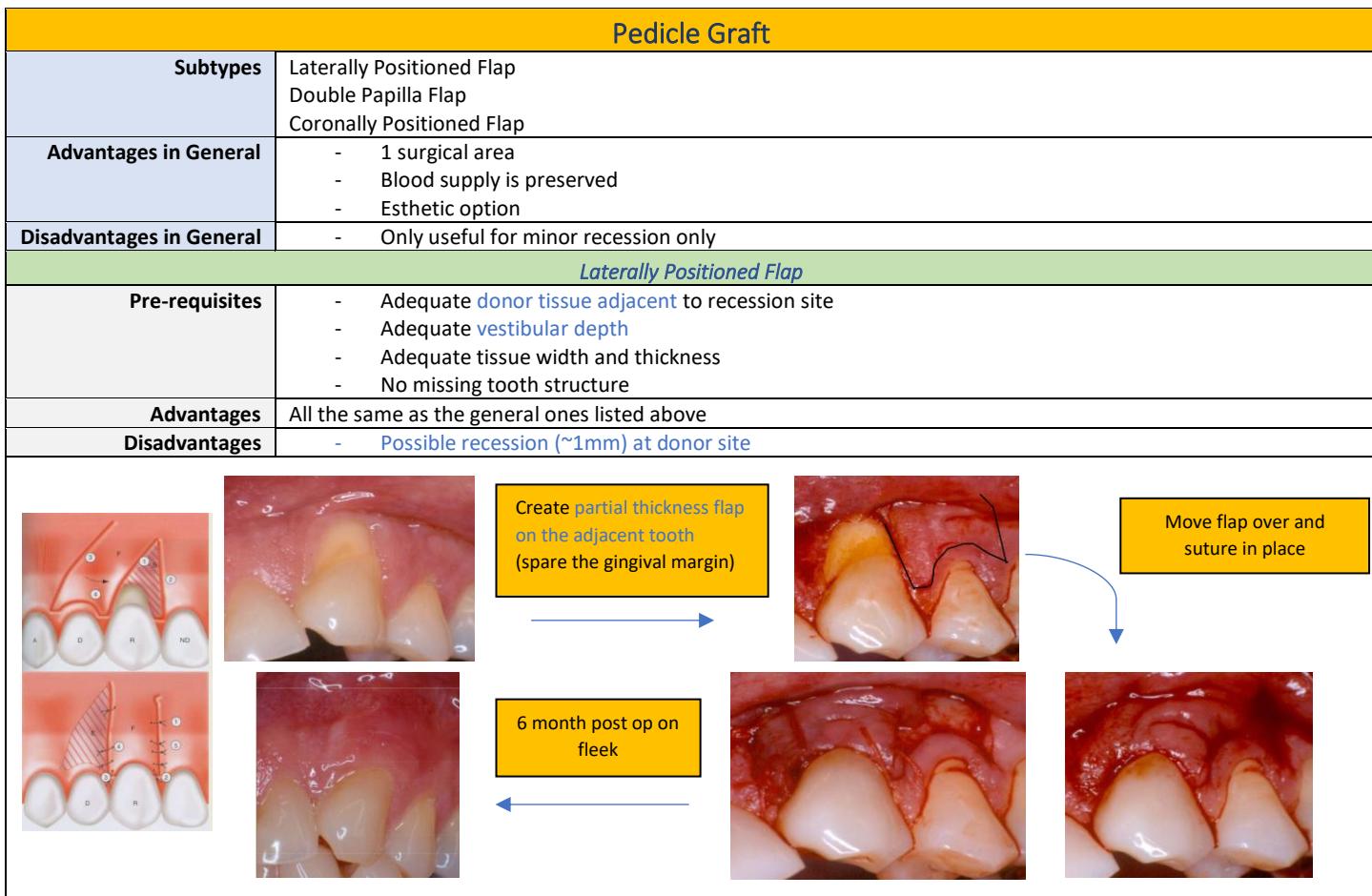
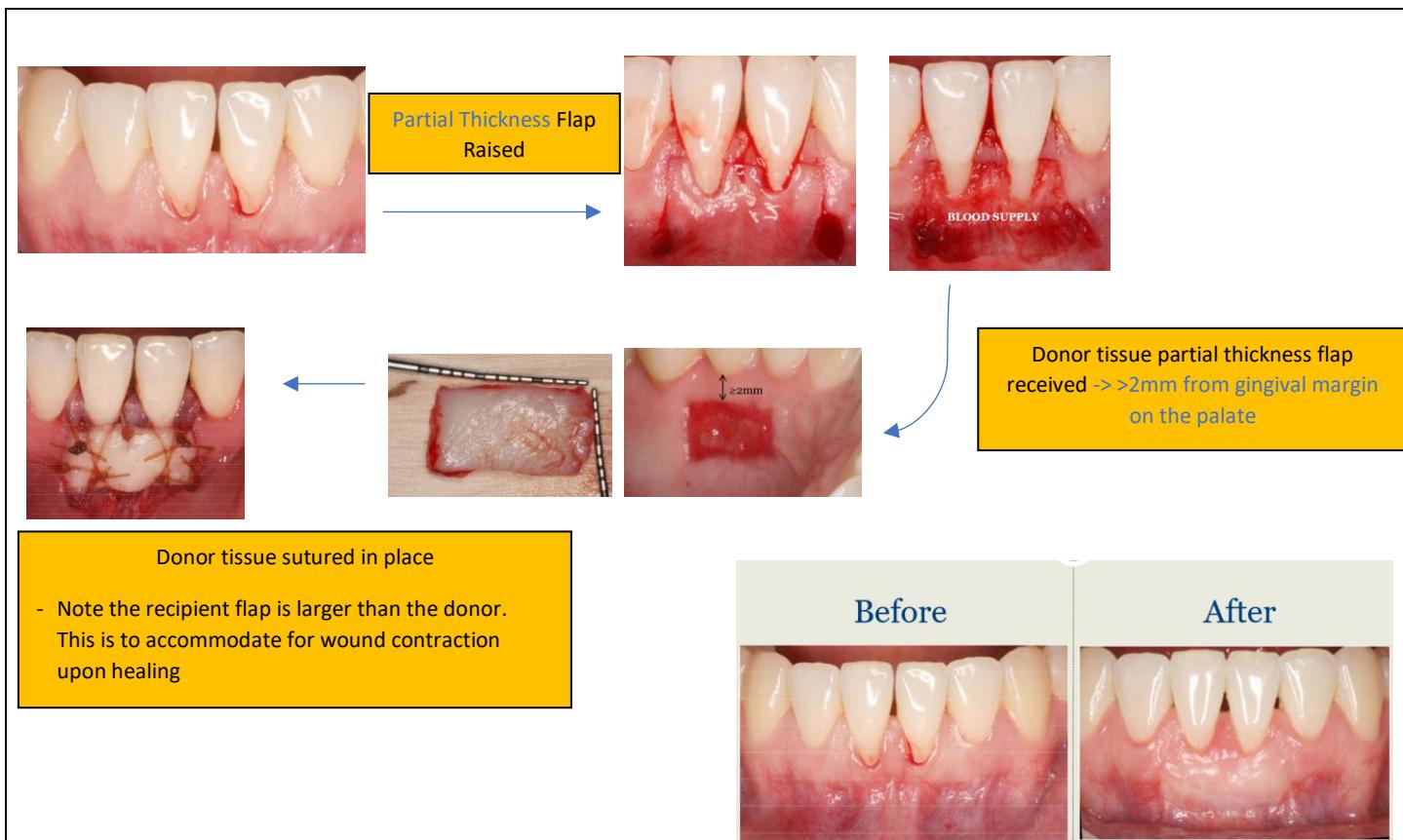
If root resorption is left untreated there is a **very high probability of it progressing in the long term**

- Treated resorption remains stable for up to 35 years though! Great long term prognosis

Indications for Root coverage	<ul style="list-style-type: none"> - Esthetic concern - Progressive recession - Hypersensitivity - Carious or Non-Carious Cervical lesions - Improper oral hygiene
Risk Factors	<p>Pt. Related Risk Factors:</p> <ul style="list-style-type: none"> - ↓ OHE - Traumatic tooth brushing - Poor habits (Playing with lip or tongue piercing) - Smoking - Systemic health issues (Diabetes etc) <p>Tooth/Site related Risk Factors</p> <ul style="list-style-type: none"> - Tooth malposition - Shallow vestibule - Decay or concavity on exposed root - Interdental bone level and Papilla level - Flap thickness (Thin biotype) - Insufficient KT - Presence of prosthesis - Presence of Frenum pull - Size of recession -> >3mm wide x >5mm tall <p>Technique Related Risk Factors</p> <ul style="list-style-type: none"> - Operator Skill - Tension free adaptation - Blood supply - Position of gingival margin

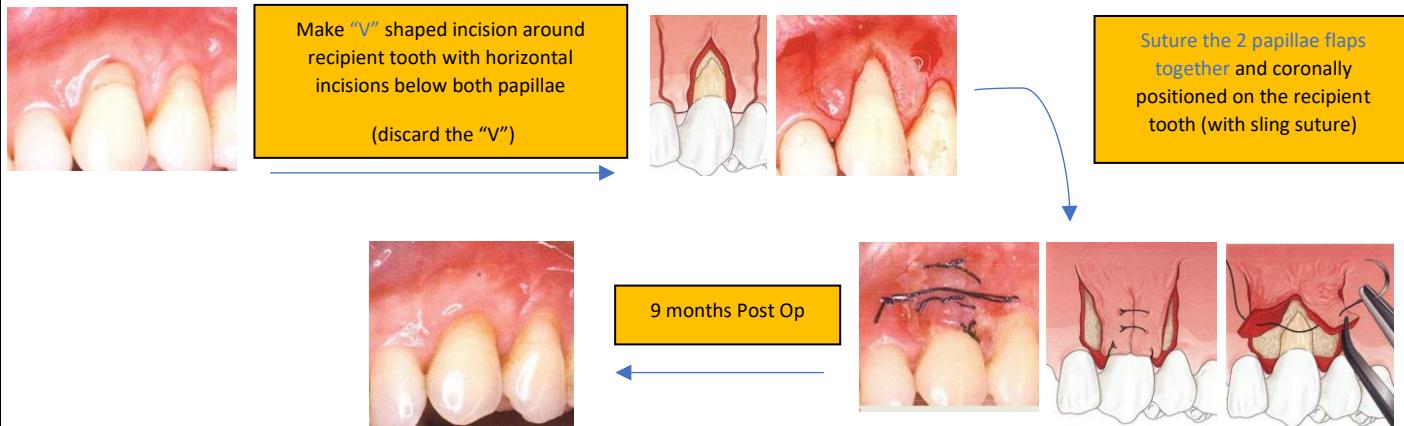
Methods

Free Gingival Graft	
Definition	<p>Tissue completely detached from one site and transferred to a different site</p> <ul style="list-style-type: none"> - Survival depends on vasculature of underlying graft bed -> Want to create a bleeding surface <p>Used traditionally to thicken tissue and prevent further recession, not so much to fix recession that is already there</p>
Indications	<p>Minimum KT Frenum Pull Shallow Vestibule</p>
Contraindications	<p>High Esthetic demand</p> <ul style="list-style-type: none"> - Grafted tissue looks whiter than then surroundings after healing
Advantages	<p>Donor material is readily available Relatively simple procedure High degree of healing predictability Can Tx multiple teeth at once</p> <p>Over time we see an ↑ in root coverage even after the graft is placed and healed (don't know why)</p> <ul style="list-style-type: none"> - Creeping Attachment - This is why we still sometimes do this, even know it looks ugly
Disadvantages	<p>2 operative sites Compromised blood supply (of the donor) ↓ root coverage predictability Greater discomfort (open wound is left to heal on its own) Poor hemostasis</p>
Recipient Site Prep	<ol style="list-style-type: none"> 1. Root debridement <ul style="list-style-type: none"> - Remove any biofilm that may compromise healing 2. Root Reduction <ul style="list-style-type: none"> - Shave down any prominences, shallow root caries or irregularities to create a nice smooth uniform surface 3. Root Conditioning <ul style="list-style-type: none"> - Tetracycline/EDTA -> removes any smear layer and exposes collagen fibrils for integration of the new tissue 



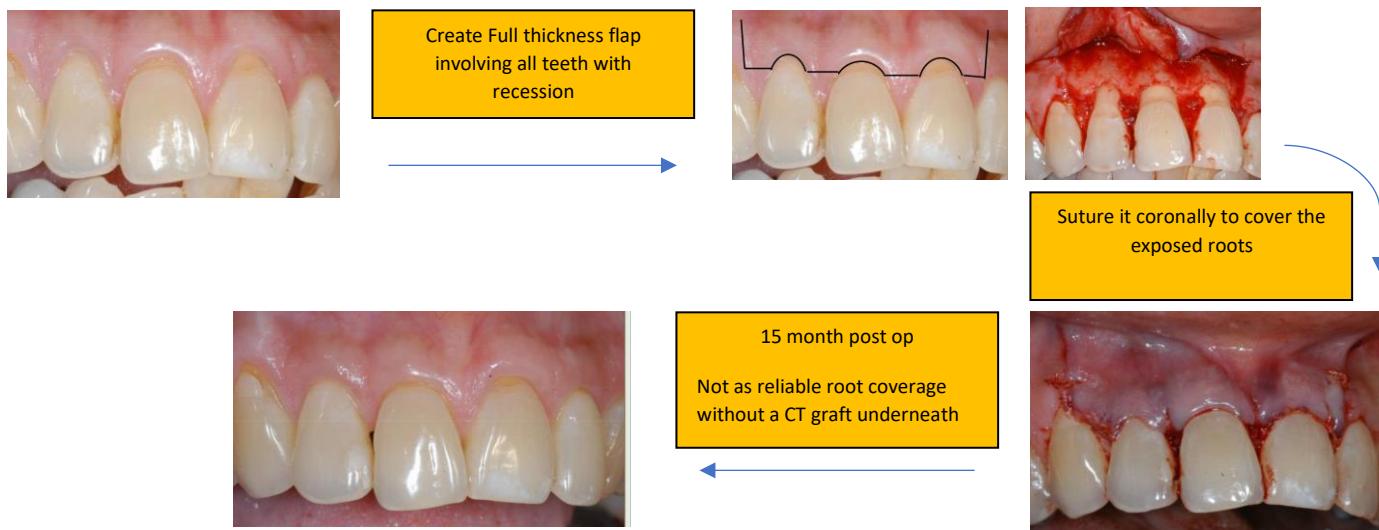
Double Papilla Flap

Indications	- Sufficient width and length of papillae
Advantages	- Minimal resorption of interdental bone
Disadvantages	- Technically challenging - Variable predictability



Coronally Positioned Flap

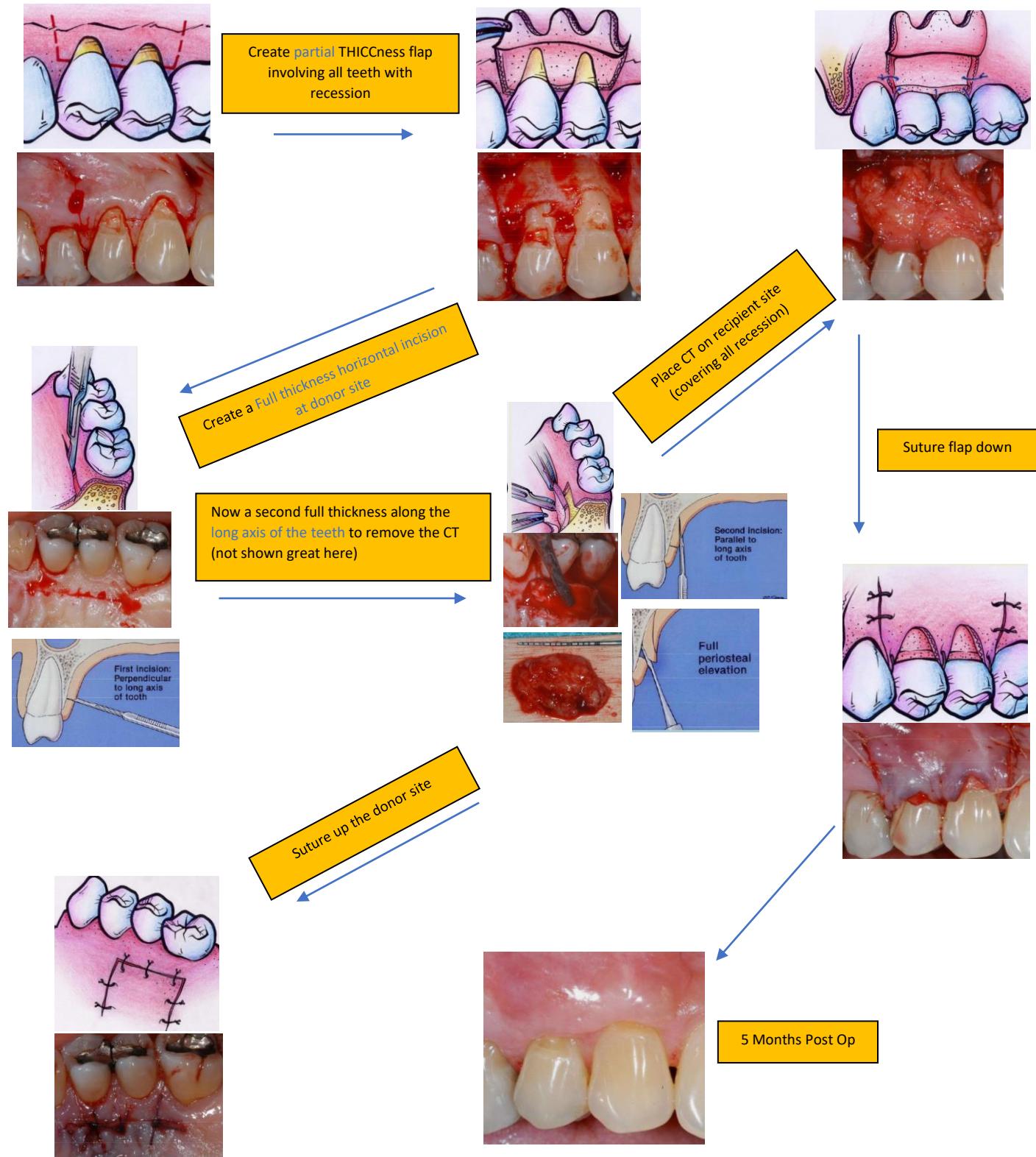
Pre-requisite	- >3mm of KT - Adequate vestibular depth
Advantages	- Manages multiple recession sites at once - No need for involvement of adjacent teeth (that are unaffected)
Disadvantages	- Shortens vestibular depth



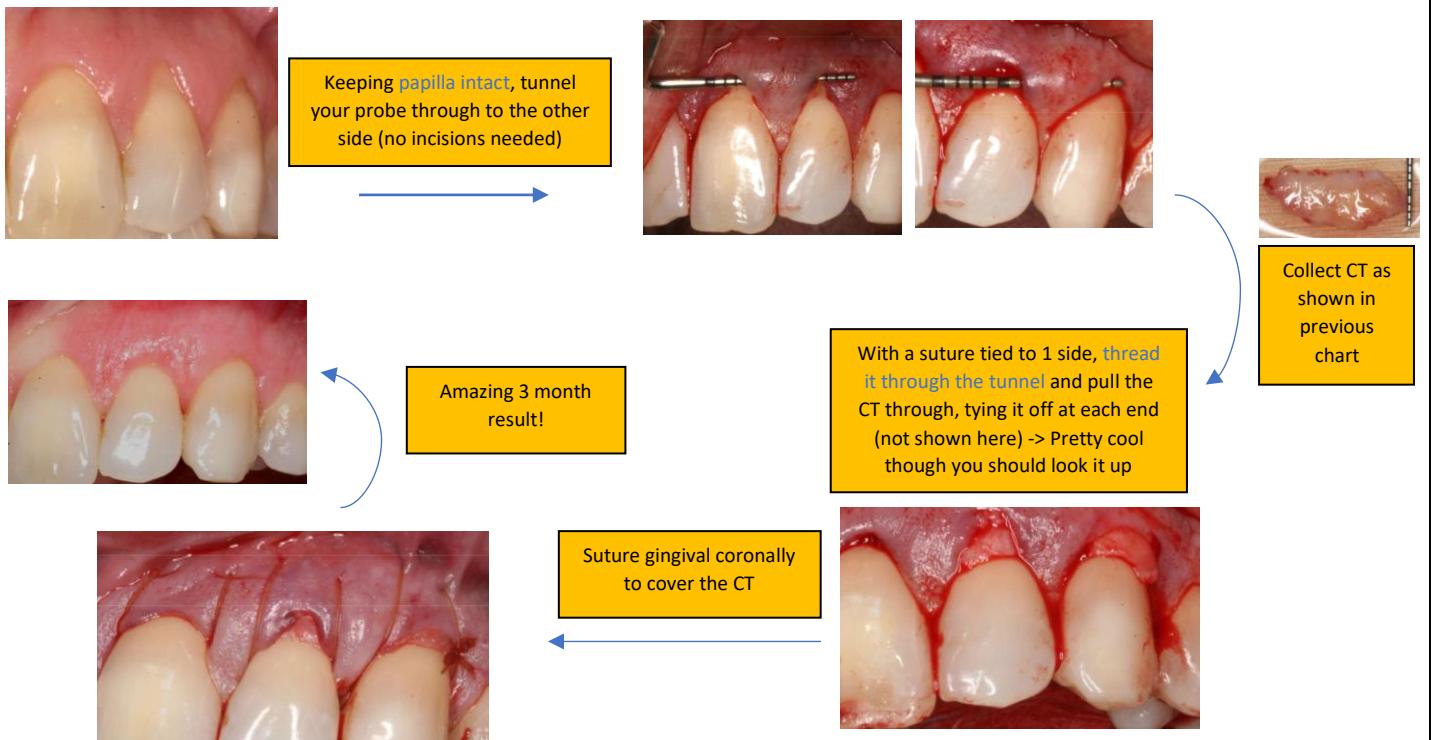
Connective Tissue Grafting

Advantages	<ul style="list-style-type: none"> - Better tissue match - Dual blood supply - Predictable root coverage - Less painful at donor site
Disadvantages	<ul style="list-style-type: none"> - 2 surgical sites - Adequate donor tissue - Technically more challenging

Langer Technique



Raetzke Pouch Technique



<https://www.youtube.com/watch?v=dclFx6kwIZM> -> This shows it pretty well!

Donor Sites	<ul style="list-style-type: none"> - Edentulous Ridges - Tuberosity - Palate (Distal to the rugae) <p>**Always take tissue palatal to the PREMOLARS. The Greater Palatine Artery and Nerve run towards the canine to the incisive canal, and the 1st molar has thin tissue with ↑ fat that we don't want**</p> <p>Can take from the same donor site usually 2-3 months after 1st harvest</p>
-------------	---

How good would it be if you didn't need a donor site!?

Non-Autogenous Grafts	<p>Now we have Allografts and Zenografts! So there is no need for autogenous tissue and all that wound healing business 😊</p> <p>Advantages:</p> <ul style="list-style-type: none"> - No secondary surgical site - ↓ surgery time - ↓ patient morbidity - No more limitations with palatal harvesting - Unlimited supply! - Can treat multiple recessions at once - ↑ patient acceptance
Alloderm (Acellular Dermal Matrix)	<p>Derived from donated human skin</p> <ul style="list-style-type: none"> - Multistep processing removes both the epidermis and all cells (just a collagen scaffold basically) = No risk of tissue rejection! <p>Rehydrate in saline or patients blood before placement</p>

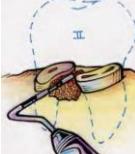
Success of Root Coverage Criteria

1. Complete root coverage (Soft tissue margin at the CEJ)
2. Clinical Attachment to the root (Long Junctional epithelium and CT attachment)
3. Depth of sulcus is within 3mm
4. No BOP
5. Nice color match

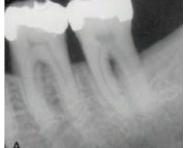
Furcation Management

- Furcation involved molars have ↑ risk of tooth loss: 1.46x in 10 years, 2.21x in 10-15 years
 - o Grade II – III have the highest risk when no periodontal care is taken
- Important to still do Perio therapy and maintenance for teeth even with severe furcation involvement -> Even though they are at high risk of tooth loss long term

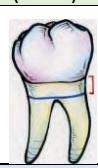
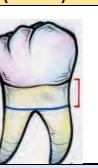
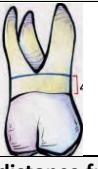
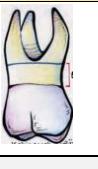
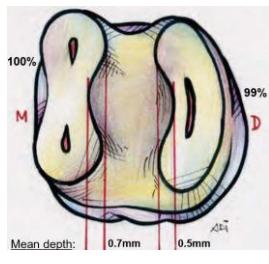
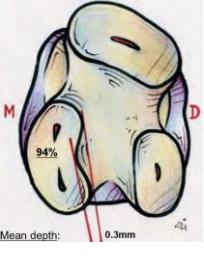
Classification

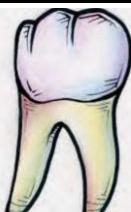
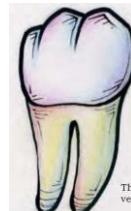
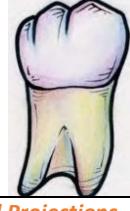
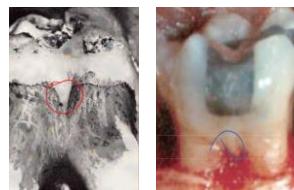
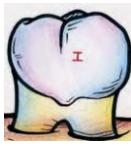
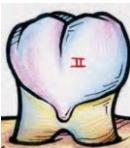
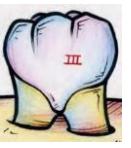
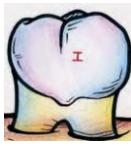
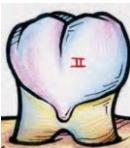
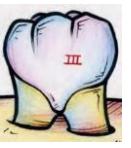
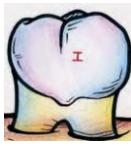
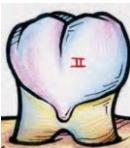
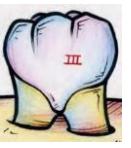
Hamp Classification **This is the one UBC uses**		
Apparently the only one we will be tested on		
Class I	Horizontal attachment loss ≤ 3mm	
Class II	Horizontal attachment loss > 3mm	
Class III	Horizontal Attachment Loss all the way through (Through and Through)	
Glickman *This is the one private practice uses mostly*		
Universal Symbol: 	Grade I Early furcation involvement -> Just into the fluting of the furcation <ul style="list-style-type: none"> - Feel the initial catch of the explorer - No significant destruction of bone or CT in the actual furcation proper 	
Universal Symbol: 	Grade II Distinct horizontal destruction of the furcation <ul style="list-style-type: none"> - Doesn't extend all the way through - "Shallow" or "Deep" depending on the horizontal probing depths - May not have vertical bone loss 	
Universal Symbol: 	Grade III Destruction of bone and CT all the way through the furcation <ul style="list-style-type: none"> - Through and Through - Furcation defect is not visible to the eye -> Gingival tissues cover the furcation entrance 	
Universal Symbol: 	Grade IV Destruction of bone and CT all the way through <ul style="list-style-type: none"> - Through and Through - Gingival recession present enough that you can visually see through the furcation on examination 	
Tarnow & Fletcher **Used more during open flap surgery**		
Grade A	Vertical loss: 1-3mm	
Grade B	Vertical Loss: 4-6mm	
Grade C	Vertical loss 7+mm	

Diagnosis

Probing	Buccal Probing is easy 		Measure the M-D Furcation from the palatal side (the furcation is located more palatally)
Radiographs	Mandibular is easy to spot -> Radiolucency in the furcation area is not usually blocked by roots or anatomy Maxillary teeth are trickier -> Palatal root typically covers the area and blocks any RL that might be there - Need to take off angled shots to see it		

Etiology

Furcation Anatomy	Root Trunk Length				
	Mandible				
	Short (2mm)	Average (3mm)	Long (4mm)		
					
	Maxilla				
	Short (3mm)	Average (4mm)	Long (5mm)		
					
	Average distance from CEJ:				
	- 3.6mm apical to CEJ on Mesial surface -> shortest				
	- 4.2mm apical to CEJ on Buccal surface				
	- 4.8mm apical to CEJ on Distal surface				
<p>**If Pt has short root trunk its really easy for furcation involvement to occur with little bone loss.</p> <ul style="list-style-type: none"> - On the flip, if the patient has LONG ass root trunk there is more leeway of bone loss before furcation involvement happens -> If they do develop enough bone loss to involve the furcation the prognosis isn't great b/c of the ↑ bone loss** 					
Root Concavities Concavities typically are found on the inner/furcation side of multi-rooted teeth and act as plaque traps that floss will not be able to clean -> Need interdental brush!					
 					

	<p>** Maxillary 1st Premolar = Super important tooth to remember for exams**</p> <ul style="list-style-type: none"> - Mesial concavity + Mesial groove that runs all the way to the apex <table border="1"> <tr> <td>Bifurcation</td><td>Apical 3rd: 35% Middle 3rd: 38% *generally in apical 3rd or middle* Cervical 3rd: 27%</td></tr> <tr> <td>Root Trunk Length</td><td>4-14.6mm (Mean 7.9mm)</td></tr> <tr> <td>Root Length</td><td>10-17.1mm</td></tr> <tr> <td>Root Concavity</td><td>Deeper on the Mesial -> runs progressively from cervical ½ towards furcation</td></tr> </table>	Bifurcation	Apical 3 rd : 35% Middle 3 rd : 38% *generally in apical 3 rd or middle* Cervical 3 rd : 27%	Root Trunk Length	4-14.6mm (Mean 7.9mm)	Root Length	10-17.1mm	Root Concavity	Deeper on the Mesial -> runs progressively from cervical ½ towards furcation	
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Root Length	10-17.1mm									
Root Concavity	Deeper on the Mesial -> runs progressively from cervical ½ towards furcation									
Thickness of investing alveolar process/Width of root divergence	<p>Wider divergence:</p> <ul style="list-style-type: none"> - Thicker bone = more resistance to destruction  <p>Narrow Divergence:</p> <ul style="list-style-type: none"> - Thinner fin of bone = faster destruction of bone so furcation involvement progresses more rapidly  <p>Fused roots</p> 									
Enamel projection and pearls	<p>Cemento-Enamel Projections</p> <ul style="list-style-type: none"> - Extension of enamel projecting from the CEJ towards the furcation  <ul style="list-style-type: none"> - VERY common - If you have a flap open for surgery etc and you see a projection = remove it! Acts as a highway for bacteria to enter the sulcus <table border="1"> <thead> <tr> <th>Grade I</th> <th>Grade II</th> <th>Grade III</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Distinct CEJ change projecting towards furcation</td> <td>Enamel projection approaching furcation (doesn't enter though)</td> <td>Enamel projection extends horizontally into furcation</td> </tr> </tbody> </table> <p>Enamel Pearls -> NOT PRECIOUS</p>  <ul style="list-style-type: none"> - Enamel doesn't allow for tissue attachment. When it's on the roots it makes it easy for bacteria to get into the furcation and harbour there - Usually spheroid and limited to 1 or 2 - Most frequently on: M & D of Max. 2nd and 3rd molars Rarely found on incisors and premolars 	Grade I	Grade II	Grade III				Distinct CEJ change projecting towards furcation	Enamel projection approaching furcation (doesn't enter though)	Enamel projection extends horizontally into furcation
Grade I	Grade II	Grade III								
										
Distinct CEJ change projecting towards furcation	Enamel projection approaching furcation (doesn't enter though)	Enamel projection extends horizontally into furcation								

	<p>Intermediate Bifurcation Ridge</p> <ul style="list-style-type: none"> - Cementum projection running from M to D root in the furcation - Plaque traps! Associated with progression of PDD <table border="1"> <thead> <tr> <th>Grade I (<1mm)</th><th>Grade II (<2mm)</th><th>Grade III (2+mm)</th></tr> </thead> <tbody> <tr> <td></td><td></td><td></td></tr> </tbody> </table>	Grade I (<1mm)	Grade II (<2mm)	Grade III (2+mm)			
Grade I (<1mm)	Grade II (<2mm)	Grade III (2+mm)					
Iatrogenic Factors	You fucked up...						
Pulpal Pathology	<p>Endo-Perio lesions</p> <ul style="list-style-type: none"> - <i>Treat the endo 1st (RCT) -> Wait 3 months (keep the temp crown on there for now) -> Re-assess the bone levels</i> - Usually bone levels will fill in after RCT and you will be a hero 😊 - If bone loss persists (furcation involvement) = <i>Perio surgery</i> 						
Trauma from occlusion	<p>If tooth is the only one in occlusion: -> It might develop Fremitus with bone loss</p> <ul style="list-style-type: none"> - Reduce the occlusion to balance everything out -> Check in a few months if bone levels return to normal = Hero mode - If bone does not heal -> Perio surgery Mode 						

Treatment

Goal	<ol style="list-style-type: none"> 1. Eliminate plaque from exposed surfaces on the root complex 2. Establish anatomy that facilitates proper hygiene maintenance
Principles	<ul style="list-style-type: none"> - Complete regeneration of periodontal support is difficult to achieve - Tx usually is based on the need to ↑ ability to access area for plaque removal

Class I Furcations	
Pure Fact	<p>Easiest to treat & Best prognosis</p> <ul style="list-style-type: none"> - Buccal furcations are easiest to access by patient (obviously) - Mandibular lingual furcations + Max. M-D furcations are more tricky
Tx Options	<p><u>Scaling and Root Planing</u></p> <ul style="list-style-type: none"> - 58% of molar furcations are too narrow for a curette to reach (<0.75mm) -> There are special options <ul style="list-style-type: none"> - Mini Five Gracey - Diamond files - Quetin furcation curettes - DeMarco curettes - Mand: Buccal Wider than Lingual - Max: Mesial > Distal > Buccal <p><u>Furcation Plasty</u></p> <ul style="list-style-type: none"> - Open flap -> Osteoplasty the bone and polish the furcation access with diamond bur (\uparrow access) -> Papilla will fill in the furcation and make the area maintainable <p><u>Recontour Fixed Restorations / Class V's</u></p> <ul style="list-style-type: none"> - Modify prep and crown to blend into the furcation otherwise a huge overhang will trap plaque in the furcation still <p>Modified to blend into furcation</p>

Class II Furcations

Treatment Options

Furcation Plasty

- As above

Osseous Resection

- **Osteotomy + Osteoplasty** to create a more cleansable and accessible area

Guided Tissue Regeneration (GTR) -> Grow some bone

- Use a membrane to **impede epithelial growth into the wound/furcation** before bone/PDL is able to heal



For **Mand.** Class I: **Most cases successful and predictable**

Class II: **Predictable and successful in most cases**

Class III: **Limited evidence of success, Not predictable**

Tunnel Preparation

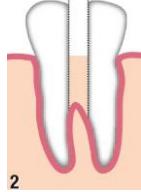
- Remove radicular bone from a Class II/III furcation involvement in order for easier oral hygiene maintenance
- Old school method for mandibular molars
- **Only used with short root trucks with long, wide spaced roots**
- Pt **NEEDS** excellent oral hygiene and compliance and dexterity to fit an interdental brush all the way through the tunnel



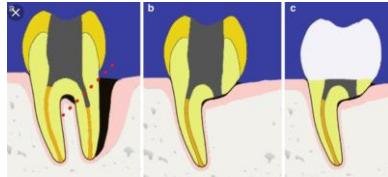
Root Separation and Resection

- **Separation** = Section of the root complex and the maintenance of all remaining roots
- **Resection** = Sectioning + the removal of 1+ roots

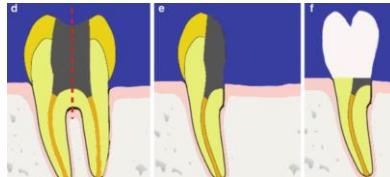
Separation



Root separation + Resection



Hemisection



Technique:

- Elevate full thickness flap => **Osteotomy** around the root to be removed
- **Amputate** root with carbide bur -> **Elevate root** (avoid pressure on the remaining tooth)
- **Reshape root truck** to ↓ plaque retention => Close the root socket with sutures
- **Adjust occlusion to minimize lateral forces**

**Ideally endo should be done first* -> Vital root amputations are possible but not sweet (Still need to do definitive RCT within 2 weeks of amputation*)*



Indications	Contraindications
<ol style="list-style-type: none"> Vertical Bone loss around ONE root Fracture in middle or apical 3rd of root Unfavorable root proximity Endo perforation of root Inability to obturate the canal Severe dehiscence of a root Root caries too close to furcation 	<ol style="list-style-type: none"> Systemic issues limiting dental Tx Unfavorable C:R ration of remaining roots Adjacent teeth supporting fixed partial Poor oral hygiene Retained root cannot be Endo Tx Retained root is fused to root to be removed Remaining roots too thin Root trunk too long (Furcation near apex) Inability to properly restore or splint the molar

Tooth Extraction

Class III Furcations

Tx Options	Tunnel Prep Root Separation and Resection Hemisection Tooth Extraction
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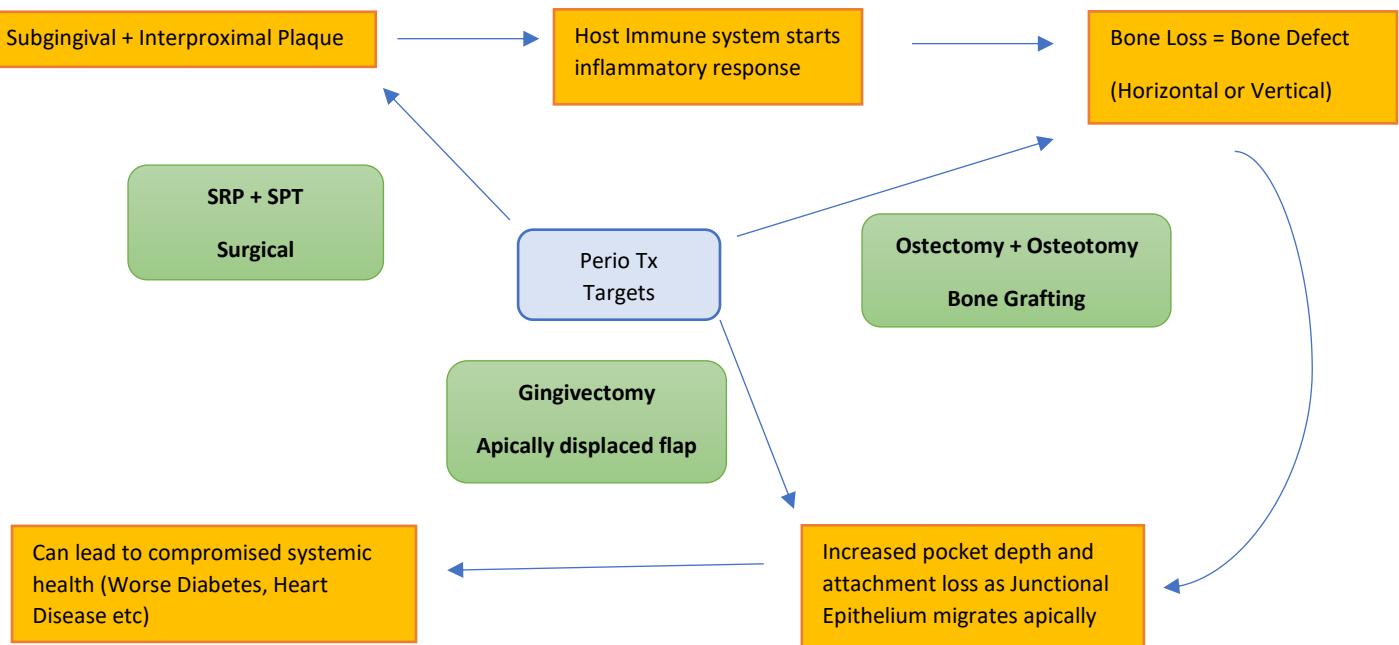
Facts:



- 70% survival rate of furcated molars
 - o Mand Molar 4x ↑ chance of repeat surgery
- **Most commonly lost teeth due to furcation involvement:**
 - o **Mx 2nd molar > Mand. 2nd molar > Mx 1st Molar > Mand 1st Molar**
- Least likely teeth to be lost:
 - o **Mand. 1st pre-molars**

Periodontal Regeneration

In case you haven't been paying attention at all...here is the really simplified way to explain perio -> Actually a great way to explain its importance to patients

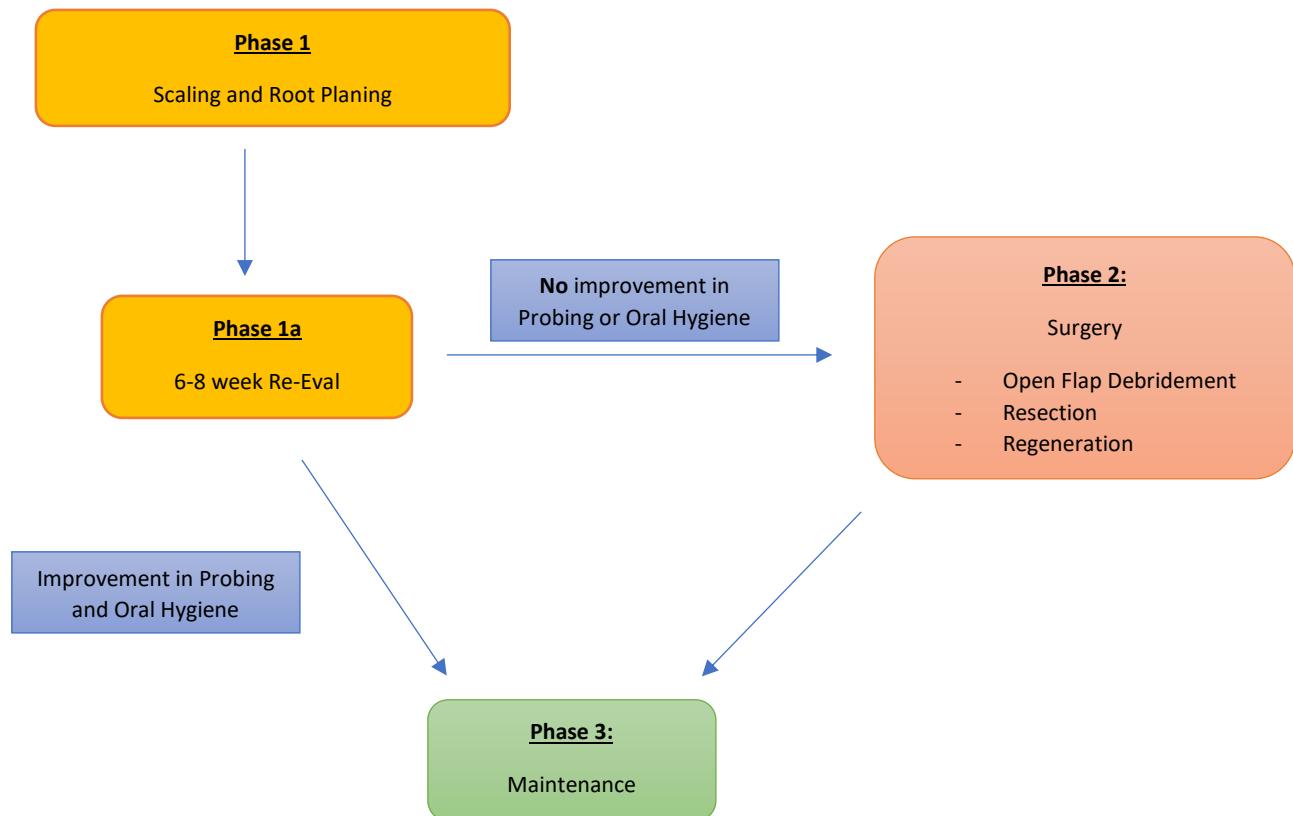


Repair	= Restoration of new tissue that does not replicate the structure and function of the original host tissues <ul style="list-style-type: none"> - Long Junctional Epithelium - Epithelium attaches first to the cementum preventing bone, PDL and cementum from regenerating 	The diagram shows two cross-sections of a tooth. The left section, labeled 'Flap Curettage', shows a flap of gingiva being moved back to expose the root surface. The right section, labeled 'Long JE', shows the junctional epithelium (pink layer) attached to the root surface, preventing new tissue from growing.
Regeneration	= Biologic process by which the architecture and function of the lost tissue is completely renewed <ul style="list-style-type: none"> - New Cementum, Bone and PDL 	The cell phenotype that succeeds in repopulating the root surface determines the nature and quality of the attachment regen (Repair vs Regeneration)

Periodontal Progenitor Cells:

- PDL -> Comes from old PLD
- Alveolar Bone -> Osteoprogenitor cells of the surrounding bone and PDL
- Cementum -> Cementoblast progenitor stem cells

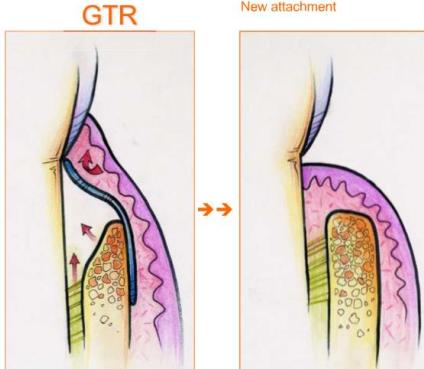
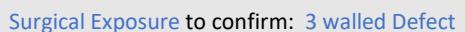
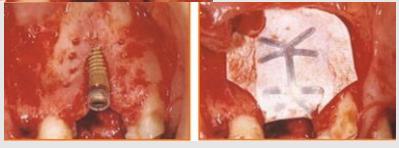
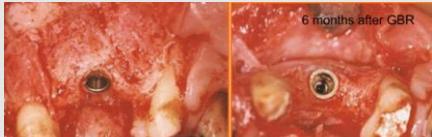
Treatment Approach



1. Open Flap Debridement	<ul style="list-style-type: none"> - Access - Removal of deposits - Pocket reduction occurs via long junctional epithelial attachment -> Repair
2. Resective Surgery (Osseous)	<ul style="list-style-type: none"> - Access - Removal of deposits - Correction of osseous irregularities (Osteectomy + Osteotomy) <ul style="list-style-type: none"> - Removing healthy bone to restore +ve architecture (Scalloping into interprox) at a more apical level - Pocket reduction via apically positioning the flap <p>*Typically comes at the cost of creating recession, but at least you now have a cleanable area* - VERY important the Pt is aware of this and consent is given before going with this option</p>
3. Regenerative Surgery (Grafting)	<ul style="list-style-type: none"> - Access - Removal of deposits - Pocket reduction via: NEW cementum, NEW PDL, NEW Alveolar bone and NEW CT attachment -> No long junctional epithelium or apically positioned flaps

Regenerative Surgery

Bone Grafting	
Types of Bone Grafts	<p>Autogenous Bone -> Intraoral or Extraoral from yourself</p> <p>Allografts -> From member of the same species (Freeze-dried vs Dehydrated)</p> <p>Xenografts -> From members of different species (Bio-Oss -> Bovine derived)</p> <p>Alloplasts -> Synthetic bone graft materials (Hydroxyappetite, Bioceramic Glass)</p>
Objectives	<p><u>Osteoinduction</u></p> <ul style="list-style-type: none"> - Grafting material is capable of inducing osteogenesis in an ectopic site -> Will stimulate the growth of bone cells to proliferate <p><u>Osteoconduction</u></p> <ul style="list-style-type: none"> - Graft material acts as a passive matrix that provides a scaffold for newly formed bone to growth within - Think "Construction", they have scaffolds

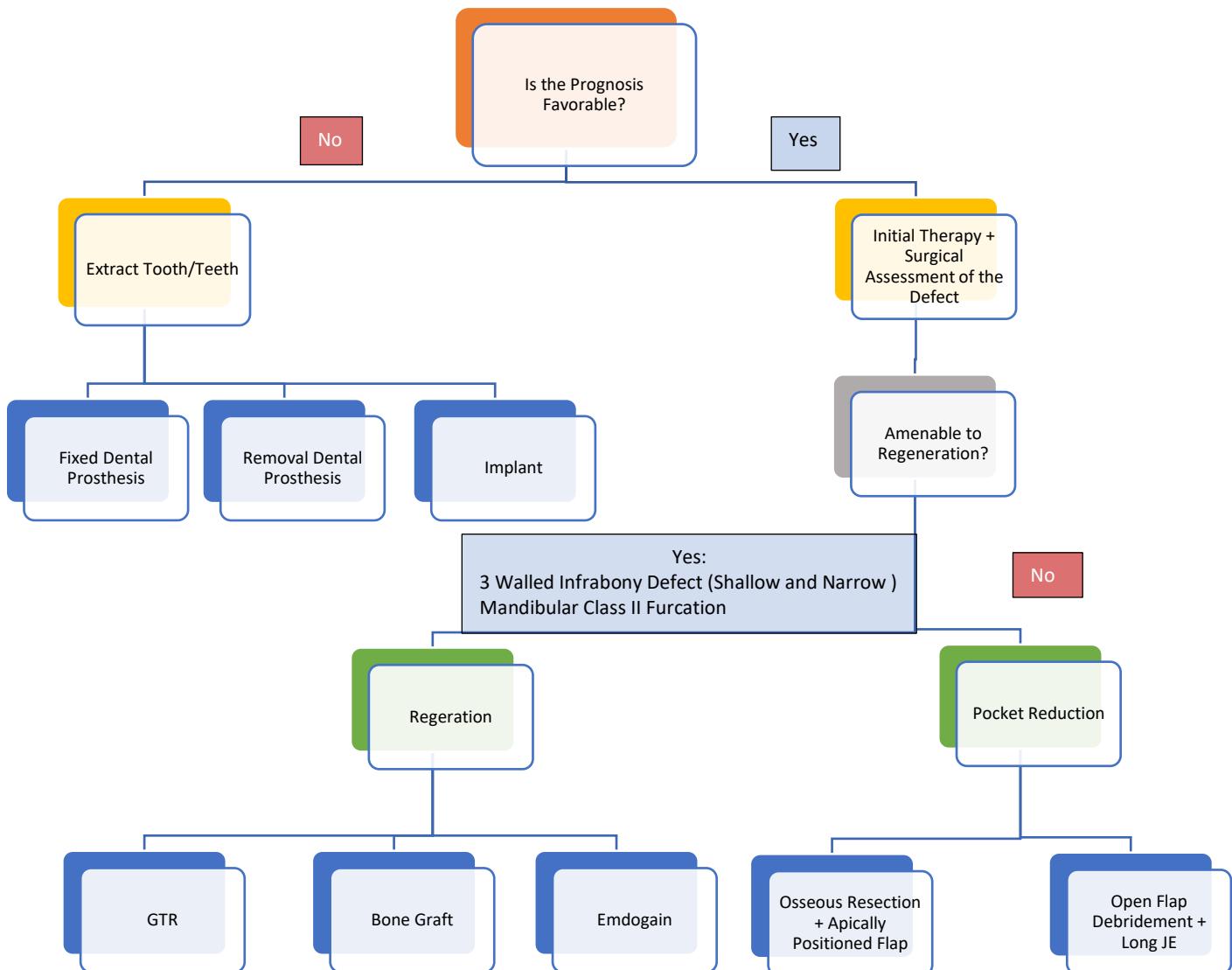
Guided Tissue Regeneration	
Rationale	<p>Epithelial cells divide and migrate much more rapidly than PDL, Bone, CT etc -> If they are not excluded or held back somehow they will fill up the defect first creating a Long Junctional Epithelium</p> <ul style="list-style-type: none"> - GTR Excludes epithelial cells from the defect via a physical barrier to select for undifferentiated mesenchymal cells: <p>Osteoblasts -> New Bone PDL Fibroblasts -> New PDL Cementoblasts -> New cementum</p> <p>*This technique <u>may or may not</u> involve graft material, but it ALWAYS involves a membrane (physical barrier)*</p> 
Membranes	<p>Non-Resorbable:</p> <ul style="list-style-type: none"> - e-PTFE Membranes (Gore-Tex) - Can buy titanium re-enforced to adapt on different curvatures and defect widths - Removal in 6-8 weeks <p>Resorbable:</p> <ul style="list-style-type: none"> - Collagen, Polyglactic Acid (Bioglide) - Starts dissolving in 4-6 weeks <p>**There is no statistically significant diff. in the outcome of using Resorbable vs non-Resorbable**</p> <ul style="list-style-type: none"> - If you need the membrane to stay for more than 4-6 weeks use non-resorbable...obviously
Clinical Workthrough	<p>Infrabony defect. 8mm buccal pockets and 6mm lingual pockets</p>    <ul style="list-style-type: none"> - Thoroughly debride the root surface and consider topical application of tetracycline   <p>Membrane is trimmed to size, sutured and stabilised Interdental papilla is closely adapted to completely cover the membrane</p>
Guided Bone Regeneration	<ul style="list-style-type: none"> - Use of a membrane to ↑ the bone formation in an edentulous area -> Usually to prepare a site for implant placement <p>Correct bone defects around existing implants</p>  <p>10mm vertical defect from the top of the implant</p>  <p>Cortical bone is penetrated w/ small round bur to induce bleeding Titanium re-enforced e-PTFE membrane is shaped and placed (titanium is used to prevent membrane collapse)</p>  <p>6 months later = Big Bony Win!</p>

Biomimetics (Emdogain)	
What is it?	<p>Amelogenin proteins -> Promotes regeneration by re-creating cellular events in tooth embryogenesis</p> <ul style="list-style-type: none"> - Enamel Matrix Proteins - Hertwigs Epithelial Root Sheath - Acellular cementum
Emdogain	An Adjunct to perio surgery -> for topical application onto exposed root surfaces
Indications	<p>Infrabony defects (1, 2, or 3 walled)</p> <ul style="list-style-type: none"> - Combine with Bone graft for 1 or 2 walled to give more structure <p>Furcation Defects (Class I or II)</p> 
Procedure	<ol style="list-style-type: none"> 1. Intrasulcular Incision + Vertical releasing incisions (if needed) to create a full thickness flap 2. Expose the defect completely 3. Remove granulation tissue from the bony walls and calculus + Plaque from the tooth 4. Condition the root surface with PrefGel (24% EDTA) and rinse with saline -> Avoid contamination with blood or saliva <ul style="list-style-type: none"> - Removes a smear layer produced from mechanical debridement 5. Apply Emdogain gel to fully cover the exposed root surface -> Be sure to add enough that gel overflows when you suture the flap closed 
Combination Therapy	
Its exactly what it sounds like	<p>GTR Membrane + Bone Graft</p> <p>Emdogain + Bone Graft</p> <p>Etc</p>

A Summary

	Open Flap Debridement	Resection/ Osseous Surgery	Regeneration
Surgical Access?	Yes	Yes	Yes
Pocket Reduction Achieved	Long Junctional Epithelium	Osseous Resection + Apically Positioned Flap	New Bone New PDL New Cementum
Healing By	Repair	Repair	Regeneration
Advantages	Predictable (++)	Predictable (+++)	Potential for restoration of the original tissue
Disadvantages	<ul style="list-style-type: none"> - Recession - Sensitivity 	<ul style="list-style-type: none"> - Recession - Sensitivity - Healthy Bone Removal 	<ul style="list-style-type: none"> - Predictability - Needs proper case selection

Decision Tree



Perio Considerations in the Esthetic Zones

Information you will Need to Gather <ul style="list-style-type: none"> - Chief Complaint, Med Hx, Smoking Hx, Dental Hx etc - <u>Extra Oral:</u> Facial Symmetry, Midlines, Face height, Lip length symmetry and thickness, Smile line - <u>Intra Oral Exam:</u> Comprehensive + Radiographs <p>AND</p> <ul style="list-style-type: none"> - Height of anatomical crowns (CEJ to incisal edge) and Clinical Crown (Gingival margin to Incisal edge) - Width of incisors, Incisors/Occlusal Plane - Tooth Shapes - Wall Thickness of Attached Gingiva - Gingival display - Level of alveolar crest relative to CEJ and gingival margin - Level of gingival margins from Centrals to Canines - Proportion of teeth (Width/Length = 0.75-0.8)

Expectations and Results	<ul style="list-style-type: none"> - <i>Perio or Implant surgery cannot fix:</i> Face Height, Lip Length and thickness, Vertical Maxillary excess - Implants have some risk factors that may compromise the esthetic outcomes <p>To Optimize results</p> <ul style="list-style-type: none"> - Coordination btwn Perio + Restorative dentist is needed - Use Wax-up Models, Photos and Surgical Guides to help position the implants - Temp Crowns will be needed for long postop periods (up to 6 months) for tissue modeling and conditioning 
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Assessments

Usually assess the anterior teeth as a unit of 6 (Canine to Canine) -> Unless you are Julia Roberts....

- Going with a tooth oriented approach can lead to a disaster smile



<p>1. Make a connecting line from lip-gingiva junction of Canine to Central</p> <p>I: Central Incisors are symmetric & approximately 1 mm apical to the lateral Incisors.</p>  <p>= Beautiful Face</p>	<p>Assess the gingival margin for the lateral:</p> <ul style="list-style-type: none"> - Below this line by 1-2mm = Beautiful Face - Above this line = Ugly face <p>Gingival Margin for the Central and Canine</p> <ul style="list-style-type: none"> - Minimal gingival apical to central and canine should be exposed -> Lip should just come to the apex of the clinical crown <p>Smile Line:</p> <ul style="list-style-type: none"> - Should follow convexity of the lower lip 						
<p>2. Sizes of Teeth</p>	<p>Average Dimensions of Maxillary Anteriors</p>						
	<table border="1" data-bbox="915 1094 1530 1151"> <thead> <tr> <th>Central Incisors</th><th>Lateral Incisors</th><th>Canines</th></tr> </thead> <tbody> <tr> <td>10-11mm</td><td>9mm</td><td>10mm</td></tr> </tbody> </table> <p>= Most apical point of the gingival margin</p> <ul style="list-style-type: none"> - Found distal to the longitudinal axis of Max. centrals and cuspids - Found along the long axis of the Max. laterals and Mand. incisors <p>**Most critical for Central Incisors**</p>	Central Incisors	Lateral Incisors	Canines	10-11mm	9mm	10mm
Central Incisors	Lateral Incisors	Canines					
10-11mm	9mm	10mm					

Crown Lengthening in Anterior Zone

Determine the Etiology of why you need to do crown lengthening

Etiology	<ul style="list-style-type: none"> - Caries - Trauma/Fracture - Endo Perf. - External Resorption - Altered passive eruption - Gummy smile - Restorative requirements (Biologic Width)
Factors to consider	<ul style="list-style-type: none"> - Esthetics - C:R Ratio - Perio Pockets - "Black Holes" between teeth - Anatomic constructions
Alternatives to Crown Lengthening	Ortho Extrusion Extraction + Implant/FPD/RPD

Basics to Keep in Mind	<ol style="list-style-type: none"> 1. <i>Positive Architecture</i> 2. <i>Biologic Width</i> 3. <i>Restorative Margin Placement</i> <ul style="list-style-type: none"> - At least 3mm between restoration margin and crest of alveolar bone -> This allows enough space for attachment of supracrestal collagen fibers (CT Attachment + JE) and the formation of a healthy sulcus <p>Why would you be so dastardly to place a margin INSIDE the sulcus?</p> <ul style="list-style-type: none"> - Removal of caries or faulty restos - Need that extra tooth structure for adequate retention of crown - Prevent root sensitivity - Esthetics
Objectives of CL	Enable margin placement without impinging on BW Access for the removal of subg. Caries Cosmetic improvement ↑ access to furcations for OHE Expose a subg. Perforation from Endo
Generalized Procedure	<ol style="list-style-type: none"> 1. Scalloping the gingiva 90° to the desired length and form <ul style="list-style-type: none"> - Change blade after each tooth, want it to be as sharp as possible 2. Elevation of flap (usually only labial flap to maintain interproximal papillae -> No black triangles) 3. Osseous surgery -> Remove bone 3mm from the desired gingival margin 4. Suture the flap back to original position <p>*If soft tissue lasers only are used.....remember to consider BW, you might need to cut bone back*</p> <p>**Hard tissue lasers to perform flapless CL are NOT recommended -> They leave behind bony troughs and pitted roots</p>

Management of Periodontal Disease in Max. Anteriors

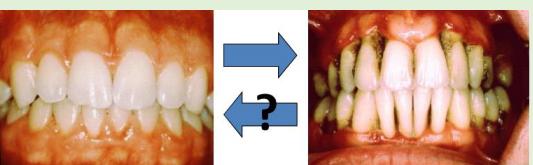
- Avoid traditional flaps -> They create recessions
 - Consider conservative non-surgical management when possible
 - Use mini-flaps with 1-sided papilla elevation and regen materials when optimal defects are present
 - Consider palatal approach also to conserve papilla
- Always inform Pt. about potential tissue shrinkage and "Black Triangle" development
- Papilla preservation is not predictable -> Consider Exo + Socket preservation

Case Studies

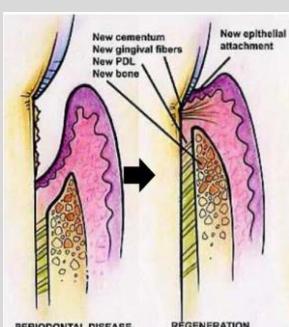
Pt: 51 Yr old Male <ul style="list-style-type: none"> - Subgingival Tooth Fracture - KT 6mm - PD 3mm - Mob: 0 - 24, 25 need crowns 	<p>Lots of KT (6mm) = gives us room for tissue discard</p> <p>- Minor scalloped shaped gingivectomy (discard) done before raising a full thickness flap -----→</p> <p>- Allows us to reposition the flap back to its original position instead of apically positioning it</p> <p>Goal: 3mm distance from the final resto to alveolar crest</p>    <p>BUT we also need a minimum of 2mm of Ferrule....so we really need to create 5mm length (3mm away from bone + 2mm of ferrule) -----→</p> <p>4 weeks post op</p>  <p>Should take into account the additional tooth length needed for the ferrule effect</p>
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<p>Pt: 31F Endo Tx 14, needs crown Lingual cusp fractured to gingival level</p> <ul style="list-style-type: none"> - KT = 5mm - PD = 2mm 	<p>C.L on Palatal aspect -> There is always room for KT removal on palatal because its all keratinized (especially when there is no recession)</p> <ul style="list-style-type: none"> - Patch the fracture to protect the GP before surgery - Buccal flap also raised to help interproximal bone removal - Osseous resection focused on the palatal aspect →   <p>3 Weeks Post op: Inflammation has ↓ and progression of healing ↓</p>
<p>Pt: PD: 5-6mm BW Invasion Intense inflammation Open anterior contact</p> 	<p>-> Crown Lengthening done</p>   <p>-> 3 months Post op...look the contact is closed on its own! -----New Crowns and Veneers-----→</p> 

Science of Periodontal Regeneration

Gingivitis	Periodontitis
<p>Inflammatory tissue damage involving soft CT and epithelium of the gingiva with minimal attachment loss</p> <ul style="list-style-type: none"> - Damage is reversible when the causative agent is removed 	<p>Causes attachment loss due to destruction of epithelial attachment apparatus, dento-gingival and PDL collagen fibers, alveolar bone and root cementum</p> <ul style="list-style-type: none"> - Damage is not naturally reversible...but we can hack science 

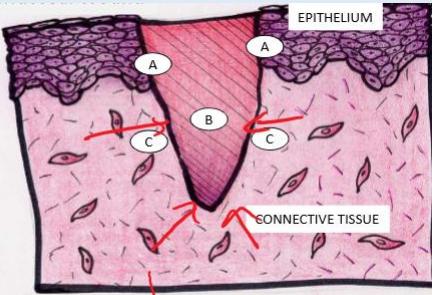
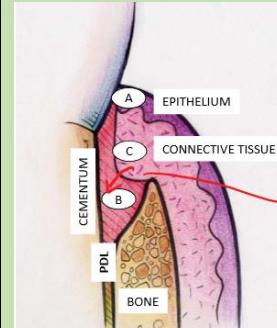
Regeneration Vs Repair

<p>Regeneration</p> 	<p>= Reproduction or reconstruction of a lost or injured part resulting in restored form and function Includes: <ul style="list-style-type: none"> - PDL - Gingiva (dento-gingival collagen fibers and attachment apparatus) - New Cementum (w/ inserting collagen fibers -> Sharpey's fibers) - New Alveolar bone <p>Formation of a new attachment</p> <ul style="list-style-type: none"> - This is different from reattachment, which is the reunion of CT and root surface that was severed by incision or injury not exposed to the pocket <p>**This is the ideal goal of Perio Tx**</p> </p>
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	<p>REGENERATIVE MODALITIES (regeneration)</p> <p>→ BEAUTIFUL AF</p>
Repair	<p>= Healing that does not completely restore the architecture or function of the tissue</p> <ul style="list-style-type: none"> - NO new cementum, PDL, bone, gingival fibers etc <p>Usually involves the formation of a long junctional epithelium</p> <p>OSSEOUS RESECTIVE SURGERY (repair)</p> <p>(Apically displaced flap)</p> <p>→ UGLY AF</p>

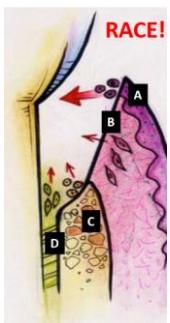
Procedures to achieve regeneration	Soft Tissue grafting Bone replacement grafts Root surface conditioning Guided Tissue Regen Combination therapy
Do they actually work?	<p>Clinically:</p> <ul style="list-style-type: none"> - ↓ probing depths - Clinical attachment gain - Radiographic bone fill - We cant REALLY detect regeneration though...need histology <p>Histologically:</p> <ul style="list-style-type: none"> - More commonly repairing with Long JE 😞 - Actual regeneration is less predictable, and usually incomplete

Wound Healing

Mucosal Healing		Periodontal Healing
Cells can come from all directions to aid in healing		Cells can only come from 1 direction = causes compromised healing
 <p>A: Borders where epithelium will migrate during epithelialization B: Fibrin Clot C: Borders of wound formed by CT</p>		<ul style="list-style-type: none"> - Tooth and alveolar bone are in the way - Epithelium will reattach and grow down the root faster than the bone can repair 
Periodontal Wound Healing Specifics		
Stages	<ol style="list-style-type: none"> 1. Hemostasis + Inflammation 2. Re-Epithelialization <ul style="list-style-type: none"> - Re-establishment of the epithelial attachment apparatus (JE, Hemidesmosomes, IBL) 3. Soft and Hard CT healing <ul style="list-style-type: none"> - Granulation tissue formation -> recruitment and differentiation of progenitor cells - Deposition, reorganization and remodeling of gingival and PDL CT -> Deposition of Cementum and Bone ECM - Mineralization of cementum and bone 	
Time-Frame	<p>Hemostasis:</p> <ul style="list-style-type: none"> - Minutes – 6h: Formation of blood clot (Minutes) + Adhesion of fibrin network and platelets to root surface <p>Inflammation:</p> <ul style="list-style-type: none"> - Within 6h: Lining of root surface with PMN's - Up to 7 days: Inflammatory cell pop. Switches from PMN to mostly macrophages. Area looks inflamed and is tender to touch - 7-14 days: Inflammation gradually ↓ histologically and clinically <p>Re-Epithelialization:</p> <ul style="list-style-type: none"> - By Day 3: Epithelial cells from gingiva migrate to root surface -> they attach and migrate further apically to initiate JE formation - Day 7: New Epi. Attachment established, but its still maturing - Day 14: New Epithelial attachment completed -> Barrier function is restored <p>Soft and Hard CT Healing</p> <ul style="list-style-type: none"> - Day 3-7: Formation of primitive ECM (New collagen laid down, Angiogenesis + Recruitment of progenitors) - Day 14: Gingival Fibroblasts form new Gingival CT, Blood flow normalized and collagen maturation and reorganization begins -> Progenitor cells differentiate into PDL Fibroblasts, Cementogenic cells and Osteogenic cells - Day 21: Gingival and PDL collagen fibers organized at tooth surface. Histologic signs of osteogenic activity and cementogenesis is present - Day 60: Functionally oriented dento-gingival and PDL fiber attachment established (New and Re-attachment formation). Lots of bone and cementum formation, but not fully calcified yet - 6 months: Radiographs demonstrate bone regen. Tissue remodeling continues 	
Strength Timeline	<p>Day 3:</p> <ul style="list-style-type: none"> - VERY low <p>Day 7:</p> <ul style="list-style-type: none"> - STILL low. Integrity mostly from sutures keeping shit together <p>Day 14:</p> <ul style="list-style-type: none"> - Weak but able to resist some gentle rupturing forces (Stitches probably done by now) <p>Day 60:</p> <ul style="list-style-type: none"> - 90% of normal <p>Why does this matter Clinically?</p> <ul style="list-style-type: none"> - Avoid brushing for 2 weeks if possible -> after 2 weeks keep it gentle and NO interdental brushing/flossing for up to 4 weeks - Avoid Probing for 2-3 months...otherwise you fuck up the attachment and create pockets again 	

Mechanisms Determining Wound Healing Outcome (Regen Vs Repair)

It's a Race!



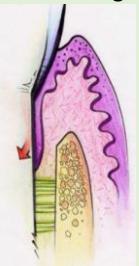
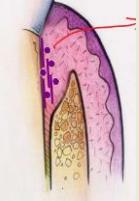
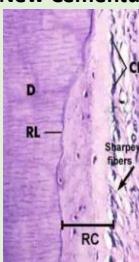
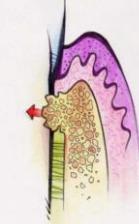
Depending on who wins determines the outcome

- A: Gingival Epithelium
- B: Gingival CT
- C: Alveolar Bone
- D: PDL

Possible Outcomes

- Long JE
- Collagen Adhesion
- Resorption
- Cementum Formation/Repair
- Ankylosis
- Regeneration

These outcomes can also present simultaneously at different parts of the surgical area

Outcomes	
Long Junctional Epithelium 	<p>Gingival Epithelium has the fastest proliferation and migration -> Easily migrates apically on root surface</p> <ul style="list-style-type: none"> - Formation of Long JE between CT and Tooth <p><u>Extent Depends on:</u></p> <ul style="list-style-type: none"> - Stability of blood clot on root surface -> This slows down the epithelium migration - Presence of Sharpey's fibers -> Stops epithelial migration when they are reached <p><u>Outcome</u></p> <ul style="list-style-type: none"> - Provides functional epithelial adhesion on the tooth - Prevents regeneration of functionally oriented PDL collagen fibers and cementum 😞
Collagen Adhesion 	<p>Gingival CT cells (Fibroblasts) come into contact with root surface -> Recognize it as a foreign body</p> <ul style="list-style-type: none"> - Similar to encapsulation process. Gingival fibroblasts produce collagen parallel to root surface (vertical orientation) <p>Close approximation of young collagen in CT to Collagen on the tooth matrix = Physicochemical valid attachment</p> <ul style="list-style-type: none"> - Somewhat resistant to mechanical disruption
Root Surface Resorption 	<p>Gingival Fibroblasts or Osteoclast-like cells populate the root surface 1st</p> <ul style="list-style-type: none"> - Resorption is usually superficial and transient only -> Followed within weeks by deposition of new cementum <p>Rarely -> Perio surgery can result in unwanted aggressive inflammatory resorption</p>
New Cementum Formation/Repair 	<p>Denuded roots, or surface resorption may stimulate cementoblast differentiation from progenitor cells -> Cementoblasts deposit hard tissue</p> <ul style="list-style-type: none"> - If new collagen fibers from gingiva and PDL become anchored to the new cementum (Sharpey's Fibers) = Promotes new attachment formation needed for regen. <p>RC = Repair Cementum CB = Cementoblast</p>
Ankylosis 	<p>Rare -> Usually in cervical region</p> <ul style="list-style-type: none"> - May result from rapid bone formation following migration of bone progenitors before PDL CT cells

Periodontal Regeneration	<p>Formation of:</p> <ol style="list-style-type: none"> 1. Functional Epithelial Seal <ul style="list-style-type: none"> - Epithelial attachment apparatus: JE, IBL, Hemidesmosomes - Must be re-established only at most coronal portion of tissue (No more than 2mm) 2. New CT Fibers (Sharpey's Fibers) <ul style="list-style-type: none"> - Must be inserted into previously exposed root surface to reproduce both dento-gingival and PDL fibers 3. New Cementum <ul style="list-style-type: none"> - Must be formed on previously exposed root surface to allow the insertion of Sharpey's fibers 4. New Alveolar Bone <ul style="list-style-type: none"> - Height must be restored to within 2mm of CEJ <p style="color: red;">**This can only really be proven histologically**</p> <p>Depends on:</p> <ul style="list-style-type: none"> - Availability, Appropriate recruitment and Activation of progenitor cells that are able to regen. PDL, Bone, Cementum - Elimination of causative agents for Perio destruction (Calculus, Biofilm, Toxins penetrating cementum etc) - Appropriate signals to activate + induce proliferation (Growth Factors), guide migration (ECM, Barriers), and induce differentiation of progenitors - Wrong cell types must be excluded - Adequate space needs to be maintained for bone regeneration (prevent ST collapse into bony defect) <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #d3d3d3;"> <th colspan="2">Progenitor Cells</th> </tr> </thead> <tbody> <tr> <td style="width: 15%;">New PDL</td> <td>Paravascular stem cells -> Come from healthy PDL and/or endosteal locations close to defect</td> </tr> <tr> <td>New Bone</td> <td>Progenitors originate from periosteum and endosteal locations (preosteoblasts)</td> </tr> <tr> <td>New Cementum</td> <td>Precementoblasts -> Come from cementum apical to the cementum removed during root planning and/or progenitors in the PDL</td> </tr> </tbody> </table>	Progenitor Cells		New PDL	Paravascular stem cells -> Come from healthy PDL and/or endosteal locations close to defect	New Bone	Progenitors originate from periosteum and endosteal locations (preosteoblasts)	New Cementum	Precementoblasts -> Come from cementum apical to the cementum removed during root planning and/or progenitors in the PDL
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Current Tx to Promote Perio Regen

Surgical Debridement + Adjunctive Root Surface Conditioning (EDTA, Tetracycline or Acidic compounds)	
Purpose	Remove smear layer Detoxify root surface Expose dentin/cementum collagen fibers <ul style="list-style-type: none"> - ↑ adsorption and stability of blood clot - Slow epithelial migration - Promote adhesion of dento-gingival collagen fibers
Does it work?	In vitro -> Yes In Vivo human trials -> unclear <ul style="list-style-type: none"> - May open tubules and cause ↑ sensitivity
Barrier Membranes of Guided Tissue Regeneration (GTR)	
Purpose	Stabilize blood clot at flap-tooth interface <u>Under the barrier</u> -> PDL and bone cells colonize the blood clot <u>Above the barrier</u> -> Apical migration of epithelium and Gingival CT fibroblasts are blocked <u>Prevent the collapse of ST</u> -> Maintains space for bone fill
Membrane Types:	<p>Non-Resorbable (ePTFE)</p> <ul style="list-style-type: none"> - Remove 4-6 weeks after placement - Can be reinforced with titanium to maintain shape <p>Resorbable Membranes (Collagen, or synthetic)</p> <ul style="list-style-type: none"> - Resorbs within 4-40 weeks

Implantation of Bone Grafting Materials (Bone, Bone derivatives, Substitutes)									
- New PDL + Cementum + Bone									
Ideal Properties	<p>Osteoconductive</p> <ul style="list-style-type: none"> - Matrix provides 3D lattice w/ interconnected pores where cells can attach -> Allows cells to migrate for ingrowth of new growth blood vessels and progenitor cells <p>Osteoinductive</p> <ul style="list-style-type: none"> - Stimulates migration and differentiation of osteoprogenitor cells -> Release stimulating factors towards Osteoblastic differentiation <p>Osteogenic</p> <ul style="list-style-type: none"> - Formation of new bone from living cells transplanted within graft 								
Graft Materials	<p>Purpose:</p> <ul style="list-style-type: none"> - Provide space filling capacity - May inhibit growth of epithelium and gingival CT - Provides an ECM that osteoprogenitor cells can use to attach to and use to migrate to the wound site (Osteoconduction) - Autogenous bone (Osteogenesis) and demineralized bone organic matrix (DFDBA, possible osteoinduction from BMP release) -> Induce bone formation <table border="1"> <tr> <td>Autogenous Bone</td><td>Transplant cortical and/or cancellous bone containing live cells from 1 location to another in the same patient</td></tr> <tr> <td>Allograft</td><td>Human cadavers OR Animal source (Xenograft) <ul style="list-style-type: none"> a. Mineralized (Bio-Oss): Contains bone minerals and organic matrix <ul style="list-style-type: none"> - No live cells b. Demineralized (DFDBA, OraGRAFT): Contains bone organic matrix, but no minerals <ul style="list-style-type: none"> - No Live cells </td></tr> <tr> <td>Naturally Derived</td><td>Hydroxyapatite (HA) <ul style="list-style-type: none"> - Corals are a typical source....yes like the reef </td></tr> <tr> <td>Alloplasts</td><td>Synthetic materials: Beta-TriCalcium Phosphate (TCP)</td></tr> </table>	Autogenous Bone	Transplant cortical and/or cancellous bone containing live cells from 1 location to another in the same patient	Allograft	Human cadavers OR Animal source (Xenograft) <ul style="list-style-type: none"> a. Mineralized (Bio-Oss): Contains bone minerals and organic matrix <ul style="list-style-type: none"> - No live cells b. Demineralized (DFDBA, OraGRAFT): Contains bone organic matrix, but no minerals <ul style="list-style-type: none"> - No Live cells 	Naturally Derived	Hydroxyapatite (HA) <ul style="list-style-type: none"> - Corals are a typical source....yes like the reef 	Alloplasts	Synthetic materials: Beta-TriCalcium Phosphate (TCP)
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Surgical Debridement w/ Adjunctive use of Biologically Active Molecules/Substances									
- New PDL + Cementum									
Biologically Active Substances	<p>Growth Factors:</p> <ul style="list-style-type: none"> - Platelet Derived Growth Factor (PDGF) - GEM 21S <p>Platelet -Rich Plasma and Platelet-Rich Fibrin:</p> <ul style="list-style-type: none"> - Prepared from the patients own venous blood - Dr. Matthew LOVES this ishhhhh <p>Others</p> <ul style="list-style-type: none"> - Enamel Matrix Proteins (Emdogain) 								
Emdogain	<ul style="list-style-type: none"> - Contains Enamel Matrix Proteins w/ or w/o added β-Tri-Calcium Phosphate (TCP)-> Derived from Porcine (pork) teeth - β-TCP = Inorganic filler used to fill space and prevent gingival tissue collapse into lesion <p>Enamel Matrix Protein</p> <ul style="list-style-type: none"> - Hertwig's Epithelial root sheath cells secrete EMP's composed of Amelogenins (90%) + Non-Amelogenin Proteins (10%) - Important components of forming enamel + Regulate the formation of root cementum and PDL <p>Functions:</p> <ol style="list-style-type: none"> 1. Promote Recruitment of perio progenitors 2. Promote attachment and proliferation of progen's from CT tissues to the root surface 3. Promote production of new matrix (Collagen + Growth Factors) 4. Induce cementum and PDL Formation 5. Prevent Epithelial adhesion and down growth (inhibit formation of long JE) 								

Where are these Tx's most effective?

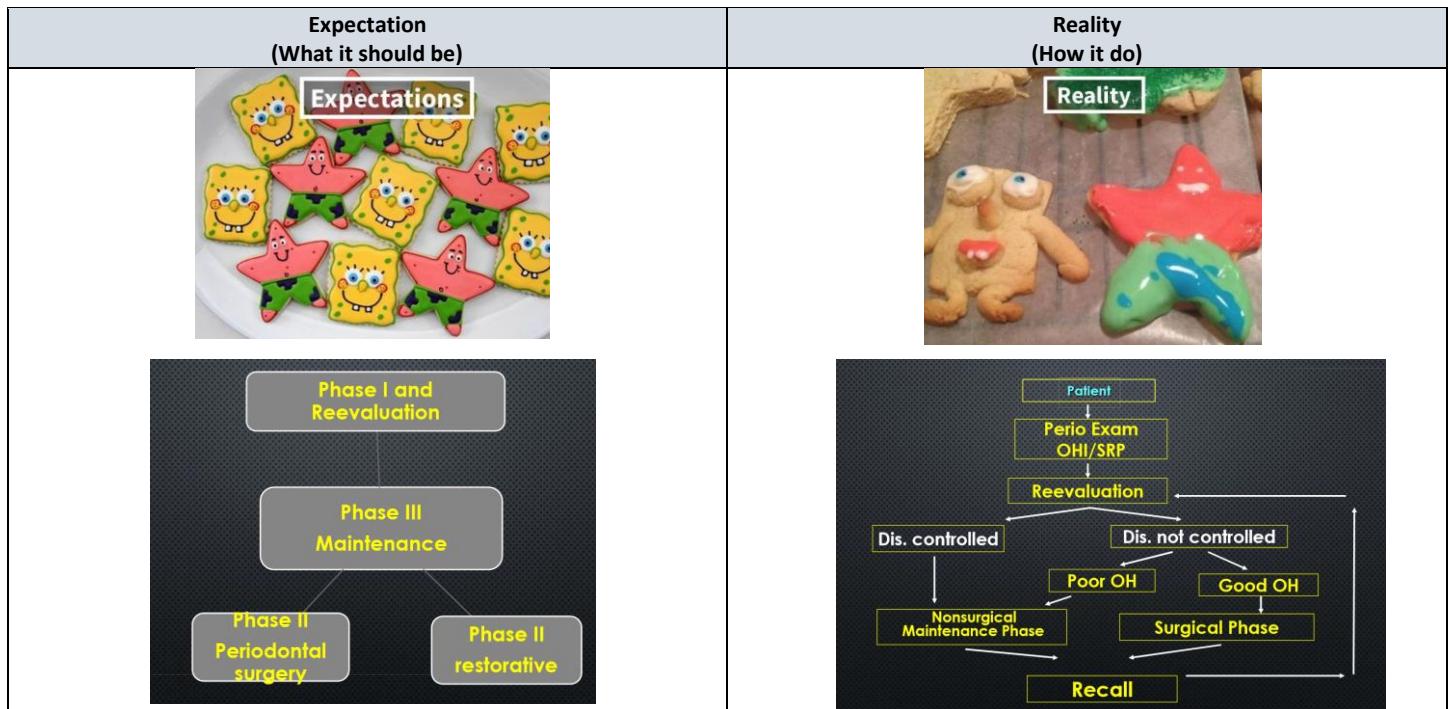
Best chance for Success

1. 3-walled Vertical Defects
2. Pockets 6mm or deeper
3. Vertical bone defect is 4mm or deeper

- Horizontal bone defects cannot be Tx with regeneration -> Need Open flap debridement + Osteoplasty/Osseous surgery

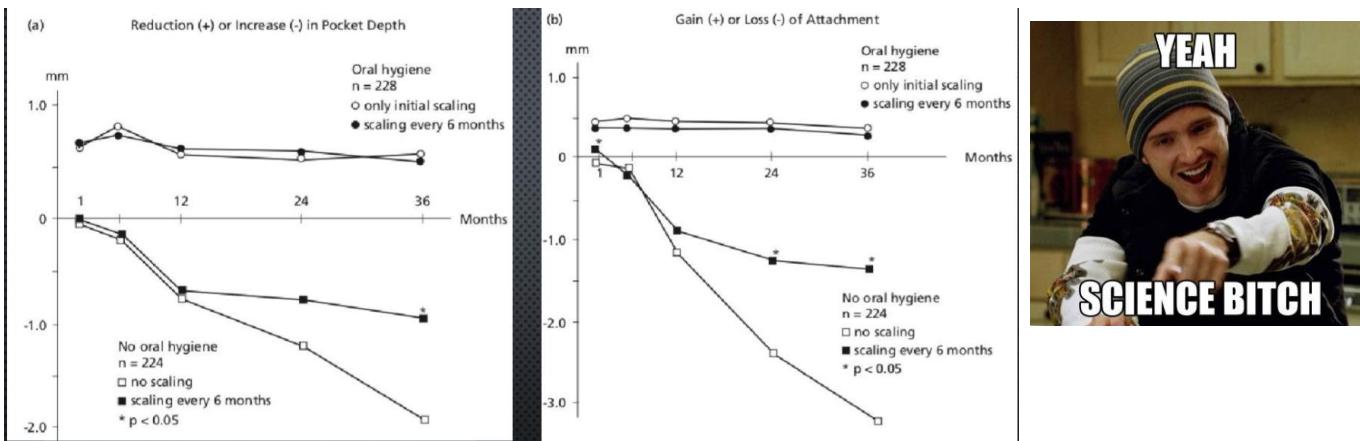
At best the pocket reduction and bone fill will reach 60% of the initial defect

Long Term Perio Maintenance



Supportive Periodontal Therapy (SPT)

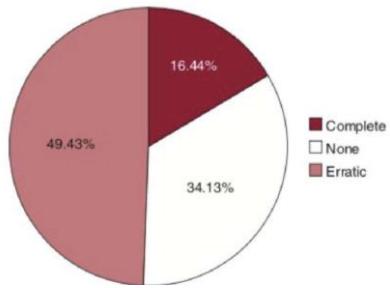
- Maintenance was renamed to SPT in 1989 -> Really expresses the **need for the PATIENT'S efforts** to continue to control their perio condish
- **Regular visits should serve as a positive feedback** between Pt and Dentist -> Purpose is to ensure the patients have the opportunity to maintain their dentition for long time
 - o Important that we **Continually diagnose and monitor** in order to intercept with adequate therapy and to optimize the therapeutic interventions



IT'S SCIENCE BITCH:

- Basically this is showing that if Pt's have poor OHE then Scaling every 6 months limits the Progression of Perio to a degree BUT it doesn't really prevent it. It is critical that patients employ proper OHE consistently to prevent Perio -> Infact when they do this, they don't really need professional scaling every 6 months!

Compliance with Maintenance Therapy



About 50% of Patients have erratic compliance and 34% of patients have no compliance at all with our prescribed oral hygiene instructions and maintenance schedules! -> This is why we can't have nice things ...and why Pt's still need to come in for professional care.

- These patients are doomed and have a large risk of developing recurrent Perio. Educate Pt's how important maintenance is!

Parameters to Check at Perio Re-Eval exams

Parameters					
Plaque Control Record	Document the change in Plaque Index over time (Generally and also specifically) <ul style="list-style-type: none"> - Gives you and your patient a log of their effectiveness - Patients are aware that their oral hygiene is being evaluated -> This may motivate them to do better 				
Bleeding on Probing (BOP)	Significant emphasis is placed on repeated BOP during re-evals <ul style="list-style-type: none"> - Absence of BOP indicates periodontal stability - Presence of BOP indicates that inflammation is present - More times a site bleeds during maintenance, the ↑ chance that attachment loss will occur at that site 				
Periodontal Attachment	2 Disease Models: <ol style="list-style-type: none"> Continuous Disease Model <ul style="list-style-type: none"> - Disease is always present (CAL) and it progresses linearly into Perio and then Severe Perio Burst Model <ul style="list-style-type: none"> - Disease is sometimes present in some sites and will cycle between remission and flair ups into periodontitis and severe Perio 				
Pocket Depth	<table border="1"> <thead> <tr> <th>Decreased PD</th> <th>No Change in PD</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> - Possibly from ↓ inflammation - Tissue tone may have ↑ (Probe doesn't penetrate past JE) - Consider if they have reduced enough to not require surgery. </td> <td> <ul style="list-style-type: none"> - Associated with fibrotic tissue - Residual calculus may be present - Access to furcation may limit the perio debridement efficacy - Local anatomy may limit decreases in PD (External oblique ridge, or shallow buccal vestibules) </td> </tr> </tbody> </table>	Decreased PD	No Change in PD	<ul style="list-style-type: none"> - Possibly from ↓ inflammation - Tissue tone may have ↑ (Probe doesn't penetrate past JE) - Consider if they have reduced enough to not require surgery. 	<ul style="list-style-type: none"> - Associated with fibrotic tissue - Residual calculus may be present - Access to furcation may limit the perio debridement efficacy - Local anatomy may limit decreases in PD (External oblique ridge, or shallow buccal vestibules)
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Mobility and Occlusion	<p>Mobility may be due to Primary or Secondary Trauma from Occlusion.</p> <table border="1" data-bbox="373 149 1514 508"> <thead> <tr> <th data-bbox="373 149 943 192">Primary Trauma from Occlusion</th><th data-bbox="943 149 1514 192">Secondary Trauma from Occlusion</th></tr> </thead> <tbody> <tr> <td data-bbox="373 192 943 508"> <p>= Larger than normal occlusal force is placed on tooth with normal alveolar support</p> <p>Ex: Mobile tooth after placement of a "high" filling, Bruxism, parafunction</p> <p>Tx:</p> <ul style="list-style-type: none"> - Adjust occlusion - Adjust filling or crown </td><td data-bbox="943 192 1514 508"> <p>= When adaptive capacity of tissues to withstand normal occlusal forces is impaired due to loss of PDL support</p> <ul style="list-style-type: none"> - Forces of occlusion may be within normal limits but the support is poor <p>Tx:</p> <ul style="list-style-type: none"> - Assess if there is loss of function or pain - Consider splinting if there is interference with function - Extract if symptoms are severe </td></tr> </tbody> </table>	Primary Trauma from Occlusion	Secondary Trauma from Occlusion	<p>= Larger than normal occlusal force is placed on tooth with normal alveolar support</p> <p>Ex: Mobile tooth after placement of a "high" filling, Bruxism, parafunction</p> <p>Tx:</p> <ul style="list-style-type: none"> - Adjust occlusion - Adjust filling or crown 	<p>= When adaptive capacity of tissues to withstand normal occlusal forces is impaired due to loss of PDL support</p> <ul style="list-style-type: none"> - Forces of occlusion may be within normal limits but the support is poor <p>Tx:</p> <ul style="list-style-type: none"> - Assess if there is loss of function or pain - Consider splinting if there is interference with function - Extract if symptoms are severe
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Pain or Discomfort	<p>Identify the source and nature of pain</p> <p><i>Acute:</i> -> Usually associated with Periodontal Abscess</p> <p><i>Chronic:</i> -> Usually associated with root sensitivity or occlusal disharmony</p>				

Recurrent Periodontitis Vs Refractory Periodontitis

Recurrent Periodontitis			
Definition	<p>= Disease was controlled but has since re-occurred</p>		
Characteristics <p>Recurrent inflammation</p> <ul style="list-style-type: none"> - Revealed w/ general gingival changes (CCST) - BOP <p>↑ Loss of Attachment</p> <ul style="list-style-type: none"> - ↑ PD and/or Recessions <p>↑ in radiographic bone loss</p> <p>↑ in tooth mobility</p>		<p>**Can be site-specific or Patient-related factors**</p>	
Factors Associated with Perio Progression			
	Site Related		
	<ul style="list-style-type: none"> - Residual calculus present - Difficult access - Endo/Perio - Vertical Root Fracture - Anatomy (External Oblique Ridge) - Tooth Malalignment (tipping) - Iatrogenic (Open contact, Overhangs) 	<ul style="list-style-type: none"> - Changes to personal life - Underlying systemic conditions - Habits 	
Symptoms and causes for recurrence	Symptom		
	<p>↑ Mobility</p> <p>↑ Inflammation ↓ OHE SubG. Calculus Inadequate Restorations Poorly designed or deteriorating prostheses</p> <p>Recession</p> <ul style="list-style-type: none"> - Toothbrush Abrasion - Inadequate KT - Frenum Pull <p>↑ Mobility w/ NO change to PD and NO Radiographic Changes</p> <p>Occlusal trauma from lateral occlusal interference Bruxism High Restoration Poorly designed or worn out prosthesis</p> <ul style="list-style-type: none"> - Poor C:R Ratio <p>↑ PD w/o radiographic change</p> <ul style="list-style-type: none"> - ↓ OHE - Infrequent recalls - SubG. Calculus - Poorly fitting PRDP - Mesial inclination of teeth into Edentulous area - Failure of new Attachment surgery - Cracked Teeth - Grooves in teeth - New Perio Dx - Gingival Overgrowth caused by meds <p>↑ PD w/ ↑ Radiographic bone loss</p> <p>^ Same as above</p> <ul style="list-style-type: none"> - W/o the gingival overgrowth 		

Refractory Periodontitis	
Definition	= Continued attachment loss in spite of adequate treatment and proper oral hygiene
Clinical Characteristics	<ul style="list-style-type: none"> - Multiple sites with clinically detectable disease progression - Disease progression is unrelated to previous severity (sites with no previous disease) - Progression is not stopped by conventional therapy or supportive care

Appointment intervals for SPT

Really depends on **Severity** and the **Age** of the patient As well as their **ability to maintain plaque control**

1. Young Patient w/ Rapidly progressing Perio = Most Susceptible to progressive attachment loss
2. Patient with Advanced Attachment Loss = Next at risk
3. Elderly Pt with minimal attachment loss = Last at risk

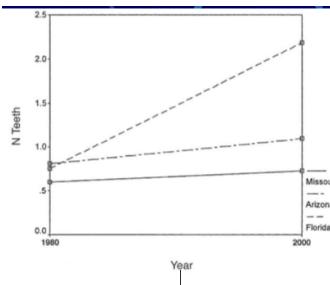
Merin Classification	Characteristics	Recall Interval
1st Year	Routine Therapy and uneventful healing	3 months
	Difficult case with complicated prosthesis	1-2 months
Class A	Excellent results, well maintained for 1+ years	6 months – 1 year
	Pt has good OHE, Minimal calculus, no occlusal issues, no complicated prostheses, No deep PD or teeth w/ <50% bone remaining	
Class B	Generally good results maintained reasonably well for 1 year but has some issues: <ol style="list-style-type: none"> 1. Inconsistent or poor OHE 2. Heavy calculus 3. Systemic Dx that predisposes to perio breakdown 4. Some remaining pockets 5. Occlusal problems 6. Complicated prostheses 7. Ongoing ortho 8. Recurrent dental caries 9. Some teeth w/ < 50% bone remaining 10. Smoker 11. Positive Family Hx or Genetic testing 12. >20% BOP 	3-4 months (Depending on number of complicating factors)
Class C	Poor Results after Perio therapy +/- several of the above complications	1-3 months (Depending on number of complicating factors. Consider re-Tx or Exo of severely involved teeth)

Implant Maintenance

Implant Health	<ul style="list-style-type: none"> - Absence of clinical signs of inflammation - No bleeding and/or suppuration on gentle probing - No ↑ PD compared to previous #'s - Absence of bone loss (Beyond the crestal bone level changes from the initial remodeling)
Peri-Implant Mucositis Dx	Presence of BOP w/ or w/o ↑ probing depth compared to previous #'s Absence of bone loss beyond the initial crestal bone remodeling
Peri-Implantitis Dx	Presence of BOP w/ or w/o ↑ probing depth compared to previous #'s ↑ PD's Presence of bone loss beyond what was removed during initial remodeling If you don't have previous Exam findings: <ul style="list-style-type: none"> - Presence of BOP - PD ≥ 6mm - Bone levels ≥ 3mm apical of the most coronal portion of the intraosseous part of the implant
Home Care	Interdental brushes w/ nylon-coated core wire Soft toothbrushes (Manual or Power) End Tufted brushes Floss (Superfloss under bridge, Plastic, Braided nylon etc) Dental Tape Postcare implant flossing aids Stannous fluoride gel Chlorhexidine Rinses

Professional Care	<p>Scaling and Root Planing</p> <ul style="list-style-type: none"> - Plastic Instruments (Flexible) + Reinforced w/ Graphite (Ridged) - Plastic covered and Novel metallic copper alloy ultrasonic tips - Rubber cups w/ FINE polishing paste to remove plaque or biofilm + enhance surface smoothness of machined surfaces <p>*Traditional stainless, titanium, gold tipped instruments -> Scratch the implant surface! BAD *Traditional Ultrasonic tips significantly damage the implant*</p>
Tx of Peri-Implant Disease	<p>Non-Surgical:</p> <ul style="list-style-type: none"> - Curettes, Ultrasonics, Polishing cups w/ prophy paste - Adjunctive Antimicrobials (CHX) - Laser therapy - Air Abrasives - Local or systemic antibiotics <p>Surgical Indications:</p> <ul style="list-style-type: none"> - Pt have adequate plaque control - BOP present - Inability to adequately instrument SubG. Areas - Peri-implant disease is not resolved w/ ↑ OH or professional maintenance <p>Success of SRP limited by:</p> <ol style="list-style-type: none"> 1. Pockets <ul style="list-style-type: none"> - <4mm = Can be scaled completely - 4-6mm = Likely not scaled completely - >6mm = Poorly instrumented 2. Furcations <ul style="list-style-type: none"> - 60% of furcation entrances are smaller than perio instruments 😞

Decision Making – When to Refer



Between 1980 and 2000 there have been a large ↑ trend in the amount of planned Exo's -> This is likely because we are not catching or treating conditions early enough...by the time the situation gets referred to Perio they need to Exo the teeth.

Other Factors could be involved with the ↑ age of our patients and a ↓ in periodontal condition

Why Refer?	<ul style="list-style-type: none"> - Keeping up with the latest science can be overwhelming - No single person can be expected to be skilled at every procedure - Patients today are better informed - Know your limit play within it -> Send to more qualified individuals when appropriate - Attempting Tx outside of your scopes is professional misconduct - You are unable to Dx the condition - Inadequate training and experience of the dentist - Legal consequences or complications may arrive after Tx - Severity of the disease is out of the general dentists scope - Patient desires to see specialist - Un-resolved inflammation despite Tx - Medically compromised Pt's - Behavioral concerns
When to Refer?	
1. Initial Exam	If you are comfortable and think you can effectively clean an 8mm pocket then you can go ahead! <ul style="list-style-type: none"> - If you think the Pt will need surgery anyways then it might be a good call to just refer right away
2. Initial Therapy	
3. Re-Evaluation	<ol style="list-style-type: none"> 1. Perform a complete Perio Exam -> Did the pockets progress? 2. Assess all areas of previous concern -> Have all defects been resolved? Is the result maintainable? 3. How efficient are we at removing plaque? <ul style="list-style-type: none"> - <3.7mm = can remove all subg. Plaque

	<ul style="list-style-type: none"> - Instrumentation limit is 6.21mm (SRP) 4. Does repeated SRP Tx's provide additional benefit over just doing it once? <ul style="list-style-type: none"> - NO. If you missed it the first time you will probably miss it the second time 5. Is the Pt's OHE enough to take themselves further into health? 6. What is the maintenance schedule going to be?
4. Annual Recalls	<ol style="list-style-type: none"> 1. Perform a complete intraoral exam and update all radiographs 2. Assess the long term stability of the disease -> Redo the perio and evaluate <ul style="list-style-type: none"> - If there is progression in some of these parameters = must refer Pt 3. Determine if you need to adjust the frequency of the SPT

3 Levels of Perio Patients

Level	Periodontist Involvement	Indicators
Level 1	Pt may benefit from co-management with dentist + Periodontist	<p><u><i>Perio inflammation/infection AND:</i></u></p> <ul style="list-style-type: none"> - Diabetes - Pregnancy - CVD - Chronic respiratory disease <p><u><i>Pt's undergoing any of the following Tx's:</i></u></p> <ul style="list-style-type: none"> - Cancer therapy - Cardiovascular surgery - Joint-replacement surgery - Organ transplantation
Level 2	Pt likely benefits from co-management from dentist + Perio	<p><u><i>Perio Risk Factors:</i></u></p> <ul style="list-style-type: none"> - Early onset perio (<35 yrs old) - Unresolved inflammation (BOP, Pus, Redness) - Pocket depths \geq 5mm - Vertical bone defects - Radiographic evidence of progressive bone loss - Progressive tooth mobility - Progressive attachment loss - Anatomic gingival deformities - Exposed root surfaces - Deteriorating risk <p><u><i>Medical Risk Factors:</i></u></p> <ul style="list-style-type: none"> - Smoking/tobacco - Diabetes - Osteoporosis/osteopenia - Drug induced gingival conditions/enlargement - Compromised immune system (Acquired or drug induced) - Deteriorating risk
Level 3	Pt should be treated by a Periodontist	<ul style="list-style-type: none"> - Severe chronic perio - Furcation involvement - Vertical/angular bony defects - Aggressive perio - Periodontal abscess - Significant or progressive gingival recession - Peri-implant disease

PBL Notes

Johnny Hodges

Term	Definition								
Refractory Periodontitis	Continued progression of disease despite excellent patient compliance (Home care and SPT) <ul style="list-style-type: none"> - Any sign of calculus or plaque etc = NOT this Antibiotic Prescriptions (if indicated by other factors): <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #ffffcc; padding: 2px;">Tetracycline</td><td style="padding: 2px;">250mg QID for 14 days</td></tr> <tr> <td style="background-color: #ffffcc; padding: 2px;">Doxycycline</td><td style="padding: 2px;">100mg BID for 14 days</td></tr> <tr> <td style="background-color: #ffffcc; padding: 2px;">Metronidazole</td><td style="padding: 2px;">250mg TID for 10 days</td></tr> <tr> <td style="background-color: #ffffcc; padding: 2px;">Metronidazole + Amoxicillin</td><td style="padding: 2px;">250mg (Metro) + 500mg (Amox.) TID for 7 days</td></tr> </table>	Tetracycline	250mg QID for 14 days	Doxycycline	100mg BID for 14 days	Metronidazole	250mg TID for 10 days	Metronidazole + Amoxicillin	250mg (Metro) + 500mg (Amox.) TID for 7 days
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Recurrent Periodontitis	Recurrence of perio in a patient that received appropriate care, SPT and had adequate home management -> But then stopped trying and perio came back								
Adult Periodontitis	Perio with onset after 35 yrs old <ul style="list-style-type: none"> - Slow progression predominantly in horizontal direction - Local factors are a major etiologic factor 								
Adult Periodontitis that has continued to Progress	This one makes sense								

2 Models for Periodontal Attachment Loss:

- Research shows that either model can occur

Continuous Disease Model	Perio progresses continuously and slowly (0.1mm/year) <ul style="list-style-type: none"> - Theory stems from average probing depths over years of measurements
Random-Burst Model	Bursts of activity for short periods of time over years <ul style="list-style-type: none"> - Occurs at random perio sites around the mouth - After bursts, sites may go into short or extended remissions <p style="color: red;">*Point being that the entire mouth needs to be probed, because you don't know which random site may be bursting*</p>

Occlusal Trauma Vs Traumatic Occlusion:

Occlusal Trauma <ul style="list-style-type: none"> - AKA Trauma from Occlusion 	<p>= Injury resulting in tissue changes within the attachment apparatus (PDL) as a result of occlusal forces.</p> <ul style="list-style-type: none"> - May be both an etiology and a diagnosis <p>Histologic changes include:</p> <ul style="list-style-type: none"> - Widened/Compression of PDL - Bone remodelling (Resorption/repair) - Hyalinization/Repair - Increased Cellularity - Vascular Dilation/Permeability/Thrombosis - Root Resorption - Cemental Tears <p style="color: red;">**All these changes are reversible by eliminating the offending occlusal forces**</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; background-color: #cccccc;">Symptoms</th><th style="text-align: center; background-color: #cccccc;">Signs</th></tr> </thead> <tbody> <tr> <td style="vertical-align: top;"> <ul style="list-style-type: none"> - Sensitivity to cold - Sensitivity to biting (and percussion) - Loose teeth </td><td style="vertical-align: top;"> <ul style="list-style-type: none"> - ↑ Mobility - Fremitus <p style="text-align: center;">Rads Changes:</p> <ul style="list-style-type: none"> - Widened PDL - Thickened Lamina Dura - Appearance of Infrabony defects (funnel shaped defects) w/o attachment loss. - Radiolucency and Radiopacities in the alveolar bone - Root Resorption </td></tr> </tbody> </table> <p>Things it ISNT:</p> <ul style="list-style-type: none"> - NOT occlusal force itself -> its an injury - NOT synonymous Traumatic Occlusion - DOESN'T affect marginal gingival -> Only occurs within the supporting structures (PDL + Bone) - DOESN'T cause attachment loss -> in the absence of inflammation 	Symptoms	Signs	<ul style="list-style-type: none"> - Sensitivity to cold - Sensitivity to biting (and percussion) - Loose teeth 	<ul style="list-style-type: none"> - ↑ Mobility - Fremitus <p style="text-align: center;">Rads Changes:</p> <ul style="list-style-type: none"> - Widened PDL - Thickened Lamina Dura - Appearance of Infrabony defects (funnel shaped defects) w/o attachment loss. - Radiolucency and Radiopacities in the alveolar bone - Root Resorption
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	Acute Trauma from Occlusion	Chronic Trauma from Occlusion									
	<p>= from <i>abrupt change in occlusal forces</i> that changes the direction of occlusal forces (New resto's etc)</p> <p>Symptoms:</p> <ul style="list-style-type: none"> - Tooth pain - Sensitivity to Percussion - ↑ mobility <p>Consequences:</p> <ul style="list-style-type: none"> - If tooth shifts or resto wears down, the injury will heal and ↓ symptoms - Cemental tears may occur - Injury may persist w/ tissue necrosis - Abscess formation or chronic asymptomatic condition may develop 	<p>= More common, develops from <i>gradual changes</i> (tooth wear, drifting, extrusion) in combo w/ bruxing</p> <ul style="list-style-type: none"> - DOESN'T develop as a consequence of acute perio trauma 									
Primary Occlusal Trauma:											
<ul style="list-style-type: none"> - Trauma resulting from excessive occlusal forces applied to tooth w/ normal periodontal support - Malocclusion is primary etiologic factor. Usually a "high" restoration - Tx: Occlusal Adjustment 											
Secondary Occlusal Trauma:											
<ul style="list-style-type: none"> - Trauma resulting from normal or excessive forces on teeth w/ poor periodontal support - Mobility is monitored, if it is stable -> No Tx - If loss of function or pain is present -> Splint the tooth, or Extract if mobility is severe 											
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Secondary Occlusal Trauma	Normal OR Excessive	Reduced									
Traumatic Occlusion	<p>= The occlusion that produces the injury trauma from occlusion</p> <p>**In the Presence of perio inflammation -> Traumatic occlusion can accelerate attachment loss...** -> But doesn't cause it</p> <ul style="list-style-type: none"> - However in the absence of periodontal inflammation -> Traumatic occlusion can cause bone loss and ↑ mobility but NOT Connective Attachment Loss <p>Trauma from Occlusion DOESN'T cause attachment loss</p>										

Even if Pt maintains good Perio maintenance

- **1st and 2nd max. molars are the most likely teeth to be lost before the Mand. molars**
 - o Max Molars: Difficult to keep clean, Trifurcation makes home care challenging, ↑ occlusal stress, root proximity

Limitations of oral rinses (Ability to reach the bottom of Perio Pockets)

- Antimicrobial agents as **mouth rinses** have ↑ effect on Subg. Bacteria in deep pockets, but have issues getting all the way down
- **Improve delivery of antimicrobial mouth rinses by:**
 - o **Pulsated Jet Irrigation** -> Delivers agent to **half depth of pockets ≤ 6mm**
 - o **Subgingival irrigation w/ Syringe** -> Tip placed 3mm subg. And **agent will reach 70-90% of deep pockets ≤ 6mm.** BUT, Calculus ↓ penetrating depth
 - o **Antimicrobials as cooling agent during ultrasonic scaling** -> **No statistically significant improvement** (CHX needs multiple applications)

Chlorhexidine	<ul style="list-style-type: none"> - Rinse for 30 sec. w/ 50mL of 0.12% CHX - Wait 30 min after rinsing to eat or drink - Rinse CHX 30min before or after brushing -> CHX ↓ function by being chelated by SLS in toothpaste <p>Side Effects</p> <ul style="list-style-type: none"> - Staining - Altered taste sensation <p>MOA:</p> <ul style="list-style-type: none"> - Bacteriostatic at [Low], Bacteriocidal at [High] - CHX binds to -'ve cell wall -> ↑ permeability = ions leak out. w/ ↑ concentration the membrane is damaged irreversibly
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Local Delivery of Antibiotics

May be useful in specific sites refractory to traditional Tx -> Should not be a routine option and is not indicated if routine mechanical therapy can be done.

- This is an *adjunct for debridement*, not a replacement

Tetracycline Fibers	= Non-resorbable <i>cylindrical fiber loaded w/ tetracycline</i> -> Placed into the perio pocket <ul style="list-style-type: none"> - Held in the pocket w/ adhesive for 7-10 days
Metronidazole Gel	= <i>Metronidazole suspended in a matrix</i> <ul style="list-style-type: none"> - Placed into perio pockets
Minocycline Ointment	= <i>Minocycline in a matrix</i> <ul style="list-style-type: none"> - Placed into perio pockets
Chlorhexidine Chip	= <i>35% CHX in cross-linked gelatin matrix</i> <ul style="list-style-type: none"> - Small wafer placed into perio pockets until it dissolves away

Jon Seever

Bony Defect Classification

- *Infrabony* defect is a broad term for any vertical bone loss

Three-Walled Defects (AKA Intrabony Defect)	<ul style="list-style-type: none"> = <i>Bone present on 3 sides</i> <ul style="list-style-type: none"> - The root is the 4th wall <p>Tx Options:</p> <ol style="list-style-type: none"> 1. <i>Root Planing</i> -> Can result in partial bone fill + long JE to ↓ pocket depth 2. <i>Open Flap Debridement</i> -> Better access to clean the defect fully 3. <i>Osseous Surgery</i> -> Remove the remaining walls to eliminate the vertical defect + Apically replace the flap to ↓ pocket. <ul style="list-style-type: none"> - This does <i>create more recession and root sensitivity</i>. Don't do in esthetic areas 4. <i>Guided Tissue Regen (GTR)</i> -> Raise flap + debride. Place membrane over defect to allow more bone fill. <ul style="list-style-type: none"> - True regen = New cementum on root + New PDL attachment + New Bone fill
Two-walled Defect	Progression of the 3 walled to where <i>one of the walls is perforated though</i> <ul style="list-style-type: none"> - <i>2 Walls of bone, 1 open space, and a root surface</i> <p>Craters</p> <ul style="list-style-type: none"> - <i>Subtype of 2 walled defect</i> -> Forms a trough interproximally between 2 teeth with a B and L wall - Most common type of osseous defect
One-walled Defect	Only 1 bony wall remaining

Furcation Classifications

Horizontal Classifications (Hamp)	
Class I	Horizontal loss through furcation <3mm
Class II	Horizontal bone loss through furcation >3mm but not all the way through
Class III	<i>Through and through</i> involvement
Vertical Classifications	
<ul style="list-style-type: none"> - Not often used 	
Subclass A	0-3mm vertical probable depth
Subclass B	4-6mm
Subclass C	7+mm

Degree of furcation involvement depends on:

1. Amount of *bone loss*
2. Root trunk Length
3. Degree of root separation

Tx Options for Furcation Defects:

Root Planing	↓ inflammation to ↓ pocket + form Long JE - Suitable for <i>mild furcations</i>
Odontoplasty	Reshape the tooth w/ bur to remove the roof of the furcation -> Eliminate the "cave" for bacteria - Suitable for <i>mild – moderate furcations</i>
GTR	Similar for vertical defect Tx - Suitable for <i>deep Class II Mandibular Molar furcations</i>
Hemisection	Cut a root canaled mandibular molar in half -> Creates 2 "bicuspid" roots - For <i>severe furcation involvement</i>
Root Amputation	Remove 1 root from a 3 rooted Max. molar (or Mand. molar but with ↓ success) - If 1 root is severely involved and the others are healthy
Tunnel Preparation	Apically positioning the tissue to expose a class III furcation for easier cleaning

GTR	
Indications	<ul style="list-style-type: none"> - 2 or 3 walled defects - 6mm pockets w/ Vertical bone loss of 4+mm - Adequate Soft tissue to close over membrane - V. good home care - Commitment to professional maintenance
Contraindications	<ul style="list-style-type: none"> - Vertical root Fracture - Smoking - Finances (\$1500/area) - No consent for materials derived from animals or humans
Membranes	<p>Non-Resorbable:</p> <ul style="list-style-type: none"> - Remove after 6-8 weeks - <u>Titanium Reinforced</u>: Helps you "tent up" the membrane to prevent collapsing into the defect <p>Resorbable:</p> <ul style="list-style-type: none"> - Resorb after 4-6 weeks (no second surgery needed)

Some Other Treatments	
Root Surface Conditioning	<p>Use EDTA to demineralize the root surface -> reverses the periodontitis-induced hypermineralization, removes bacterial endotoxins in the root surface and exposes old collagen fibers inside the root cementum</p> <ul style="list-style-type: none"> - Exposed collagen promotes interdigititation of new collagen formed in healing - Exposed Collagen ↑ stabilization of blood clot and ↓ epithelial migration <p>*This procedure has not produced predictable results -> sometimes causes ankylosis and root resorption*</p>
Implantation of bone, or its derivatives	<p>Osteoinductive</p> <ul style="list-style-type: none"> - Induces osteoblasts and cementoblast differentiation from progenitors - Allografts have no osteoinductive activity - Autogenous bone IS osteoinductive <p>Osteoconductive</p> <ul style="list-style-type: none"> - Matrix acts as a passive scaffold to guide osteoblast and cementoblast migration <p>Materials:</p> <ul style="list-style-type: none"> - <u>Human Bone</u>: Autografts (Extra or intraoral) Allografts (Fresh frozen bone, freeze-dried bone, demineralized freeze-dried bone) - <u>Bone Substitutes</u>: Xenografts (Bovine hydroxyapatite, Coralline Calcium carbonate) Alloplasts (Ceramics, Hydroxyapatites, Polymers, Bioglass)
Growth Factors	<p>Gem21S</p> <ul style="list-style-type: none"> - Contains Platelet-Derived Growth Factor to induce progenitor cells into repopulation <p>PepGen P-15</p> <ul style="list-style-type: none"> - Contains HA particles coated w/ peptides to bind Collagen type I + supports adhesion of fibroblasts and bone forming cells <p>Emdogain</p> <ul style="list-style-type: none"> - Enamel Matrix Derivative (Amelogenin is major protein) -> from <i>porcine sources</i> - Can be combined with TCP (Tricalcium phosphate) to prevent gingiva collapse into the defect

Reattachment Vs New Attachment

Reattachment	= reunion of CT and root surface that has been <i>separated by incision or injury</i>
New Attachment	= Formation of new CT attachment to the root surface that was previously pathologically exposed to Perio pocket or covered by <i>pocket epithelium</i>

Connective Tissue Healing

- **1 Hr:** Early Inflammatory phase -> initiated by **neutrophil infiltration into the clot**
- **6 Hr:** Root surface lined by **neutrophils** -> Decontaminate the wound (Phagocytose injured + necrotic tissue)
- **3 Days:** **Neutrophils ↓ and macrophages ↑** -> Macros remove dead cells and residual debris + release growth factors
 - o Transition from Inflammation to Granulation tissue
 - i. CT cells come from various sources (CT in flap, PDL, Perivascular cells, Blood etc) -> Histologic outcome depends on where these CT progenitors come from
- **3-7 Days:** Macrophages, Fibroblasts, Endothelial cells migrate to provisional matrix (Fibrin clot + inflammatory cells)
 - o Primitive wound CT called **Granulation Tissue** right now. Lots of new collagen made from fibroblasts
- **7 Days:** Granulation tissue matures and migrates to meet functional demand -> ↑ Type I collagen
- **10-14 days:** Fibroblasts differentiate into myofibroblasts -> attach to collagen and contract in parallel direction to ↑ strength
- **21 Days:** Osteogenic activity + Cementogenesis starts if regeneration is induced
 - o Cementoblasts + Osteoblasts produce non-mineralized matrix that mineralizes over a few weeks
 - o New Sharpey's fibers form

Kinu (Implant Tx Planning)

Oral/Periodontal Disease and affect on Implant Treatment	<ul style="list-style-type: none"> - Plaque is the 1° etiology for both Periodontal disease and peri-implant disease -> OHE needs to be great for success of implant - Poor OHE = 14x ↑ for peri-implantitis - Pt's w/ 1+ pockets > 6mm have ↑↑ prevalence of peri-implant bone loss and BOP
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Medical Risk Factors for Implant Therapy

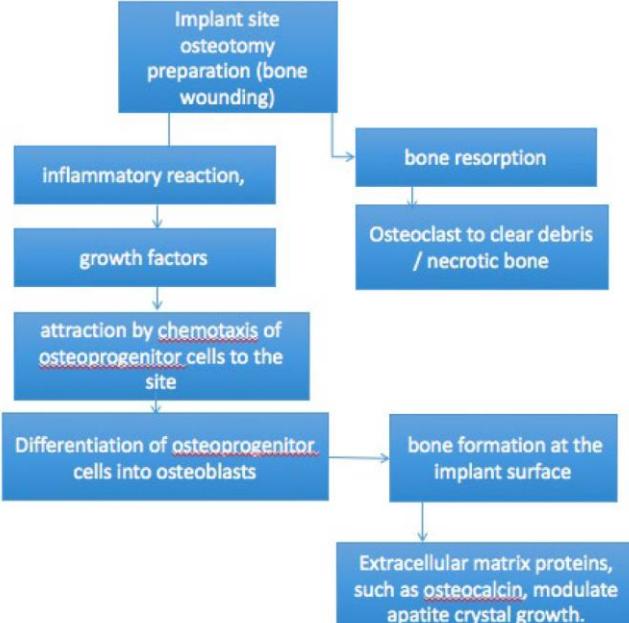
Uncontrolled Diabetes	Affects wound healing <ul style="list-style-type: none"> - If their glycemic control is good, the inflammatory markers look like otherwise healthy peeps
Head and Neck Radiation Therapy	No significant difference in implant success btwn Pre- and Post-implant radiation <ul style="list-style-type: none"> - Anatomical site of implant placement is most pertinent variable affecting survival: Mandible > Maxilla
IV Bisphosphonates	Tx/conditions affecting bone turnover (Rads, Osteoporosis) ↑ risk for implant failure -> There is little research though <ul style="list-style-type: none"> - IV Bisphosphonates have been an absolute contraindication for implant placement b/c BRONJ - NOW, evidence shows single IV infusion of bisphosphonates is NOT an absolute contraindication for implants
Immunocompromising disease	Degree of systemic disease control is the most important factor vs. the disease itself
Smoking	Moderate – Heavy smoking = ↑ rate of early implant failure (5x greater odds for peri-implantitis)
Parafunctional Habits	↑ non-axial loads on teeth and implants <ul style="list-style-type: none"> - Implants have no ability to accommodate excessive stress (no PDL)
Periodontal Disease	Control Periodontal disease and keep pt's in frequent maintenance
Current Infection	Endo etc -> Needs to be controlled prior to implants to avoid failure and complication

Assessment for Edentulous Space

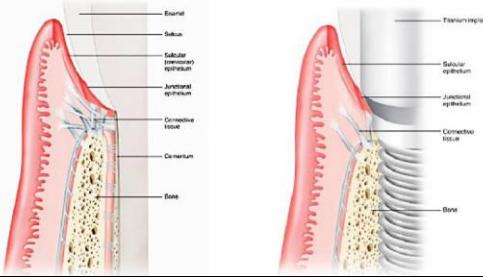
Keratinized Tissue	<p>Ideally, 2mm</p> <ul style="list-style-type: none"> - KT provides strong seal w/ cuff of parallel fibers around the implant - Lack of KT = ↑ plaque accumulation, inflammation, mucosal recession - BUT...in presence of good OHE, lack of KT doesn't impair the health or function of implants <p>Recommend augmenting KT if deficient</p>
Space Available	<p>Depends on size/type of implant...generally:</p> <ul style="list-style-type: none"> - 2mm buccally and lingually - 1.5mm between implant-adjacent teeth - 3mm between implant-implant <p>Interocclusal space (Depends on implant): -> for a 4mm (regular) implant</p> <ul style="list-style-type: none"> - Interdental space (M-D) = 7mm - Interocclusal Space = Avg. 7mm (for cement retained), 4mm (for screw retained) - Alveolar Bone Height = Avg. 10mm (allow 2mm of safety margin near vital structure) <ul style="list-style-type: none"> - This is implant dependent based on the length of implant you want to use

Width of Bone Radiographs	Siebert Classification	
	Class I	= Horizontal deficiency -> could be ST or HT - B-L deficiency - Apico-Coronal is normal
	Class II	= Vertical Deficiency - Apico-coronal tissue loss - Normal B-L
	Class III	= Combo - Apico-coronal loss - B-L loss
PA - Bone height - Root angulation - PA pathoses		
PAN (Major distortion/Magnification) - Good for initial assessment for IAN, Sinus, Pathologies		
CBCT - Bone volume, height, width - Bony Defects (need for grafting) - Vital structures - Useful for determining implant size, width, angulation		

Osseointegration

Definition = Direct structural and functional connection between living bone and the surface of a load-bearing implant w/o intervening soft tissues Clinically = Asymptomatic rigid fixation of an alloplastic material (implant) in bone w/ ability to withstand occlusal force	
Stages https://www.youtube.com/watch?v=o-kKXbg0w&sns=em  <pre> graph TD A[Implant site osteotomy preparation (bone wounding)] --> B[inflammatory reaction] B --> C[growth factors] C --> D[attraction by chemotaxis of osteoprogenitor cells to the site] D --> E[Differentiation of osteoprogenitor cells into osteoblasts] E --> F[bone formation at the implant surface] F --> G[Extracellular matrix proteins, such as osteocalcin, modulate apatite crystal growth.] B --> H[bone resorption] H --> I[Osteoclast to clear debris / necrotic bone] </pre>	

Implant Attachment	
Tooth	Implant
<ul style="list-style-type: none"> - Bone support w/ PDL -> Sharpey's fibers insert into cementum - Junctional epithelial attachment - Gingival sulcus lined w/ sulcular epithelium - Rich blood supply 	<ul style="list-style-type: none"> - Bone directly approximated w/ implant surface w/o intervening PDL - CT present above level of bone w/ parallel fibers to implant surface (no fiber insertion) - Minimal JE - Deeper sulcus lined w/ sulcular epithelium - Poor blood supply



Implant Surface Design

- Many systems combine more than one surface modification

Implant Surface Design													
Machined Surfaces	<ul style="list-style-type: none"> - Smoothish surface (there are grooves, ridges etc from machine) <ul style="list-style-type: none"> - Defects provide mechanical resistance through bone interlocking - Longer waiting time btwn surgery + Implant loading (3-6month waiting period) - High success rate in areas of good bone quality (Anterior mandible) - Challenging in areas of poor bone quality (Posterior mandible) 												
Rough Surface Implants	<p>Cells react differently to smooth vs rough surfaces</p> <ul style="list-style-type: none"> - Fibroblasts and epithelial cells adhere stronger to smooth surfaces - Osteoblastic proliferation and collagen synthesis ↑ on rough <table border="1"> <tr> <td>Macro Roughness</td><td>Millimeters – Tens of microns</td></tr> <tr> <td>Micro Roughness</td><td>1-10um</td></tr> <tr> <td>Nanotopography</td><td>Can influence process of cell migration, proliferation, differentiation</td></tr> </table>	Macro Roughness	Millimeters – Tens of microns	Micro Roughness	1-10um	Nanotopography	Can influence process of cell migration, proliferation, differentiation						
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Abutment Types													
Stock Prefabricated	<ul style="list-style-type: none"> - Generally, cement retained 												
Custom lab Fabrication	<p>Cement vs Screw Retained</p> <ul style="list-style-type: none"> - <u>Cement Retained</u>: Custom abutment (titanium or zirconia) w/ cemented crown - <u>Screw Retained</u>: Metal Ceramic vs full contour zirconia vs layered zirconia crowns <table border="1"> <thead> <tr> <th colspan="2">Screw Retained</th></tr> <tr> <th>Advantages</th><th>Disadvantages</th></tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> - Retrievable - Useful for limited interocclusal space (4mm) - Better tissue response - Avoids cement trap w/ deep implants </td><td> <ul style="list-style-type: none"> - Needs more ideal placement - ↑ risk of ceramic fracture - ↑ risk of screw loosening/fracture - Harder to get passive fit - Harder for ideal occlusion b/c screw access hole </td></tr> <tr> <th colspan="2">Cement Retained</th></tr> <tr> <th>Advantages</th><th>Disadvantages</th></tr> <tr> <td> <ul style="list-style-type: none"> - Can restore implants in non-ideal positions - Easier to achieve esthetics and occlusion - Easier to achieve passivity </td><td> <ul style="list-style-type: none"> - Irretrievable w/ definitive cement - Needs more interocclusal space (7mm) - Excess cement can cause peri-implantitis </td></tr> </tbody> </table>	Screw Retained		Advantages	Disadvantages	<ul style="list-style-type: none"> - Retrievable - Useful for limited interocclusal space (4mm) - Better tissue response - Avoids cement trap w/ deep implants 	<ul style="list-style-type: none"> - Needs more ideal placement - ↑ risk of ceramic fracture - ↑ risk of screw loosening/fracture - Harder to get passive fit - Harder for ideal occlusion b/c screw access hole 	Cement Retained		Advantages	Disadvantages	<ul style="list-style-type: none"> - Can restore implants in non-ideal positions - Easier to achieve esthetics and occlusion - Easier to achieve passivity 	<ul style="list-style-type: none"> - Irretrievable w/ definitive cement - Needs more interocclusal space (7mm) - Excess cement can cause peri-implantitis
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Antibiotic Prophylaxis for Implant Tx

2g Amoxicillin PO 1hr pre-operatively

- Significant ↓ in failure rate

Post-op Instructions

-500mg Amoxicillin TID for 7 days (if needed)

-CHX rinse 50mL, swish 30 seconds 1 time daily for 7-10 days

-Ice Packs for first 24-48 hours

-Maintain soft diet/refrain from smoking for 7-10 days

Implant Site Development

Socket Grafting

= After exo of tooth, the alveolar ridge decreases in volume and will change in morphology

- Changes are clinically significant and will change the prognosis of FDP's or implant crowns

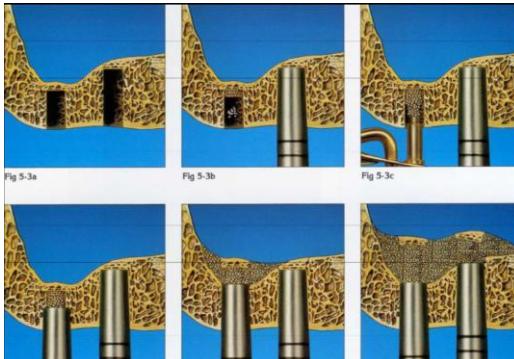
Bone Grafting	<p>3 mechanisms:</p> <table border="1"> <tr> <td data-bbox="314 365 551 544">Osteogenesis</td><td data-bbox="551 365 1521 544"> <p>= Viable osteoblasts and precursors are transplanted w/ grafting material into the defect</p> <ul style="list-style-type: none"> - Serve as centers of bone formation - True osteogenic cells can encourage bone formation in soft tissues, or active rapid bone growth in bone sites <p>Ex: Autogenous Graft</p> </td></tr> <tr> <td data-bbox="314 544 551 639">Osteoinduction</td><td data-bbox="551 544 1521 639"> <p>= Stimulates osteogenesis. Causes differentiation of local connective tissue cells into bone forming cells</p> <ul style="list-style-type: none"> - Requires 1+ inducing agents like BMP's (bone morphogenic proteins) </td></tr> <tr> <td data-bbox="314 639 551 692">Osteoconduction</td><td data-bbox="551 639 1521 692"> <p>= Grafting material serves as a scaffold/support for new bone growth through conduction, induction or a combo</p> </td></tr> </table>	Osteogenesis	<p>= Viable osteoblasts and precursors are transplanted w/ grafting material into the defect</p> <ul style="list-style-type: none"> - Serve as centers of bone formation - True osteogenic cells can encourage bone formation in soft tissues, or active rapid bone growth in bone sites <p>Ex: Autogenous Graft</p>	Osteoinduction	<p>= Stimulates osteogenesis. Causes differentiation of local connective tissue cells into bone forming cells</p> <ul style="list-style-type: none"> - Requires 1+ inducing agents like BMP's (bone morphogenic proteins) 	Osteoconduction	<p>= Grafting material serves as a scaffold/support for new bone growth through conduction, induction or a combo</p>		
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Membranes	<p>= Used to prevent soft tissue impingement on bone growth and also to help maintain a contour for your bone fill (as in the titanium reinforced membranes)</p> <table border="1"> <tr> <td data-bbox="314 1315 551 1421">Non-resorbable</td><td data-bbox="551 1315 1521 1421"> <p>Must remove in 6-8 weeks</p> <p>Ex: Cyoplast titanium reinforced, or e-PTFE (Gore-tex)</p> </td></tr> <tr> <td data-bbox="314 1421 551 1569">Resorbable</td><td data-bbox="551 1421 1521 1569"> <p>Starts dissolving in 4-6 weeks</p> <ul style="list-style-type: none"> - This membrane is much more forgiving than the non-resorbable if you have an exposure to the oral cavity <p>Ex: Collagen Membranes, Polyglactic Acid (Bioglide)</p> </td></tr> </table> <p>**There is no statistically significant diff. in the outcome of using Resorbable vs non-Resorbable**</p> <p>If you need the membrane to stay for more than 4-6 weeks use non-resorbable...obviously</p>	Non-resorbable	<p>Must remove in 6-8 weeks</p> <p>Ex: Cyoplast titanium reinforced, or e-PTFE (Gore-tex)</p>	Resorbable	<p>Starts dissolving in 4-6 weeks</p> <ul style="list-style-type: none"> - This membrane is much more forgiving than the non-resorbable if you have an exposure to the oral cavity <p>Ex: Collagen Membranes, Polyglactic Acid (Bioglide)</p>				
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How much bone loss can we expect after extractions? Lets see what science says

- There WILL be bone loss even with socket preservation. [Socket grafting just mitigates the loss](#)

	Average Width Loss - Important for fitting the implant within the ridge	Average Height Loss - Important for esthetics
Membrane Alone	1.32mm	0.38mm
Natural Socket Healing Control	4.56mm	1.50mm
Allograft + Membrane	1.2mm	1.3mm GAIN
Natural Socket Healing control	2.7mm	0.9mm LOSS
Xenograft + Membrane	2.5mm	0.7mm
Natural Socket Healing control	4.3mm	3.6mm
	Teeth that lost >20% bone height	Average loss of height of the buccal wall
Xenograft w/o membrane	16%	2.4mm
Natural Socket Healing control	71%	5.2mm
	Initial Buccal Wall thickness at 10-12 weeks	Loss of alveolar height
Putty grafted sockets + Membrane	>1.2mm	0.2mm
Natural Healing Socket control	<1mm	1.7mm

Sinus Grafts

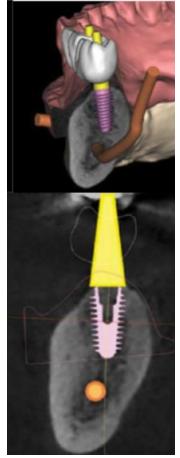
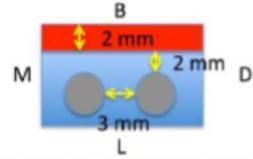
Some Science Facts	<p>Sinus Graft Success Rates</p> <ul style="list-style-type: none"> - Iliac Block grafts 83.3% Survival vs Particulate bone grafts (92.3% survival) - Machined implants (84%) vs Rough Surface implants (91.6%) - Membrane on Window (93.6%) vs No membrane (88.7%) - Simultaneous and delayed implant placement both have 90% <p>Graft Type Success:</p> <ul style="list-style-type: none"> - 92% survival for Autogenous bone grafts (or grafts containing autogenous bone) - 93.3% survival for Allografts - 95.6% survival for Xenografts -> Likely because the bovine bone creates a much tighter and stronger matrix for the implant to osseointegrate into <p>3 Year Survival Rate = 90.1%</p> <ul style="list-style-type: none"> - ↑ to 98.3% w/ rough surface implants + membrane covering the lateral window
Indirect Sinus Lift Procedure	<p>Usually combined with implant placement</p> <ul style="list-style-type: none"> -> Through the hole that you drilled for the implant, you will place the bone graft. -> Bone graft will be forced through the sinus floor and be deposited along the floor of the sinus. It will eventually turn into a thick floor to support the implant! 

Implant Risk Factors

General Risk Factors/Considerations	<p>General Health</p> <ul style="list-style-type: none"> - Medical Status, Medications, Allergies - Uncontrolled diabetes: ↑ amount of crestal bone loss after implant placement. Well controlled is like normal though - Osteoporosis: Does not affect implant Tx outcome. Oral bisphosphonates have low risk of BRONJ after implant surgery but IV bisphosphonates have higher risk. Informed consent - Penicillin Allergy: 3.1x ↑ risk if you cannot take penicillin postop. 10x ↑ risk in immediate implant placement. Most failures are within the first 6 months. Other antibiotics (clindamycin) show - Smoking <ul style="list-style-type: none"> - Complications ↑ in smokers (↑ postop infections, ↑ ↑ failure rates, ↑ crestal bone loss) - Not an absolute contraindication, recommend cessation get informed consent and consider 2-stage implants vs immediate - Age <ul style="list-style-type: none"> - No implants in those who have not stopped growing - Old age alone is not a contraindication, but other age related issues may contraindicate surgery - Jaw opening - Oral Self Care <ul style="list-style-type: none"> - Peri-implantitis and peri-implant mucositis ↑ risk with poor OHE - Ridge Deficiency <ul style="list-style-type: none"> - M-D, B-L, Occlusal clearance, distance between anatomical structures, tooth roots, implants - Seibert Classification (Class I = B-L; Class II = Vertical; Class III Both) - Space (M-D and interarch) - Parafunction - KT <ul style="list-style-type: none"> - Full periodontal assessment included - Periodontal disease - Commitment for maintenance
Esthetic Risk Factors	<ul style="list-style-type: none"> - Smile Line - Papilla fill - Gingival biotype - Vertical bone resorption - Adjacent implants
Biomechanical risk factors	<ul style="list-style-type: none"> - Occlusion - Parafunctional Habits - Implant Length and width
Other	<ul style="list-style-type: none"> - Emergence Profile - Cement

Factors Associated w/ moderate-severe peri-implantitis	
Periodontitis	4x ↑ risk
Edentulous	1.6x ↑ risk
>4 implants placed	15x ↑ risk
Implants placed by General Dentist	4.25x ↑ risk
Implant brand	3-6x ↑ risk depending on the brand <ul style="list-style-type: none"> - Not Straumann though

Assessments

Radiographic <ul style="list-style-type: none"> **CBCT is the standard of care for implants** - Conventional rads for the initial assessment though <p>Check for:</p> <ul style="list-style-type: none"> - Available bone volume at the ideal site - Proximity of anatomical structures (Nerves, vessels, sinuses, undercuts) - Assessment of bone density <p>Intraoral scan → CBCT → Digital Waxup → Surgical guide</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="5">Table 1: Bone Density and Common Locations</th> </tr> <tr> <th>Bone Types Tactile Sense</th><th>D1 Oak or Maple</th><th>D2 Pine or Spruce</th><th>D3 Balsa Wood</th><th>D4 Styrofoam</th></tr> </thead> <tbody> <tr> <td>Histology</td><td>Dense cortical bone</td><td>Dense to porous cortical bone and dense trabecular bone</td><td>Porous cortical bone and fine trabecular bone</td><td>Little cortical bone and fine trabecular bone</td></tr> <tr> <td>Usual Location</td><td>Anterior mandible (6%) Posterior mandible (3%)</td><td>Anterior mandible (66%) Posterior mandible (50%) Anterior maxilla (25%)</td><td>Anterior maxilla (65%) Posterior maxilla (50%)</td><td>Posterior maxilla (40%)</td></tr> </tbody> </table> 	Table 1: Bone Density and Common Locations					Bone Types Tactile Sense	D1 Oak or Maple	D2 Pine or Spruce	D3 Balsa Wood	D4 Styrofoam	Histology	Dense cortical bone	Dense to porous cortical bone and dense trabecular bone	Porous cortical bone and fine trabecular bone	Little cortical bone and fine trabecular bone	Usual Location	Anterior mandible (6%) Posterior mandible (3%)	Anterior mandible (66%) Posterior mandible (50%) Anterior maxilla (25%)	Anterior maxilla (65%) Posterior maxilla (50%)	Posterior maxilla (40%)	<p>For sufficient papilla width, emergence profile, ↓ crestal bone loss, ↓ ST defects</p> <ul style="list-style-type: none"> - Adjacent teeth = 1.5mm away - Adjacent implants = 3mm away - 2mm Labial bone (buccal plate) - 2mm gingival thickness <p>OCCLUSAL CLEARANCE: 8-12mm (minimum 5mm) to allow for abutment + crown height</p> <p>*Implant should be at least 3mm less than the M-D and B-L dimensions of the bone*</p> 
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Emergence Profile	<p>= Gradual transition from implant head to the level of gingiva</p> <ul style="list-style-type: none"> - Depends on implant size, positioning, soft tissue thickness, inter-occlusal space and the positioning of neighbouring teeth - Don't over or under-contour the abutment -> Becomes a home for peri-implant bacteria - Use Healing abutments and provisional resto's (with the appropriate emergence profile) -> Ideally the emergence profile of the healing abutment, temp abutment,  <p>**Platform switching systems are boss**</p> <ul style="list-style-type: none"> - The idea is that you use a slightly narrower abutment diameter vs the diameter of the implant head. Junctional epithelium will then migrate in to fill this space to create a pseudo-Biologic Width - This results in less crestal bone loss  <p><small>Dental implants without (left) and with (right) platform switching</small></p>																																		