

## OMFS 430/440 STUDY REVIEW

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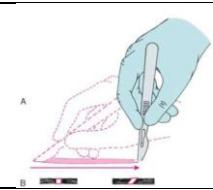
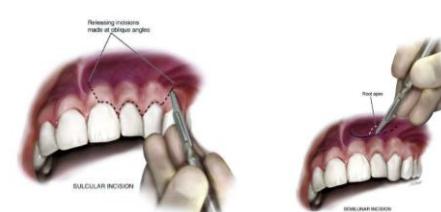
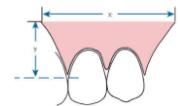
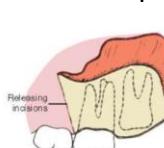
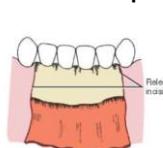
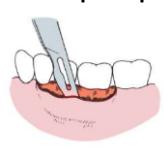
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# Principles of Surgery

<b>Swelling at angle of mandible:</b>	
<ul style="list-style-type: none"> <li>- Compensatory Hypertrophy (w/ hypotrophy on contralateral side)</li> <li>- Masseter Muscle myopathy</li> <li>- Masseter muscle neoplasia</li> <li>- Salivary Gland diseases (Sialosis, Parotitis)</li> <li>- Parotid neoplasia (Pleomorphic Adenoma)</li> <li>- Parotid Inflammatory Disease</li> <li>- Odontogenic Problems (Chronic Dental Abscess)</li> <li>- Neoplasia of soft tissues</li> <li>- Vascular Lesion</li> </ul>	

<b>Incisions</b>	
<b>Principle 1</b> <ul style="list-style-type: none"> <li>- <b>Use a Sharp Blade</b></li> </ul>	<ul style="list-style-type: none"> <li>- Standard blade = #15 for oral surgery (#11 and #12 are specialized options as well)</li> <li>- Sharp blades allow clean incisions w/o damage from making multiple strokes</li> <li>- The rate a blade dulls depends on resistance of tissues and contact with bone -&gt; <b>Blades need frequent changing</b></li> </ul>
<b>Principle 2</b> <ul style="list-style-type: none"> <li>- <b>Use Firm continuous strokes</b></li> </ul>	<ul style="list-style-type: none"> <li>- ↑ tissue damage occurs from repeated tentative strokes. Commit or eat shit! Just use <b>one confident continuous stroke</b></li> </ul>
<b>Principle 3</b> <ul style="list-style-type: none"> <li>- <b>Avoid Cutting Vital Structures</b></li> </ul>	<ul style="list-style-type: none"> <li>- Cut deep enough to define the next major layer when making incisions close to vessels, ducts and nerves -&gt;</li> <li>- Don't get lost with how deep you are cutting!</li> <li>- Vessels can be divided, and nerves freed from adjacent tissues away from area to be incised</li> </ul>
<b>Principle 4</b> <ul style="list-style-type: none"> <li>- <b>Make incisions perpendicular to epithelial surface when planning to reapproximate</b></li> </ul>	<ul style="list-style-type: none"> <li>- A 90° squared edge incision is easier to re-orient properly during suturing and is less susceptible to necrosis from ischemia</li> </ul> <div style="text-align: right; margin-top: 10px;">  </div>
<b>Principle 5</b> <ul style="list-style-type: none"> <li>- <b>Ensure properly placed incisions</b></li> </ul>	<ul style="list-style-type: none"> <li>- When possible make incisions through ATTACHED gingiva and over healthy bone</li> <li>- Keep a <b>margin of a few mm away from damaged bone</b> -&gt; suture margins should be over healthy bone</li> <li>- Incisions made around teeth to be extracted are done in the sulcus if possible</li> </ul> <div style="text-align: center; margin-top: 10px;">  </div>
<b>Flap Design</b>	
<p>Flaps help to ↑ the access to the surgical area</p> <ul style="list-style-type: none"> <li>- Maintaining design principles work to ↓ Necrosis, Dehiscence and tearing</li> </ul>	
<b>Prevent Necrosis</b>	<ul style="list-style-type: none"> <li>- <b>Apex of flap NEVER wider than base</b> <ul style="list-style-type: none"> <li>- Sides should run either parallel or converge to the apex (top) of the flap</li> <li>- Length should be <b>NO MORE than 2x the width of the base</b>. Width should be &gt; length</li> <li>- Axial blood supply should be included in the base</li> </ul> </li> <li>- Don't twist, stretch or grab flap w/ anything that could damage the vessels</li> </ul> <div style="text-align: right; margin-top: 10px;">  </div>
<b>Prevent Dehiscence</b>	<ul style="list-style-type: none"> <li>- Approximate edges of flap over healthy bone</li> <li>- Handle the edges gently</li> <li>- Don't suture flap under tension</li> </ul> <p style="color: red;"><b>*Dehiscence exposes underlying bone = pain, bone loss, ↑ scarring*</b></p>
<b>Prevent flap tearing</b>	<ul style="list-style-type: none"> <li>- Larger incisions heal just as quickly as short ones -&gt; Go bigger to prevent tearing from imparting too much force on tissue</li> <li>- Add releasing incisions to ↓ the tension placed on the tissues</li> </ul> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p><b>2 Sided Flap</b></p> </div> <div style="text-align: center;">  <p><b>3- sided Flap</b></p> </div> <div style="text-align: center;">  <p><b>Envelope Flap</b></p> </div> </div>

# Hemostasis

## Necessary b/c:

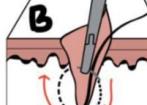
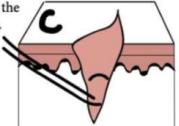
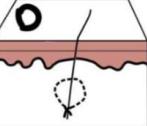
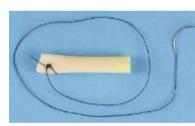
- ↑ visibility during surgery (surgical suction does a better job of keeping the surgical field dry vs restorative suctions)
- ↓ formation of a hematoma which can: ↑ pressure on wound, ↑ tension on wound edges, act as a culture medium to ↑ infections

<b>How to promote Haemostasis</b>	<ul style="list-style-type: none"> <li>- Apply pressure with 2x2 gauze -&gt; 20-30sec (small vessels), 5-10 mins (large vessels)</li> <li>- Place haemostat on a severed vessel</li> <li>- DAB don't wipe the wound -&gt; Wiping ↑ risk to reopen vessels</li> </ul> <p><b>Cautery:</b> Heating to coagulate the ends of a cut vessel and fuse tissues -&gt; can use electricity or heat</p> <ol style="list-style-type: none"> <li>1. Pt must be grounded to allow current to enter body</li> <li>2. Cautery tip + metal instrument (haemostat) cannot touch anywhere other than the cautery size (could cause undesirable current path and burn)</li> <li>3. Remove blood or fluid accumulating around vessel -&gt; Prevents sufficient heat from reaching vessel</li> </ol> <p><b>Suture Ligation</b></p> <ul style="list-style-type: none"> <li>- If vessel is large enough, tie it off with a non-resorbable suture (Vicryl)</li> </ul> <p><b>Vasoconstrictive substances</b> -&gt; Epinephrine, or commercial coagulants</p> <ul style="list-style-type: none"> <li>- Place Epi in wound via LA injection or soaking in 2x2 gauze -&gt; Most effective when placed 7-10 minutes before surgery though</li> <li>- Apply coagulant (thrombin, collagen etc) on wound</li> </ul>
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## Dead Space

= Any area in a wound that remains devoid of tissue after wound closure -> Created by removing deep tissue or not approximating tissues well

- Usually the space will fill with blood -> Haematoma with infection potential

<b>Principles of Dead Space Management</b>	
<b>1. Deep Sutures</b>	<p>Vertical mattress sutures allow for deep tissue suturing, bringing tissue planes together and ↓ the void</p> <p><b>How do I place deep sutures?</b></p> <p>A. To start, the needle is inserted at the level of the superficial fascia and exits at the dermal-epidermal junction.</p>  <p>B. The needle is then re-armed with the driver and inserted at the dermal-epidermal junction on the contralateral side and exited at the level of the superficial fascia.</p>   <p>D. Using 3 or 4 throws, the knot is tied and buried at the level of the superficial fascia. The knot is cut leaving only 2mm "tails."</p> 
<b>2. Apply Pressure Dressing</b>	<p>Dressing compresses tissue planes together until they are bound by fibrin or pressed together by surgical edema (or both)</p> <ul style="list-style-type: none"> <li>- Takes about 12-18 hours to happen</li> </ul> <p>This is that real kinky shit</p> 
<b>3. Place packing into void until bleeding stops</b>	<p>This is done when tissue cannot be tacked together, to keep the wound edges open, to place pressure dressings</p> <ul style="list-style-type: none"> <li>- Impregnated with antibacterial meds to ↓ infection risk</li> </ul>
<b>4. Use drains</b>	<p><u>Suction drains</u> continually remove blood that accumulates in the wound until bleeding stops and tissues bind together -&gt; Eliminates the dead space</p> <ul style="list-style-type: none"> <li>- Allows bleeding to drain to the surface vs creating a hematoma</li> </ul>   <p>→ Penrose drain (<u>non-suction</u>)</p>

## Wound Decontamination & Debridement

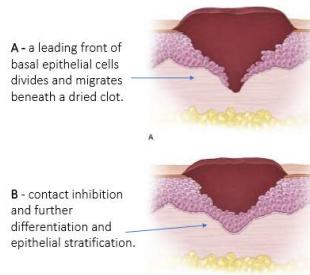
<b>Decontamination</b>	Infection risk ↑ w/ ↑ size of inoculum -> Try to ↓ bacteria count to ↓ risk of infection <ul style="list-style-type: none"> <li>- Irrigate the wound during surgery repeatedly</li> <li>- Irrigation under pressure dislodges bacteria and other foreign materials -&gt; typically w. sterile saline and sterile water</li> </ul>
<b>Debridement</b>	= Careful removal of necrotic and ischaemic tissue as well as foreign material that would impede wound healing <ul style="list-style-type: none"> <li>- Only really done from traumatic wounds or severe tissue damage from pathological condition</li> </ul>  <p>Like in this dude and his road rash</p>

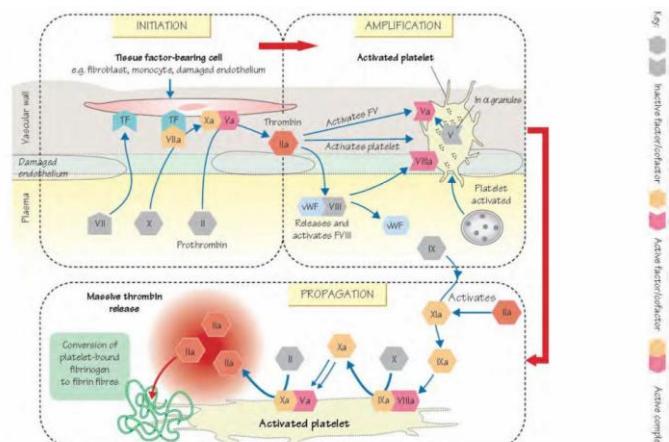
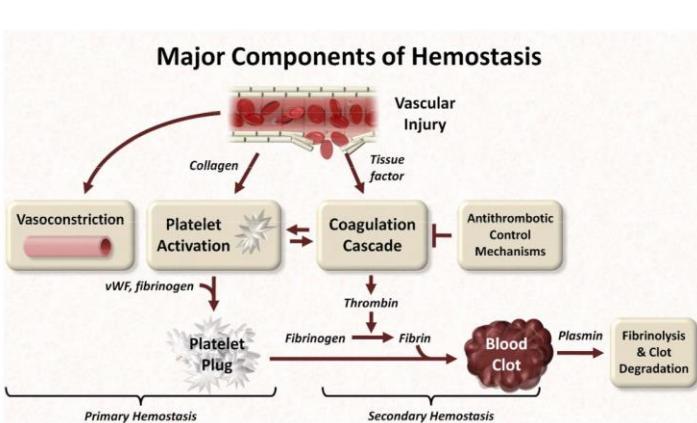
## Principles of Wound Repair

### Phases of Normal Healing

#### 4 phases to normal healing:

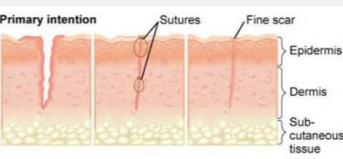
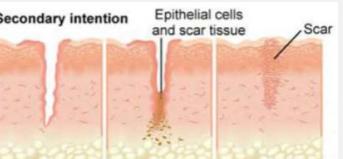
Phase	What goes down						
<b>1. Hemostasis</b>	<ul style="list-style-type: none"> <li>- Vascular constriction</li> <li>- Platelet aggregation, degranulation, fibrin formation (<b>Thrombus</b>)</li> </ul>						
<b>2. Inflammation</b>	<p>Begins the moment tissue injury occurs (<b>lasts typically 3-5 days</b>)</p> <p><b>2 Phases:</b></p> <ol style="list-style-type: none"> <li>1. <u>Vascular</u> <ul style="list-style-type: none"> <li>- Initial vasoconstriction due to Thromboxane and Prostaglandin release -&gt; Slows blood flow to the area to promote clotting</li> <li>- <b>Within minutes:</b> Histamine, PGE1, PGE2 from WBC cause vasodilation and endothelial leakage -&gt; allows leukocytes to migrate to interstitial space</li> <li>- Fibrin from transudate plasma causes lymphatic obstruction -&gt; accumulation of transudate around injury diluting contaminants = <b>Inflammatory Edema</b></li> <li>- Platelets bind exposed collagen to form platelet plug -&gt; degranulation activates more platelets &amp; ↑ affinity to bind fibrinogen</li> <li>- <b>GPIIb/IIIa (blocked by clopidogrel)</b> is modified. Platelet activating factor (PAF), vWF and Thromboxane A2 stimulate conversion of fibrinogen to fibrin = <b>Propagates formation of thrombus</b> (usually white to begin with)</li> <li>- As red blood cells become trapped thrombus turns red</li> </ul> <div style="background-color: yellow; padding: 10px; border: 1px solid black; margin-top: 10px;"> <p style="text-align: center;"><b>Cardinal Signs of Inflammation</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">- Redness</td> <td style="width: 50%;">- Pain</td> </tr> <tr> <td>- Swelling</td> <td>- Loss of Function</td> </tr> <tr> <td>- Warmth</td> <td></td> </tr> </table> </div> </li> <li>2. <u>Cellular</u> <ul style="list-style-type: none"> <li>- Triggered by activation of serum complement -&gt; C3a and C5a act as chemotactic factors and cause neutrophils to stick to vessel walls (<b>Margination</b>) and migrate through (<b>Diapedesis</b>)</li> <li>- Neutrophils contact bacteria and degranulate -&gt; <b>Proteases released from lysozymes to destroy bacteria</b></li> <li>- Monocytes/macrophages <b>phagocytize</b> foreign and necrotic materials</li> </ul> <p><b>Infiltration of:</b></p> <ul style="list-style-type: none"> <li>- Neutrophils</li> <li>- Monocytes -&gt; they differentiate into macrophages as well</li> <li>- Lymphocytes</li> </ul> </li> </ol>	- Redness	- Pain	- Swelling	- Loss of Function	- Warmth	
- Redness	- Pain						
- Swelling	- Loss of Function						
- Warmth							

<p><b>3. Proliferation/Fibroplastic</b> - 2-3 weeks long</p>	<p>Fibrin strands (derived from blood clotting) crosslink wounds and laydown framework which ground substance and tropocollagen is laid → ground substance cements collagen together</p> <ul style="list-style-type: none"> <li>- Fibroblasts transform mesenchymal cells to begin <b>tropocollagen production</b> on 3-4<sup>th</sup> days after injury</li> <li>- Fibroblasts secrete fibronectin to <b>stabilise fibrin</b>, recognise bacteria to be removed by immune system, recruit more fibroblasts, and guide macrophages</li> </ul> <p><b>Migratory subphase</b></p> <ul style="list-style-type: none"> <li>- Re-epithelialization (Secondary Epithelialisation)</li> <li>- Angiogenesis → capillaries bud from existing vessels along fibrin strands that cross the wound</li> <li>- Collagen synthesis → Tropocollagen crosslinks to produce collagen <ul style="list-style-type: none"> <li>- Initially laid down haphazardly, ↓ wound strength, so more collagen is needed initially to strengthen</li> </ul> </li> <li>- ECM formation</li> </ul> <p>**By end of stage the wound will be: Stiff (↑ collagen), erythematous (↑ vascularization), Can withstand 70-80% of uninjured tissue tension**</p> <p><b>Contact inhibition</b> = cells will reproduce until they contact other cells, then they stop growing.</p>  <p>Malignant epithelial cells lose their contact inhibition and this beautiful thing happens →</p>  <p>Squamous Cell Carcinoma</p> <p><b>Caution:</b> When you open into max. sinus (usually by accident) → Epithelium of both the oral mucosa and the sinus wall begin to proliferate. If the sinus wall epithelium first contacts the oral mucosa, Contact inhibition will stop the proliferation creating a nice tasty Oroantral fistula 😞</p> 
<p><b>4. Remodeling</b></p>	<ul style="list-style-type: none"> <li>- Collagen remodeling → oriented to ↑ strength (never reached &gt;80-85% max strength though) <ul style="list-style-type: none"> <li>- Less collagen is needed for strength when it is properly oriented = scars soften</li> </ul> </li> <li>- Epithelial stratification is restored</li> <li>- Fibroblasts slowly disappear</li> <li>- Vascular maturation and regression → ↓ erythema</li> </ul> <p><b>Wound Contraction</b></p> <ul style="list-style-type: none"> <li>- Edges migrate towards each other, ↓ size of wound (when edges are not placed together)</li> <li>- Can cause problems with deep injuries (burns etc) if wounds are not covered with skin grafts <ul style="list-style-type: none"> <li>- Sharply curved lacerations cause mound of tissue on concave side of scar → can ↓ this contraction by placing epithelium between free edges</li> </ul> </li> </ul>



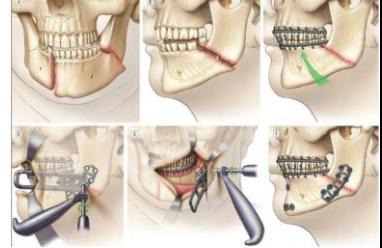
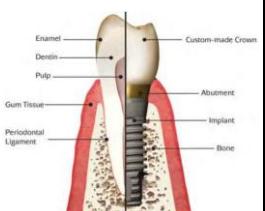
Factors Impairing Healing	
Foreign Material	<p><u>3 Basic Problems:</u></p> <ul style="list-style-type: none"> <li>- Bacteria proliferate and cause an <b>infection</b> where <b>bacterial products</b> destroy tissue</li> <li>- Non-bacterial material acts as <b>haven for bacteria</b>, sheltering them from host defense</li> <li>- Chronic <b>inflammatory reaction</b> ↓ fibroplasia</li> </ul>
Necrotic Tissue	<p><u>2 Necrotic issues:</u></p> <ul style="list-style-type: none"> <li>- Barrier to ingrowth of reparative cells -&gt; <b>Prolongs inflammatory stage</b> while WBC try to remove the tissue</li> <li>- <b>Protected niche for bacteria</b> -&gt; <b>Trapped blood = nutrient source for bacteria</b></li> </ul>
Ischemia	<p><u>↓ blood is bad:</u></p> <ul style="list-style-type: none"> <li>- Leads to further necrosis and ↓ delivery of antibodies, WBC, antibiotics</li> <li>- ↓ O<sub>2</sub> and nutrient delivery</li> </ul> <p><u>Causes:</u></p> <ul style="list-style-type: none"> <li>- Tight or poorly located <b>sutures</b></li> <li>- Poorly designed <b>flaps</b></li> <li>- Excessive external <b>pressure</b></li> <li>- Internal pressure on wound (haematoma)</li> <li>- Systemic <b>hypotension</b></li> <li>- Peripheral vascular disease</li> <li>- Anaemia</li> </ul>
Wound Tension	<p>Anything tending to hold wound edges apart</p> <ul style="list-style-type: none"> <li>- If sutures removed too early wound is under tension, will probably reopen and then heal w/ excessive scar formation and wound contraction</li> <li>- If sutures left in too long, will still tend to spread open during remodeling stage of healing and tract into epithelium through which the sutures ran will epithelialize (permanent disfiguring marks)</li> </ul>

## Primary, Secondary and Tertiary Intention

<b>Primary Intention</b>	<p>Theoretically ideal but <b>practically impossible clinically</b> -&gt; can get close though</p> <ul style="list-style-type: none"> <li>- <b>Edges of wound</b> (with no tissue loss) placed and stabilised in the <b>same anatomical position</b> that they were in before injury and allowed to heal</li> <li>- ↓ amount of re-epithelialisation, collagen deposition, contraction and remodeling during healing</li> <li>- Minimal scar tissue, faster healing, ↓ risk of infection</li> </ul> <p>Ex: Well-repaired lacerations, well-reduced bone fractures</p> 
<b>Secondary Intension</b>	<p><b>Gap is left btwn edges</b> of incision or btwn bone/nerve ends after repair, <b>OR tissue loss has occurred</b> and prevents approximation of wound edges</p> <ul style="list-style-type: none"> <li>- ↑ epithelial migration, collagen deposition, contraction and remodeling</li> <li>- Slower healing, ↑ scar tissue vs 1<sup>o</sup> intention</li> </ul> <p>Ex: Extraction sockets, poorly reduced fractures, deep ulcers,</p> 
<b>Tertiary</b>	<p>Healing of wounds via tissue grafts to cover large wounds and bridge the gap between wound edges</p> <p>→ Skin graft has been “meshed” and spread across wound. = faster healing and smaller graft can spread over larger area</p> 

## Other Healing mechanisms

<b>Extraction Socket Healing</b>	<p>Empty sockets consist of cortical bone covered by torn periodontal ligament with a rim of epithelium (gingiva) at the coronal portion -&gt; Socket fills with blood (coagulates and seals)</p> <p><b>Week 1:</b></p> <ul style="list-style-type: none"> <li>- <b>Inflammatory Stage:</b> WBC enter socket and remove contaminating bacteria + break down debris (bone fragments left there)</li> <li>- <b>Fibroblastic Stage:</b> Ingrowth of fibroblasts and capillaries. Epithelium migrates down socket wall until it reached the epithelium coming down from the other side or a bed of granulation tissue</li> <li>- Osteoclasts accumulate along crestal bone</li> </ul>
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	<p><b>Week 2</b></p> <ul style="list-style-type: none"> <li>- Most of <b>socket epithelialisation</b> is complete during 2, 3, 4 weeks. Cortical bone continues to be resorbed from crest and walls and new trabecular bone laid down.</li> <li>- As bone fills socket, epithelium moves towards crest and becomes level with adjacent gingiva</li> </ul> <p><b>4-6 Months</b></p> <ul style="list-style-type: none"> <li>- Cortical bone lining the socket is fully resorbed (loss of distinct lamina dura)</li> </ul>
	<p align="center"><b>Bone Healing</b></p> <p><b>Bone Healing</b></p> <p>Same events as soft tissue healing + Involvement of osteoblasts and osteoclasts to remodel bone</p> <ul style="list-style-type: none"> <li>- <b>Bone formed perpendicular to lines of tension to help withstand forces</b> (Excess forces on fracture healing site produces mobility which compromises vascularity and ↓ healing) -&gt; <i>Functional Matrix Concept</i></li> </ul> <p><u>Factors required for the best healing:</u></p> <ul style="list-style-type: none"> <li>- <u>Vascularity</u> -&gt; w/o sufficient blood or O<sub>2</sub> ↑ cartilage is laid down instead of bone, and ↓ ossification</li> <li>- <u>Immobility</u></li> </ul> <p><u>Osteoblasts are derived from:</u></p> <ul style="list-style-type: none"> <li>- Periosteum</li> <li>- Endosteum</li> <li>- Circulating pluripotent <b>mesenchymal</b> cells</li> <li>- Lay down osteoid -&gt; Calcifies into bone if immobile during healing</li> </ul> <p><u>Osteoclasts are derived from:</u></p> <ul style="list-style-type: none"> <li>- <b>Monocyte</b> precursor cells</li> <li>- Resorb necrotic bone and bone to be remodeled</li> </ul> <p><b>Secondary Intention Healing</b></p> <ul style="list-style-type: none"> <li>- *If free ends of bone are <b>&gt;1mm apart</b> -&gt; bone heals via secondary intention (<b>↑ collagen to be laid down to bridge the boy gap, this usually extends past the free ends and forms a callus</b>)</li> <li>- During remodeling, haphazard bone is resorbed by osteoclasts and osteoblasts lay down new bone to resist low-grade tensions</li> </ul> <p><b>Primary Intention Healing</b></p> <ul style="list-style-type: none"> <li>- When bone is not completely fractured (<b>ends are not separated from each other</b>) -&gt; <b>AKA Greenstick fracture</b> OR when surgeon closely reapproximates rigidly stabilises the fractured ends of a bone (<b>&lt;1mm</b>)</li> <li>- Little fibrous tissue is produced = <b>minimal callus formation</b> = 😊</li> <li>- Best way to achieve this is by applying plates to hold the bone together</li> </ul> 
<b>Implant Osseointegration</b>	<p><b>2 Factors:</b></p> <ol style="list-style-type: none"> <li>1. Healing of bone to implant</li> <li>2. Healing of alveolar soft tissue to implant</li> </ol> <p><b>Surface epithelium migration along the implant is stopped by direct bone-implant integration.</b></p> <ul style="list-style-type: none"> <li>- Can tip the scales and selectively <b>help bone integrate before soft tissue using <i>Guided Tissue Regeneration</i></b> <ul style="list-style-type: none"> <li>- <b>Woven membranes</b> can be added that have pore size for only O<sub>2</sub> and nutrients to reach bone beneath membrane but <b>prevents fibroblasts from crossing</b> -&gt; This excludes soft tissues</li> <li>- Well adapted abutments (component that extends through the oral mucosa) help as well <ul style="list-style-type: none"> <li>- <b>Epithelium stops migrating when it reaches titanium abutment</b>. Hemidesmosomal basal lamina system forms = ↑ strength of soft tissue attachment to implant abutment</li> </ul> </li> </ul> <p><b>Want to ↑ likelihood of bone integrating before the soft tissue around an implant screw, to do this we:</b></p> <ul style="list-style-type: none"> <li>- Keep short distance between bone and implant (<b>precise implant fit</b>)</li> <li>- Ensure viable bone at or near the surface of the bone along the implant (<b>minimize bone damage</b>)</li> <li>- Have <b>no movement of the implant while bone is attaching</b></li> <li>- Implant surface reasonably free of contamination by organic or inorganic materials</li> </ul>  </li></ul>

	<p><b>Limit heat production to avoid damaging bone:</b></p> <ul style="list-style-type: none"> <li>- Use sharp bone cutting instruments</li> <li>- Limit cutting speeds to ↓ friction</li> <li>- Use irrigation to keep bone cool</li> </ul>	<p><b>Limit forces on implant:</b></p> <ul style="list-style-type: none"> <li>- Countersinking implant and low profile implants ↓ forces</li> <li>- Cover implant with gingiva during healing (not all the time though, depends)</li> </ul>
	<p>Implant is covered with a thin layer of <u>titanium oxide</u> -&gt; This layer <b>stabilizes the surface</b> and is the layer that the bone osseointegrates with</p> <p>Once initial integration has occurred, limited daily pressure (1mm of strain) on the implant will ↑ <b>cortical bone deposition</b></p> 	

## Facial Neuropathy of Traumatic Origin

Occasionally happens w. facial fractures, Tx of impacted teeth, Tx of pathological conditions, or reconstructive surgery

**Most commonly injured branches of Trigeminal Nerve are:**

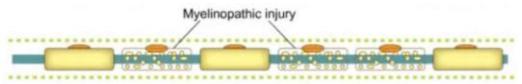
- Inferior Alveolar-Mental nerve
- Lingual Nerve

**IAN Damage caused by:**

- Mandibular fractures
- Preprosthetic surgical procedure
- Sagittal split osteotomy surgery
- Mandibular resection for oral neoplasms
- Removal of impacted lower wissey's

	<p><b>Neuropraxia</b></p> <p>Injury to nerve that causes <b>no loss of continuity of axon</b></p> <ul style="list-style-type: none"> <li>- Compressed nerves</li> <li>- Blunt trauma</li> <li>- Inflammation around a nerve</li> <li>- Local ischemia</li> </ul> <p><b>Full recovery w/i days to weeks</b></p>
	<p><b>Axonotmesis</b></p> <p>Injury to nerve causing <b>loss of axonal continuity but preserving endoneurium</b></p> <ul style="list-style-type: none"> <li>- Overly aggressive retraction of mental nerve</li> <li>- Severe blunt trauma</li> <li>- Nerve crushing</li> </ul> <p><b>Possible recovery in 2-6 months</b></p>
	<p><b>Neurotmesis</b></p> <p>Injury to nerve <b>causing loss of continuity to both axonal and endoneurium</b></p> <ul style="list-style-type: none"> <li>- Cutting IAN during removal of impacted Wisdom Tooth</li> <li>- Badly displaced fractures</li> </ul> <p><b>Poor prognosis for recovery</b> (unless ends are approximated and properly oriented)</p>

## Nerve Healing

<b>Nerve Healing</b>	
<p><b>Phase 1:</b></p> <ul style="list-style-type: none"> <li>- <b>Degeneration</b></li> </ul> <p><b>Segmental Degeneration</b></p> <ul style="list-style-type: none"> <li>- Myelin sheath dissolves in isolated segments -&gt; slowing of conduction velocity or fully stop transmission</li> <li>- Axon is spared</li> </ul> <p><b>Symptoms:</b></p> <ul style="list-style-type: none"> <li>- <b>Paresthesia</b> (Altered sensation, not painful)</li> <li>- <b>Dysaesthesia</b> (Altered sensation, uncomfortable)</li> <li>- <b>Hyperesthesia</b> (↑ sensitivity to stim.)</li> <li>- <b>Hypoesthesia</b> (↓ sensitivity to stim.)</li> </ul> <p><b>Wallerian Degeneration</b></p> <ul style="list-style-type: none"> <li>- Axons AND myelin sheath <b>distal to interruption site undergo full disintegration</b></li> <li>- Some degen. Proximal to the injury towards the CNS can degenerate (but mostly downstream)</li> </ul>	
<p><b>Phase 2:</b></p> <ul style="list-style-type: none"> <li>- <b>Regeneration</b></li> </ul> <p>Begins almost immediately after injury</p> <ul style="list-style-type: none"> <li>- Proximal nerve stump sends out <b>new fibers that grow down the remnant Schwann cell tube</b>.</li> <li>- Growth at 1-1.5mm/day until innervation site is reached (or growth is blocked by fibrous tissue or bone)</li> <li>- <b>New myelin sheath grows as axons ↑ diameter</b></li> <li>- As axons make contact with innervation site Paresthesia or Dysaesthesia can be experienced (burning pain frequently) -&gt; This is a positive sign for healing</li> </ul>	

# Prescription Writing

## Compounding

= Preparation, mixing, assembling, packaging or labeling of a drug as a result of a practitioner's Prescription Drug Order AND for the purpose of research, teaching, analysis or based on regularly observed ordering patterns.

### Gin and Tonic Example:

- Soda is the delivery medium for the prescribed medication -> Can be mixed with 1, 2, 3, 4, etc shots of Gin (the medicament) and/or with lime juice, cucumbers etc as modifiers or adjuvants

### LA Example

- Adding bicarbonate to LA cartridge -> ↑ pH of fluid and makes it less painful on injecting

## Format

<b>Heading</b>	Dr Demographics: - Name, Address, Age, Phone Number Pt demographics - Name, Address, Age, Phone number Rx Date
<b>Body</b>	Symbol "Rx" Name + Dosage form of drug Quantity dispensed (write the number fully, it's easy to add 0's) Directions to the Pt
<b>Closing</b>	Prescribers Signature College ID Number Refill Instructions

\*\* Try to not use abbreviations -> They can be misread by Pt and pharmacists if you have messy writing (which you probably do unless you are Kelsey)\*\*

- Be clear in directions: Write "Take every 8 hours" instead of "3 times a day" where patients might take all 3 doses at once and call it done like a pleb

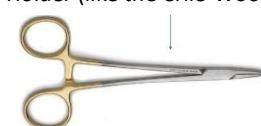
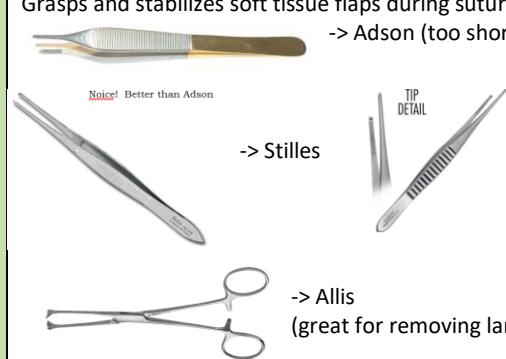
<b>Antibiotic Prophylaxis</b> <b>(no Penicillin allergy)</b>  Rx: Amoxicillin 500mg Caps  Disp: Four (4) capsules  Sig: Take 4 capsules orally 1 hr before dental procedure	<b>Antibiotic Prophylaxis</b> <b>(Penicillin allergy)</b>  Rx: Clindamycin 300mg Caps  Disp: Two (2) capsules  Sig: Take 2 capsules orally 1 hr before dental procedure. Recommend to take with probiotic yogurt
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\*\* If patient needing prophylaxis is coming back within a month, cannot Rx Amoxicillin again (worries about resistance) -> Give clindamycin for the next prophylaxis antibiotic\*\*

The University of British Columbia Faculty of Dentistry Vancouver, B.C.
Phone: 822-8005      Date: Today's Date
Name: _____ Patient's Name      Age: _____ Patient's Age
Address: _____ Patient's Home Address
RX
1. penicillin 300mg tab Dispense: 28 tabs Sig: Take 1 tab orally every 6 hours until finish
2. ketorolac 10mg tab Dispense: 8 tabs Sig: Take 1 tab every 6 hours prn pain, maximum 4 tabs (40mg) per day
Student: _____ Your Name & Phone Number
Faculty Signature: _____ Your Instructor's Signature
Print First Initial & Last Name: _____ Your Instructor's Name
College # _____ Your Instructor's Registration Number

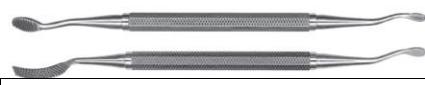
Drug Class	Generic Names	Common Trade Names	Common Dosage Forms	Common Quantity	Common Instructions *	Prescription?	Special Considerations
Analgesics	acetaminophen	Tylenol	regular strength = 325mg tab  Extra strength = 500mg tab		1 or 2 tabs orally every 4-6 hour, do not exceed 4000 mg per day	no	
	ibuprofen	Advil, Motrin	regular strength = 200mg tab  extra strength = 400mg tab prescription strength = 600mg tab		1 or 2 tabs orally every 4-6 hour, do not exceed 2400 mg per day	no	
	ketorolac	Toradol	10 mg tab		one tab orally every 6 hr prn pain, max 40 mg per day	yes	
	naproxen	Naprosyn	tablets: 250mg, 537mg, 500mg		250mg orally every 6-8 hours	yes	
		Tylenol #3	acetaminophen 300mg, caffeine 15mg, codeine 30mg		1-2 tabs orally every 4-6 hr prn pain	yes	
		Empracet-30	acetaminophen 300mg, codeine 30mg		1-2 tabs orally every 4-6 hr prn pain	yes	written Rx only, cannot phone in; does not require a duplicate Rx; no refills allowed; for patients who cannot tolerate caffeine in T#3
	codeine phosphate		30 mg tab		1-2 tabs orally every 4-6 hr prn pain	yes (duplicate)	duplicate Rx expires 5 days after the date written, e.g. if the Rx is dated on March 3, 2019, it expires on March 9, 2019 at 00:00 hours
	oxycocet	Percocet	oxycodone 5mg, acetaminophen 325 mg		1 tab orally every 6 hours prn pain	yes (duplicate)	duplicate Rx expires 5 days after the date written, e.g. if the Rx is dated on March 3, 2019, it expires on March 9, 2019 at 00:00 hours
		Percodan	oxycodone 5mg, ASA 325 mg		1 tab orally every 6 hours prn pain	yes (duplicate)	duplicate Rx expires 5 days after the date written, e.g. if the Rx is dated on March 3, 2019, it expires on March 9, 2019 at 00:00 hours
Antibiotics	penicillin		300mg tabs	7 days (28 tabs)	1 tab orally every 6 hours until finish	yes	if you want a loading dose, add one extra pill and ask the patient to: take 2 caps STAT, then, 1 cap po every 6 hours until finish
	amoxicillin	Amoxil	regular capsules: 250mg & 500mg  chewable tabs in 125mg & 250mg  liquid in 125mg/5mL or 250mg/5mL	7 days	adult infection: 250mg or 500mg orally every 8 hr until finish	yes	
				7 days	adult prophylaxis: 2g orally 1 hour prior to dental procedures  paedo infection: 20-40 mg/kg/day (divide dosage into every 8 hours)  paedo prophylaxis: 50mg/kg 1hr prior to dental procedures	yes  yes  yes	you need to do the calculations for the pharmacists; do not exceed adult dose  you need to do the calculations for the pharmacists; do not exceed adult dose (2g)
	clindamycin		150mg or 300mg caps	7 days	adult infection: 150mg or 300mg orally every 6 hours until finish  adult prophylaxis (allergic to pen): 600mg orally 1 hour prior to dental procedures	yes  yes	if you want a loading dose, add one pill and ask the patient to: take 2 caps po STAT, then 1 cap every 6 hours until finish
					pedo prophylaxis (allergic to pen): 20mg/kg 1hr prior to dental procedures	yes	you need to do the calculations for the pharmacists; do not exceed adult dose (2g)
	metronidazole		250mg tabs	7 days	adult infection: 250mg or 500mg orally every 8 hr until finished		usually add to pen/amoxicillin for treating anaerobic bacterial infections; no alcohol!
Antifungals	nystatin		oral suspension 100,000 units/mL	7-14 days	squish and spit with 5mL solution QID for 7 days	yes	Calculate the volume you need; some prescribers may choose squish and swallow instead
	clotrimazole		10 mg lozenges	14 days	dissolve by mouth 5 lozenges a day for 14 days	yes	Available at a compounding pharmacy
Mouthwash	chlorhexidine	Peridex	0.12%, 475mL bottle	1-2 weeks	rinse with 15mL for 30 sec, 2 times/day	yes	
Anti-inflammatory	dexamethasone	Decadron	4mg tab	2-3 days	take 1 tab every 12 hours for 3 days	Yes	
	dexamethasone oral rinse	Decadron	0.4 mg/mL	4-5 days	Hold 5 mL in mouth TID for 3 minutes before meals	yes	Dispense 250 mL

# Instruments

Begin surgery by making your incisions:						
<b>Scalpel</b>	 <ul style="list-style-type: none"> <li>-&gt; #12</li> <li>-&gt; #11</li> <li>-&gt; #15</li> </ul> <p>- #15 is most common - #11 used for small stab incisions (draining abscess) - #12 useful for mucogingival procedures w/ incisions in Max. tuberosity or posterior of teeth</p>	<b>Scalpel Handles</b>	 <p>#3 #5 #7</p> <p>Dr. Matthew loves the #5 **Place scalpel blade on/off the handle using a a Needle Holder (like the Crile-Wood)</p> 			
Now you need to elevate the mucoperiosteum						
<ul style="list-style-type: none"> <li>Ideally you should reflect the periosteum from the cortical bone in 1 layer</li> </ul>						
<b>Periosteal Elevator</b> – Molt #9	<p>Detach Periosteum from bone/neck of tooth</p>  <p>Pointed end: begin the periosteal reflection and reflect papillae from between the teeth</p> <ul style="list-style-type: none"> <li>- Twisting, prying motion</li> </ul> <p>Rounded End: Continue the elevation of periosteum from bone</p> <ul style="list-style-type: none"> <li>- Push stroke inserts broad end under periosteum (Pull strokes tent to shred/tear)</li> </ul>					
Retract the soft tissue back so you can see what's going on						
<ul style="list-style-type: none"> <li>Austin and Minnesota are the 2 most popular</li> </ul>						
<b>Tissue Retractor</b> (Austin, Senn, Selden) Minnesota works too	<p>Deflect and retract periosteum from bone</p>  <p>-&gt; Austin -&gt; Senn -&gt; Selden (not awesome)....SEDOMLY used hehehe</p>					
<b>Tongue and Cheek Retractor</b> (Minnesota, Shuman, Weider, Mirror)	<p>Hold back tongue and cheek away from surgical site</p>  <p>-&gt; Minnesota -&gt; Shuman -&gt; Weider (AKA: The Sweetheart) - Used for tongue only, and only use child size (adult size can cause bruising of the FOM)</p>		 <p>Mouth mirror</p>			
So you have done some things and now you need to grasp some tissue						
<b>Tissue Forceps</b> (Adson, Allis, Stilles, Gillies)	<p>Grasps and stabilizes soft tissue flaps during suturing and reconstructive procedures</p>  <p>-&gt; Adson (too short for mouth) -&gt; BAD BOIS <small>Note: Better than Adson</small> -&gt; Stilles -&gt; Allis (great for removing large tissue, but causes lots of destruction)</p>					

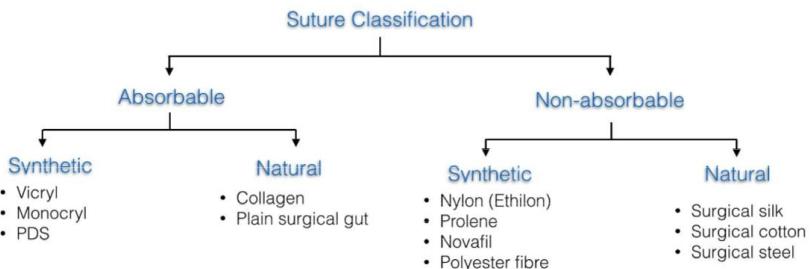
<p style="text-align: center;"><i>Shit...your patient is bleeding....</i></p> <p>- Usually pressure on the wound does the trick -&gt; but if it doesn't, grab one of these</p>	
<b>Curved Haemostat</b>	 <p>Securely hold small items, clamp blood vessels, remove small pieces of tooth/bone</p>
<b>Surgicel</b>	 <p><b>Oxidized Cellulose membranes</b> Absorbs 7 – 10 times its own weight.</p> <ul style="list-style-type: none"> <li>- Can be packed into the socket (Gelfoam becomes friable when wet and cannot be packed)</li> </ul> <p><b>MOA:</b></p> <ul style="list-style-type: none"> <li>- Act in the intrinsic pathway -&gt; contact activation and platelet activation and, as absorbed, a gelatinous mass is formed, aiding in clot formation</li> </ul>
<b>Gelfoam</b>	 <p><b>Porcine-derived collagen</b> that is whipped into foam and then dried -&gt; <b>Gelatin</b></p> <ul style="list-style-type: none"> <li>- It is available in sponge and powder forms and may be used as a stand alone or in combination with topical thrombin.</li> </ul> <p>Absorbs the blood up to 40 times its weight and expands to 200% of its initial dimensions.</p> <ul style="list-style-type: none"> <li>- Potential for 'overswelling' when used within small spaces, potentially causing damage. For this reason, it is not used intravascularly</li> </ul> <p>Can apply Thrombin to the sponge for more direct clotting action -&gt; skips the clotting cascade and converts fibrinogen to fibrin directly</p>
<b>Collagen</b>	 <ul style="list-style-type: none"> <li>- Derived from bovine skin.</li> </ul> <p><b>MOA:</b></p> <p>Bind tightly to blood surfaces to provide a matrix for clot formation and strengthening, as well as enhancement of platelet aggregation, degranulation and release of clotting factors = further promoting clot formation.</p>

## Removing Bone

<b>Rongeurs (Side Cutting, End Cutting)</b>	Cut and contour bone -> Remove sharp edges of alveolar crest and remove exostoses
<b>Bone Chisel and Mallet</b>	<p><b>Side Cutting</b></p>  <p><b>End Cutting</b></p>  <p>-&gt; Double action Rongeurs have 2 hinges, but when you are using them in the posterior you can nip the lips or tongue and leave a nasty wound</p> <p><b>*NEVER use your rongeurs to remove large chunks of bone or for extracting teeth -&gt; Dulls and destroys them*</b></p>
<b>Burs and Handpieces</b>	<p>Best = High speed, high torque w/ sharp carbide burs</p> <ul style="list-style-type: none"> <li>- FG1702S 😊</li> <li>- DON'T use restorative burs, they suck for this</li> </ul> <p><b>Handpiece Requirements:</b></p> <ol style="list-style-type: none"> <li>1. Completely sterilisable</li> <li>2. High speed and torque</li> <li>3. NO exhausting air into operative field (normal restorative handpiece is bad for this) <ul style="list-style-type: none"> <li>- Air exhausted into wound can be forced into deeper tissue and produce <b>Tissue Emphysema</b></li> </ul> </li> </ol> 
<b>Bone File (Straight or cross cut or curved)</b>	<p>Smooth bone for better contour of alveolar ridge (after rongeur)</p>  <ul style="list-style-type: none"> <li>- Usually double ended (small + large end)</li> <li>- Cannot efficiently remove lots of bone</li> <li>- <b>Effective stroke is the pull -&gt; Don't push</b> (will burnish and crush)</li> </ul>
<b>Curette</b>	<p>Used for removing soft tissue from bony cavities -&gt; Granulomas or small cysts</p>  <ul style="list-style-type: none"> <li>-&gt; Angled</li> <li>-&gt; Molt</li> </ul>

## Suturing Soft Tissue

<b>Needle Drivers</b> <b>(Crile wood is best for surgery)</b>	<p>Holds Suture Needle -&gt; Like hemostat, but with concave area inside each beak</p> <ul style="list-style-type: none"> <li>- Beaks are shorter + stronger than hemostat and crosshatched texture helps grip the needle... <b>NEVER USE THE HEMOSTAT FOR THIS</b></li> </ul>  <p>These are the Castroviejo, they are garbage</p>  <p>Crile-Wood is good!</p>
<b>Suture Needle</b>	 <ul style="list-style-type: none"> <li>- Comes as small <b>½ circle or 3/8 needles</b> -&gt; Curve helps it pass through tight spaces</li> <li>- Triangular tips make them cutting needles -&gt; Passes through tissue easier (<b>cutting portion is 1/3<sup>rd</sup> the length of the needle</b>)</li> </ul>
<b>Sutures</b>	<p>Lots of materials are available, classified based on:</p> <ul style="list-style-type: none"> <li>- <b>Diameter</b> (designated by series of O's) -&gt; 3-0 (Three O) is good for oral mucosa</li> <li>- <b>Resorbability</b> <ul style="list-style-type: none"> <li>- Gut (from sheep intestines) resobs quick (<b>3-5 days</b>)</li> <li>- Chromic Gut (coated in chromic acid) = <b>7-10 days</b> to resorb + ↑ handling</li> <li>- Synthetic resorbable (Polyglycolic) = <b>4 weeks to resorb</b> -&gt; Vicryl Rapide resobs in <b>2 weeks</b> 😊</li> <li>- PTFE Cytoplast (Gore-Tex) is best synthetic <b>Non-resorbable</b></li> </ul> </li> <li>- <b>Monofilament or polyfilament</b> <ul style="list-style-type: none"> <li>- Mono: Nylon (Ethilon), Monocryl, Plain Gut, Chromic Gut, PTFE. <b>No wicking</b> 😊</li> <li>- Poly: Silk, polyglycolic acid, Polylactic acid. Braided together, easy to tie BUT <b>wicking</b> oral fluids/bacteria into underlying tissues 😞</li> </ul> </li> </ul>
<b>Scissors</b>	<p>Short cutting edges</p> <ul style="list-style-type: none"> <li>- Dean Scissors have slightly curved handle (for no real reason)</li> </ul> 



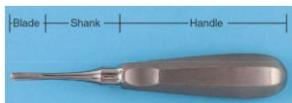
## Misc Items that you also need

<b>Mouth Prop</b>	 <p>Supports the mandible to prevent undue stress on the TMJ</p> <ul style="list-style-type: none"> <li>- <b>Only use child size even on adults!</b></li> </ul>
<b>Molt Mouth Prop</b>	<p>This can be used if you need the mouth to open wider -&gt; it sucks though, super slippery</p> <ul style="list-style-type: none"> <li>- Ratchet type action -&gt; <b>Can really fuck up the TMJ though! Caution</b></li> </ul> 
<b>Suctioning</b> <b>- Coupland, Fraser, Yankauer</b>	<p>Have smaller orifices for ↑ fluid evacuation from surgical site</p>  <p>-&gt; <b>Coupland</b> - if gets clogged, reverse it and it will be fixed</p>  <p>-&gt; <b>Fraser</b> - There is a hole in the handle. Cover it for ↑ fluid suction during hard tissue cutting. Open hole to prevent soft tissue injury</p>  <p>-&gt; <b>Yankauer</b> - Disposable is best! The replacement tips of the non-disposable can come loose and fall into Pt's throat...  - Usually just used to clear deep in the throat for pt's under GA</p>

Towel Clip		Used to hold the towel draped around the Pt -> Be VERY careful to not pinch the skin under the towel
Irrigation		Can use sterile water or saline -> Cools bur and prevents bone damaging heat. Also lubricates and washes away cut tissue for ↑ efficiency -> Use monojet to thoroughly irrigate under flap

## Extracting Teeth

Elevators have Blade, Shank and Handle

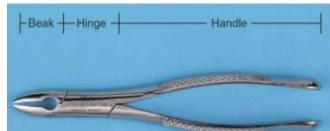


- Usually handle has good girth to it to be comfy but allow controlled force
- Shank connects the handle to the working end
- Blade – Working tip. Transmits force to the tooth or bone

There are 3 General types of elevators:

<b>Straight</b> - 301, 77R, 34S - Miller, Potts	301 = most common elevator 77R and 34S are nice also with a little curve 😊  Angled shanks allow the use in more posterior areas - Miller and Potts elevator	
<b>Triangular</b> - Worrack James - Cryer	Useful when broken tooth remains in the socket, and the adjacent socket is empty “Cryer” is AKA “East-West Elevator” **Very Important to use a “Wheel-Axle” motion to elevate the root tips. Don’t fulcrum the shank off the bone -> This is a Class 1 lever and will break your patients shit	
<b>Pick</b> - Crane Pick - Double Ended	Used to remove roots -> Usually have to drill a hole with a bur to create a purchase point (3mm into root) - Using buccal plate as a fulcrum, insert the tip into the purchase point and elevate  	 -> Very delicate movements. Don't use like a Cryer or Crane with Wheel-Axle movements
<b>Periotome</b> (BONUS, he is a mad man!)	Used to extract teeth while preserving the anatomy of the socket -> Sever the periodontal ligament of the tooth - Tip inserted into periodontal ligament and pushed apically 2-3mm. Remove and repeat in the adjacent area. Work around the tooth gradually going deeper and deeper each round	

## Extraction Forceps



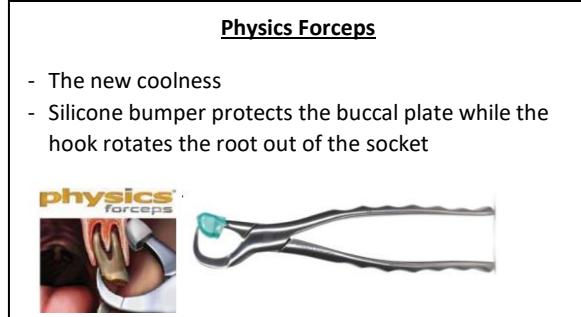
- Beaks are designed to adapt to the tooth root near the CEJ. NOT the crown

53R, 210S	53R	150	1	1	150	53	53 , 210S
18	17	16	15	14	13	12	21
48	47	46	45	44	43	42	41
21, 73	21, 73, 86, 87	151, 74		151, 74	21, 73, 86, 87	21, 73	

Maxillary Forceps			Mandibular Forceps		
#1 (Max. Anteriors + Canines)			#74 Ash (Man. Root Tips and anteriors)		
#150 (Max. Anteriors and Premolars)	Universal (R +L)		#151 (Man. Anteriors + Premolars)	(Universal R+L)	
#53 R/L (Right Max. Molars)	Round Beak contours lingual root Pointed back contours bifurcation of buccal roots  *#53 = straight handle*		#86/87 (Ma. 1 <sup>st</sup> + 2 <sup>nd</sup> molars)  #86 is English side action	- 86 English side action	
#88R/L (Max. 1 <sup>st</sup> and 2 <sup>nd</sup> molar)	Bayonet Beak Beak w/2 projections contours lingual root		#73 Ash (Man. Molars)		
#210 (Max. 3 <sup>rd</sup> Molars)	Universal (L + R)		#222 (Man. 3 <sup>rd</sup> Molars)		
#65 + #69 (Max. Overlapping Anteriors / Root Tips)	Very Narrow beaks  -> #69 doesn't have contra-angled head				

#### Pediatric Forceps

50S	1	1	150S
55	54	53	52 51 61 62 63 64 65
85	84	83	82 81 71 72 73 74 75
151S		151S	



Maxillary Forceps			Mandibular Forceps		
#1 (Max. Anteriors + Canines)			#151s (All mand)		
105s (Max. Posterior)			#16s (Mand. Posterior)	Peds cowhorns - Calf horns? :P	

## Tray Setup



### Featuring:

- LA Syringe + Needles + LA
- No. 9 Molt Periosteal elevator
- Periapical curette
- Small + Large elevator (301, etc)
- Curved Haemostat
- Towel Clip
- Minnesota Retractor
- Suction Tip
- 2x2 and 4x4 gauze
- The Required forceps -> Tissue and Extraction

## Professional Negligence and Informed Consent

Professional negligence = subset of general rules of negligence

### **3 elements of Negligence:**

1. Professional owes "a duty of care" to the claimant
2. Duty was breached
3. Breach caused loss or injury that should be compensated in damages

The Standard of Care = The care which a reasonable and prudent practitioner would do under the same or similar circumstances

- Once we graduate we are held to the same standard of care as someone 30 years into practice....be diligent!

Classic Dental Negligence Claims	
<b>Poor Craftsmanship</b>	<ul style="list-style-type: none"> <li>- Faulty crowns/bridges</li> <li>- Cuts to patients lips and tongue</li> <li>- Fractured root tips remaining after extraction</li> <li>- Chemical burns</li> </ul>
<b>Inattention to patient and/or records</b>	<ul style="list-style-type: none"> <li>- Extraction of wrong tooth</li> <li>- Failure to diagnose cavities and/or perio</li> <li>- Problems with TMJ</li> <li>- Paresthesia due to extrusion of endo sealers and medicaments</li> <li>- Failures from not obtaining a full Med Hx</li> </ul>
<b>Communication Breakdown</b>	<ul style="list-style-type: none"> <li>- Failure to obtain informed consent</li> <li>- Failure to inform patients about problems during procedures</li> </ul>
<b>Injuries because of treatment</b>	<ul style="list-style-type: none"> <li>- Infection after tooth removal</li> <li>- Aspiration of foreign objects dropped in mouth</li> </ul>
<b>Working out of our scope as generalists</b>	<ul style="list-style-type: none"> <li>- Failure to refer patients to specialists to obtain second opinions</li> <li>- Performing work outside of expertise</li> </ul>

## When a Problem Arises

Do's	Don'ts
<ul style="list-style-type: none"> <li>- Remain Calm</li> <li>- Notify your professional liability program immediately</li> <li>- Instruct staff not to speak with anyone about the incident</li> </ul>	<ul style="list-style-type: none"> <li>- Admit liability for the alleged error</li> <li>- Ignore it and assume it will go away</li> <li>- Contact a patient who has started a lawsuit against you</li> <li>- Talk to the Pt's lawyer -&gt; Refer them to your insurer or lawyer</li> <li>- Treat the patient after the suit begins (unless emergency)</li> <li>- Seek info about the patient from other providers</li> <li>- Give away original records</li> <li>- Alter the notes or add anything to patients record (Especially if it pertains to the legal action!)</li> </ul>

## Informed Consent

= Legal concept that is given by a patient to a doctor for Tx with full knowledge of the possible risks and benefits.

- Patient must be educated by dentist in order to make a reasonable choice
- Dentist is legally and ethically obligated to treat a patient within the limits of the consent provided -> May avoid liability and damages for battery if you can provide evidence of a valid consent

### Disclosure Standard

= Medical provider is required to disclose to the patient the nature of the proposed operation, its gravity, any material risks and any special or unusual risks attendant upon the operation

#### 3 Components:

- o Was the risk material unusual or special?
  - Unusual or Special= Rare, known to occur only occasionally -> in comparison to material risk these are less dangerous and not frequently encountered
  - Material = Subjective concerns and unique nature of each individual patient also determines materiality of a risk
  - Risks that are unlikely must still be explained to the patient if they have serious effects
  - Risks with minor effects must be explained as well if it will probably happen
- o Should the doctor have disclosed that risk?
- o Did the breach of the duty cause the plaintiff's damages?

#### Considerations for Materiality

- Inherent risks of Tx
- If the Tx consequences are serious
- Frequency of risk
- Information normally given to patients undergoing the same procedure
- Gravity of the patient's condition
- Importance of the benefit of the Tx
- Any need to encourage the patient to accept treatment
- Intellectual and emotional capacity of the patient
- Info the Doctor knows (or should know) that patient deems relevant to their decision in choosing treatment
- Evidence from the patient for the information they wanted to know before electing a certain Tx

### Examples

- The odds are 1/100,000 wisdom teeth extractions that a jaw fracture will occur
  - o Low risk = no warning is required
- If there is significant chance of a slight injury -> Risk is "material" and needs to be disclosed

### KEEP COMPLETE RECORDS

- Progress notes containing full and complete information show the judge that the patient was aware of his or her condition and is responsible for their choice to have the Tx provided

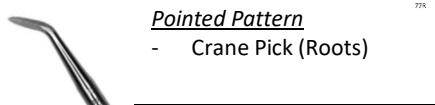
Dental Record includes	<ul style="list-style-type: none"><li>- Treatment Notes</li><li>- Emails</li><li>- Text Messages</li><li>- X-Rays</li><li>- Casts</li><li>- Study Models</li><li>- Tracings</li><li>- Molds</li><li>- Impressions</li><li>- Photographs made of the patient in the course of treatment</li></ul>
Things to Include in the Record	<ul style="list-style-type: none"><li>- Patients name and contact info</li><li>- Tx dates and missed appointments</li><li>- Up-to-date med and dent Hx</li><li>- Allergies and medications</li><li>- Chief Complaint</li><li>- Patient expectations</li><li>- Clinical findings and impressions</li><li>- Differential Dx</li><li>- Tx plan (including explanations given to patient)</li><li>- Informed consent notes and documents</li><li>- Notes regarding complications (known or suspected) and side effects from Tx or meds</li><li>- Recommendations or referrals</li><li>- Tx performed</li><li>- Consultation with referrals</li></ul>

# Principles of Routine Exodontia

<b>Indications</b>	<ul style="list-style-type: none"> <li>- Unrestorable caries           <ul style="list-style-type: none"> <li>- The crowns will be soft and easier to crumble, try to luxate as much as possible first</li> </ul> </li> <li>- Periodontal Disease           <ul style="list-style-type: none"> <li>- Easy to extract but ↑↑ bleeding</li> </ul> </li> <li>- Orthodontic reasons -&gt; Count the teeth! Make sure nothing has changed since last x-ray, if you fuck up the ortho plans will need to change</li> <li>- Failed Endo</li> <li>- Associated pathology (odontogenic cyst or neoplasm)</li> </ul>
<b>History</b>	<p><u>Important medical conditions to consider</u></p> <ul style="list-style-type: none"> <li>- <b>Hypertension</b> <ul style="list-style-type: none"> <li>- ↑ Bleeding</li> <li>- LA can ↑ BP further = risk of stroke!</li> </ul> </li> <li>- <b>Type 1 DM</b> <ul style="list-style-type: none"> <li>- ↑ infection risk</li> <li>- ↓ wound healing</li> <li>- Hypoglycemia risk</li> </ul> </li> <li>- <b>Bleeding Disorders</b> <ul style="list-style-type: none"> <li>- Know which kind</li> <li>- Obtain INR within 24 hours of surgery if you can</li> </ul> </li> <li>- <b>Anticoagulant drug Therapy</b> <ul style="list-style-type: none"> <li>- Warfarin (Get INR)</li> <li>- Pradaxa (Dabigatran) -&gt; Direct Thrombin inhibitor</li> <li>- Eliquis (Apixaban) -&gt; Reversible inhibition of factor Xa</li> <li>- Xarelto (Rivaroxaban) -&gt; Reversible inhibition of factor Xa           <ul style="list-style-type: none"> <li>- *These are taken for Atrial fib and stroke risk -&gt; Never stop these meds! They don't actually bleed THAT much*</li> </ul> </li> </ul> </li> <li>- <b>Immunosuppressant Drug therapy</b> <ul style="list-style-type: none"> <li>- Consider Ab. Post surgery to compensate for immune compromise</li> </ul> </li> <li>- <b>Co-existing cardiac disease, Prosthetic heart valve</b> <ul style="list-style-type: none"> <li>- Follow Prophylactic Endocarditis protocols</li> </ul> </li> <li>- <b>Bisphosphonates</b> <ul style="list-style-type: none"> <li>- Risk of ONJ -&gt; Mostly with oral meds if taken for 3 years</li> <li>- Give Ab and CHX a few days prior to surgery -&gt; Try to ↓ bacterial load to ↑ chance of healing</li> </ul> </li> </ul> <p><u>Important things to Inquire about:</u></p> <ul style="list-style-type: none"> <li>- Previous anesthesia issues or difficulties</li> <li>- Previous Extraction difficulties</li> <li>- Post-Op bleeding problems</li> <li>- Pre and Post-op. Infection problems</li> </ul>
<b>Radiographs</b>	<ul style="list-style-type: none"> <li>- If X-ray older than 1 yr = Retake</li> <li>- Must include a Pan (can miss things with PA)</li> </ul> <p><u>Things that make you happy to see</u></p> <ul style="list-style-type: none"> <li>- Single root configuration (conical with nice broad apex)</li> <li>- Well-defined Periodontal Space (lamina dura) -&gt; No ankylosis 😊</li> <li>- Loss of alveolar bone height (Advanced Periodontal disease) -&gt; Loose teeth!</li> </ul> <p><u>Things you are sad to see</u></p> <ul style="list-style-type: none"> <li>- Hypercementosis</li> <li>- Root Resorption</li> <li>- Submergence and ankylosis</li> <li>- Impaction and Ankylosis</li> <li>- Complex tooth formation (Large mega teeth)</li> <li>- Erosion</li> <li>- Critical anatomical structures in close proximity</li> </ul>
<b>Patient Assessment</b>	<p><u>Level of Cooperation</u></p> <ul style="list-style-type: none"> <li>- Mental status</li> <li>- Physical Status</li> <li>- Patient's previous experience</li> <li>- Patient's apprehension and confidence in your abilities</li> <li>- Anesthesia options (Local, Nitrous, Oral sedation, IV sedation, GA)</li> </ul> <p><b>**Must display quiet unhurried confidence**</b></p>
<b>Clinical Examination</b>	<p><u>General Build</u></p> <ul style="list-style-type: none"> <li>- Ethnic variations in bone densities -&gt; African descent = THICCCCC bone</li> <li>- &gt; 50 yrs old also dense bone and strong PDL attachment (Surgical extraction typically needed)</li> </ul> <p><u>Bone Structure</u></p> <ul style="list-style-type: none"> <li>- Older Patients may have brittle tooth roots within dense sclerotic bone -&gt; Root will break before buccal plate flexes</li> </ul> <p><u>Mouth Opening</u></p> <ul style="list-style-type: none"> <li>- Tough access in children/adults with small mouths and in patients with TMJ, Infection or collagen disorders</li> </ul>

Pain and Anxiety Control	<p><b>Pain Control</b></p> <ul style="list-style-type: none"> <li>- Obviously essential to freeze teeth and soft tissues</li> <li>- Apprehension may ↑ perception of pain (Pain vs Pressure)</li> </ul> <p><b>Pre-Extraction Analgesia</b></p> <ul style="list-style-type: none"> <li>- 800mg x 1 Ibuprofen (Max dose 3200mg/day) q4h</li> <li>- 500mg x 2 Acetaminophen (Max 4000mg/day) q4h</li> </ul> <p><b>Anxiety Control</b></p> <ul style="list-style-type: none"> <li>- Confidence is key!</li> <li>- Sedation Options: <ul style="list-style-type: none"> <li>- Oral Sedation (Triazolam, Lorazepam) -&gt; Tiazolam is best (1/2 life = 3-6hrs), place sublingual for fast absorption</li> <li>- Nitrous Oxide,</li> <li>- IV Sedation (Mild, Moderate, Deep) -&gt; Medazolam Fentanyl</li> </ul> </li> <li>- General Anesthesia</li> </ul>	<table border="1"> <thead> <tr> <th>Initial technique</th><th>Plus</th><th>Supplemented if necessary by</th></tr> </thead> <tbody> <tr> <td colspan="3"><b>MAXILLA</b></td></tr> <tr> <td>Incisor</td><td>Labial infiltration</td><td>incisive nerve block Periodontal ligament (PDL)</td></tr> <tr> <td>Canine/premolar</td><td>Buccal infiltration</td><td>Greater palatine nerve block Palatal infiltration</td></tr> <tr> <td>1<sup>st</sup> molar</td><td>Buccal infiltration over both buccal apices</td><td>Greater palatine nerve block Palatal infiltration</td></tr> <tr> <td>2<sup>nd</sup> and 3<sup>rd</sup> molars</td><td>Buccal infiltration</td><td>Greater palatine nerve block</td></tr> <tr> <td colspan="3"><b>MANDIBLE</b></td></tr> <tr> <td>Incisor</td><td>Mental nerve block</td><td>Lingual infiltration</td></tr> <tr> <td>Or</td><td></td><td>PDL</td></tr> <tr> <td>Incisor</td><td>Inferior alveolar nerve block</td><td>Buccal/lingual infiltration *</td></tr> <tr> <td>Canine/premolar</td><td>Mental nerve block Inferior alveolar nerve block</td><td>PDL</td></tr> <tr> <td>Molar</td><td>Inferior alveolar nerve block</td><td>Long buccal nerve block</td></tr> <tr> <td colspan="3"></td></tr> </tbody> </table> <ul style="list-style-type: none"> <li>④ 2% lidocaine with 1:100,000 epi <ul style="list-style-type: none"> <li>• 5mg/kg</li> <li>• 10 cartridges for an adult ~70 kg patient</li> <li>• 3 cartridges for a child ~ 20 kg</li> </ul> </li> <li>⑤ 3% mepivacaine plain <ul style="list-style-type: none"> <li>• 5mg/kg</li> <li>• 6 cartridges for an adult ~70 kg patient</li> <li>• 2 cartridges for a child ~ 20 kg</li> </ul> </li> <li>⑥ 4% Articaine with 1:100,000 epi <ul style="list-style-type: none"> <li>• 7mg/kg</li> <li>• 6 cartridges for an adult ~70 kg patient</li> <li>• 1.5 cartridges for a child ~ 20 kg</li> </ul> </li> </ul>	Initial technique	Plus	Supplemented if necessary by	<b>MAXILLA</b>			Incisor	Labial infiltration	incisive nerve block Periodontal ligament (PDL)	Canine/premolar	Buccal infiltration	Greater palatine nerve block Palatal infiltration	1 <sup>st</sup> molar	Buccal infiltration over both buccal apices	Greater palatine nerve block Palatal infiltration	2 <sup>nd</sup> and 3 <sup>rd</sup> molars	Buccal infiltration	Greater palatine nerve block	<b>MANDIBLE</b>			Incisor	Mental nerve block	Lingual infiltration	Or		PDL	Incisor	Inferior alveolar nerve block	Buccal/lingual infiltration *	Canine/premolar	Mental nerve block Inferior alveolar nerve block	PDL	Molar	Inferior alveolar nerve block	Long buccal nerve block			
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## Instrumentation for Simple Exodontia

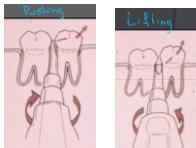
Mouth Mirror/Retractors	   																																
Dental Probe	I hope you know what this is...																																
Gauze	Also this <ul style="list-style-type: none"> <li>- Create a throat pack (with 4x4) to protect the airway from fragments that might fall in</li> </ul> 																																
Bite Blocks/Molt Mouth Prop	**Child Bite blocks only!** <ul style="list-style-type: none"> <li>- Allows for a relaxing pain-free opening</li> <li>↓ Stress on TMJ and muscles</li> </ul> 																																
Periosteal Elevator	Molt #9 is king																																
Dental Elevator	   <p><u>Straight Pattern</u> - #301</p> <p><u>Curved Pattern</u> - #77R, or Potts</p> <p><u>Pointed Pattern</u> - Crane Pick (Roots)</p> <p><u>Triangular Pattern</u> - Cryer</p>																																
Extraction Forceps	<p>This Again...</p> <p><b>Maxillary:</b></p> <ul style="list-style-type: none"> <li>- Upper Universal = 150</li> <li>- Max. Molars = 53R and 53L</li> </ul> <p><b>Mandibular:</b></p> <ul style="list-style-type: none"> <li>- Lower Universal = 151</li> <li>- Ash Forceps or English -Style Side action</li> </ul> <table border="1"> <tr> <td>53R, 210S</td><td>53R</td><td>150</td><td>1</td><td>1</td><td>150</td><td>53</td><td>53 , 210S</td> </tr> <tr> <td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>21</td> </tr> <tr> <td>48</td><td>47</td><td>46</td><td>45</td><td>44</td><td>43</td><td>42</td><td>41</td> </tr> <tr> <td>21, 73</td><td>21, 73, 86, 87</td><td>151, 74</td><td>151, 74</td><td>151, 74</td><td>21, 73, 86, 87</td><td>21, 73</td><td></td> </tr> </table>	53R, 210S	53R	150	1	1	150	53	53 , 210S	18	17	16	15	14	13	12	21	48	47	46	45	44	43	42	41	21, 73	21, 73, 86, 87	151, 74	151, 74	151, 74	21, 73, 86, 87	21, 73	
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	<ul style="list-style-type: none"> <li>- Cowhorn = 23</li> </ul>
<b>Periostomes</b>	<p>These are very thin fins that you insert gently between the tooth and the bony socket in order to separate the periodontal ligament fibers -&gt; Makes it much easier to extract the tooth after</p> 

## Surgical Ergonomics

<b>Chair Position</b>	<p><b>Maxillary Extractions</b></p> <ul style="list-style-type: none"> <li>- Chair back so the occlusal plane is ~ 60° to the floor</li> <li>- Chair should be high enough for patients' mouth to be just below elbow height</li> <li>- Turn patients head towards you</li> </ul> <p><b>Mandibular Extractions</b></p> <ul style="list-style-type: none"> <li>- Patient more upright (vs max.)</li> <li>- Occlusal plane parallel to the floor</li> <li>- Turn patients head towards you</li> </ul> <p><b>The Old Mandibular Reach Around (posterior approach)</b></p> <ul style="list-style-type: none"> <li>- Surgeon stands behind pt. -&gt; allows left hand to support the mandible</li> <li>- Hold the forceps "underhand"</li> </ul>	
<b>Stance/Posture</b>	<ul style="list-style-type: none"> <li>- Arms should be close to your sides -&gt; Keep those shoulders and elbows down</li> <li>- Wrists straight -&gt; Allows the force to be delivered with the arms and shoulders (not the hands and fingers)</li> <li>- No leaning</li> </ul>	

## Mechanical Principles

<b>Elevators</b>	Lifting and Pushing 	Wedging (Placing into the PDL space to displace the tooth out) 
<b>Forceps</b>	 Wedging <ul style="list-style-type: none"> <li>- Narrow tips are pushed apically (into PDL space) -&gt; Expands the bony crest and displaces the tooth occlusally</li> </ul>	<p><b>Forces used to Mobilize a Tooth</b></p> <ol style="list-style-type: none"> <li>1. <b>Apical Pressure</b> -&gt; Breaks the Periodontal Seal</li> <li>2. Forces to break Periodontal Fibers -&gt; <b>Buccal Force</b> (Expands the buccal Plate), <b>Lingual Force</b> (Expands Lingual Crest), <b>Rotational Force</b> (Overall expansion of the socket) <ul style="list-style-type: none"> <li>- Be careful with the B and L forces: Tooth rotates along a central axis, so when you pull the tooth buccally the root pushes lingually (and vice versa) -&gt; If you go too hard you can snap the root</li> </ul> </li> <li>3. <b>Traction force</b> -&gt; Delivers the tooth out of the socket</li> </ol> 

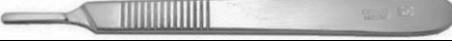
<u>Indications for Leaving Root Tips</u>
<ul style="list-style-type: none"> <li>- ↑ risk of displacing root into anatomical space</li> <li>- High risk of adjacent nerve or vessel injury</li> <li>- Patient is over it</li> <li>- The risk of taking it out weighs the risk of leaving it in</li> <li>- &lt;5mm in size</li> </ul>

# Principles of Complex Extractions

Progress Notes	
- Always follow the complete SOAP w/ Dr. Choi (Especially the "A")	
<b>S – Subjective</b>	<ul style="list-style-type: none"> <li>- Chief Complaint</li> <li>- Symptoms</li> <li>- Duration of complaint</li> </ul>
<b>O – Objective</b>	<ul style="list-style-type: none"> <li>- Exam Findings (Clinical, perio, endo etc)</li> <li>- Studies (X-rays, CBCT, Vital)</li> </ul>
<b>A – Assessment</b>	<ul style="list-style-type: none"> <li>- Determines your <b>diagnosis</b> or differential</li> <li>- Based on the S and O findings</li> <li>- Guides your Tx Plan</li> <li>- <b>"Why"</b> you are going forward with extraction</li> </ul>
<b>P – Plan</b>	<ul style="list-style-type: none"> <li>- Proposed Tx Plan</li> <li>- Include Tx options</li> <li>- Risks and Benefits or proposed plans</li> </ul>
<b>T – Treatment</b>	<ul style="list-style-type: none"> <li>- Detailed account of Tx provided</li> <li>- Mentions Informed Consent obtained</li> <li>- Includes Instruments, Meds and techniques used</li> <li>- Post Op Instructions and Prescriptions</li> </ul>

<u>Indications for Exodontia</u>
<ul style="list-style-type: none"> <li>- Unrestorable caries and fractures</li> <li>- Periodontal Disease</li> <li>- Failed Endo therapy</li> <li>- Ortho Extractions or impacted teeth</li> <li>- Supernumerary Teeth</li> <li>- Associated pathology</li> <li>- Patient choice (sometimes this isn't the best one though)</li> <li>- Facial Trauma</li> <li>- Malignant oral neoplasia requiring extractions (before radiation or chemo)</li> </ul>

## Instrumentation for Complex Exo

Everything needed for Simple Exo PLUS	
<b>Surgical Handpiece with bur</b>	Burs: FG701, or 702 Handpiece: <b>No air!</b> Can cause surgical emphysema
<b>Scalpel Blade and Handle</b>	#15 Blade with a #3, or #5 handle is a nice tasty combo 
<b>Needle Holder</b>	DON'T use the haemostat or you will get shit on <ul style="list-style-type: none"> <li>- These bois have cross hatching at the tip which ↑ their grip on the suture needle</li> </ul> 
<b>Suture and Scissors</b>	3-0 is pretty standard for Dentistry 3/8ths or 1/2 circle reverse cutting needles are also pretty standard
<b>Curettes</b>	Used to clean out granulation tissue and debris from the extraction sockets (used in simple Exo as well actually) <ul style="list-style-type: none"> <li>- 84, 85, 86, 87 Lucas Surgical Curette</li> <li>- 10, 11, 12, Miller Surgical Curette</li> </ul> 
<b>Root Tip Picks</b> - JUST the tip...(just to see how it feels)	<ul style="list-style-type: none"> <li>- 13/14 Heidbrink Root Tip Pick</li> <li>- 94 and 95 Root tip pick</li> </ul> <p style="color: red;"><b>**Only for extracting broken root tips, not for full roots, you will bend the shit out of it if the root is too large**</b></p> 
<b>Tissue Pliers</b>	<ul style="list-style-type: none"> <li>- Semkin-Taylor</li> <li>- Adson</li> <li>- Adson-Brown</li> </ul> 

<b>Luxators</b>	<ul style="list-style-type: none"> <li>- These are like small elevators that you use with tiny movements in a pen grasp</li> <li>- NOT Periotomes</li> </ul>	
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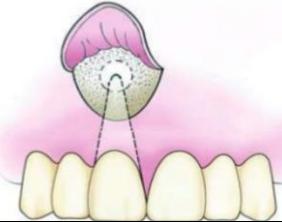
## Principles of Flap Design

**There are 5 principles:**

1. It is *outlined by a surgical incision*
  - Clean and down to the bone (include the periosteum in the flap)
  - Keep interdental papilla intact
2. Carries its *own blood supply*
  - Broad base (wider than it is high)
3. *Allows surgical access* to underlying tissues
  - Reflect and retract carefully to avoid ischemia and tearing
4. Can be *replaced in its original position*
  - Replace on sound bone, not a bony defect or over an empty space
5. *Maintained with sutures*

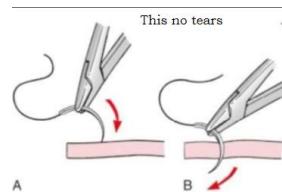


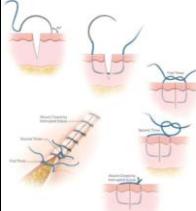
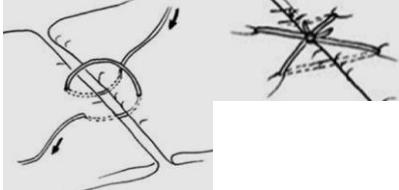
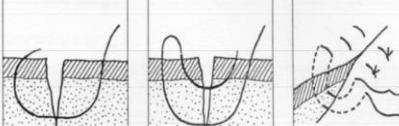
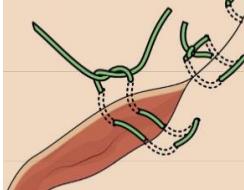
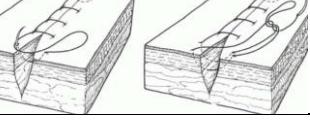
### Types of Flaps

Envelope Flap	Incise the bottom of the sulcus around all the teeth you will be reflecting. Keep the papilla intact <ul style="list-style-type: none"> <li>- Reflect with a Molt #9 Periosteal Elevator</li> </ul> 
3 Corner Flap	 Add 1x releasing incision anterior to the target tooth <ul style="list-style-type: none"> <li>- Place releasing incision at the <b>line angle of the tooth</b>, not in the middle of a tooth (recession), or the middle of the papilla (recession)</li> </ul>
4 Corner Flap	 2x releasing incisions (Anterior and posterior to the target tooth) <ul style="list-style-type: none"> <li>- Usually you don't need this kind of retraction for a simple exo, you can get by with a 3 corner</li> </ul>
Subsulcular Flap	Make the envelope incision below the bottom of the sulcus (but still on keratinized tissue) -> Prevents recession! 
Semilunar Flap	 - Used pretty much only for Apicoectomy

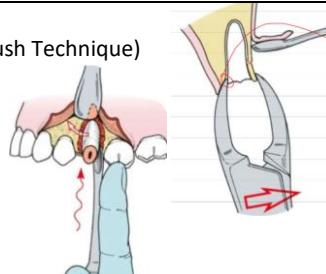
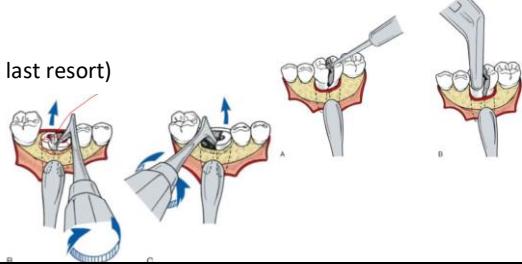
## Principles of Suturing

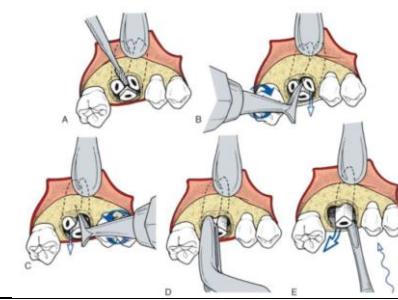
1. Insert needle 2-3mm away from the wound edge
2. Needle enters the soft tissue at a 90 degree angle
3. Rotate the needle through, don't push it!
4. Start from moveable tissue into non-moveable tissue
5. Approximate the tissue and do not strangulate it when tying the knot



Suturing Techniques		
<b>Interrupted Suture</b>		Pretty much the top dog suture that we will be doing mostly - Simple and effective
<b>Figure of 8</b>		Useful for locking a blood clot or PRF into a socket
<b>Vertical Mattress</b>		Great for re-approximating the papilla - Keeps suture within the papilla tissues, so there is no tension on the surface that might cause recession
<b>Horizontal Mattress</b>		Kinda like a figure 8, but without the cross over - Can bring deeper tissues closer together - Moves the tension further away from the incision
<b>Continuous (Non-locking)</b>		Quick and dirty, but you better make sure it doesn't come untied or the entire thing will come undone
<b>Continuous Locking</b>		Creates a little lock with each pass, allows you to tension one section at a time as you go. Doesn't prevent the entire thing from coming undone if you knot it poorly though

## Complex Exo Techniques

<b>Single Rooted Teeth</b>	<p>Create a flap for better visuals Use forceps and grasp through a lip of bone to engage the root (County Crush Technique) <b>OR</b> Section the root with surgical handpiece and use luxators <b>OR</b> Remove bone (Mesial, then distal, and if you have to Buccal)</p> 
<b>Multirooted Teeth</b>	<p>Create a flap Section the tooth to isolate the roots Remove bone if needed (Mesial, Distal, and buccal as a last resort) Can use a Cryer or Crane to elevate the root tips</p> 



**\*\* When extracting multiple teeth: Start from the distal and move mesial\*\***

## Principles of Managing Impacted Teeth

### Causes of impaction

- Inadequate arch length
- Adjacent teeth
- Dense overlying bone
- Excessive soft tissue
- Genetic abnormalities

### The most impacted teeth are:

- Max. and Mand. 3<sup>rd</sup> molars
- Max. Canines
- Mand. Premolars

**\*\*Early detection is so important\*\***

- Prevents problems from occurring later on
- Allows for possibility of ortho solution
- Prevents possible need for extracting more than 1 tooth due to issues arising later on
  - o Impacted 8's can cause external root resorption of the 7's 😞 They both need to go
  - o Can cause Periodontal disease involving the adjacent



### **Indications for Impacted tooth removal**

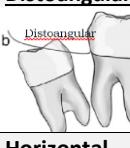
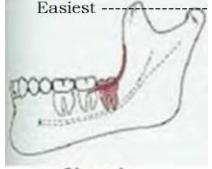
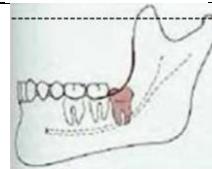
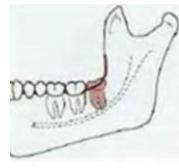
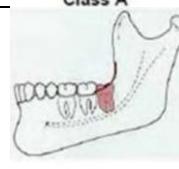
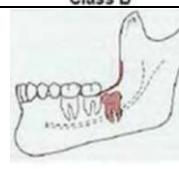
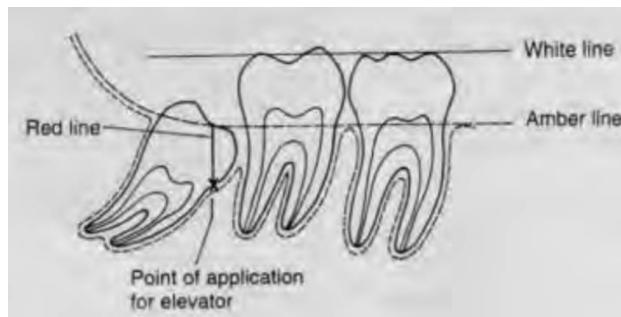
- Pericoronitis
- Caries
- Periodontal disease
- Root Resorption of adjacent teeth
- Prevention of jaw fracture
- Management of associated odontogenic cysts and neoplasia
- Orthodontic considerations
- Before orthognathic surgery
- Under dental prosthesis
- Systemic health considerations

## Angulation Classification for 3rd Molars

### Maxillary 3<sup>rd</sup> Molars

- Vertical and Distoangular are less complicated to remove

Mandibular - IAN Canal, and Lingual nerve considerations	Maxillary - Sinus and Tuberosity considerations
<b>Mesioangular</b>  43% of Mandibular 3 <sup>rd</sup> molar impactions - Easy to remove	<b>Mesioangular</b> - 12% of impactions - Challenging b/c thickness of bone and 2 <sup>nd</sup> molar position

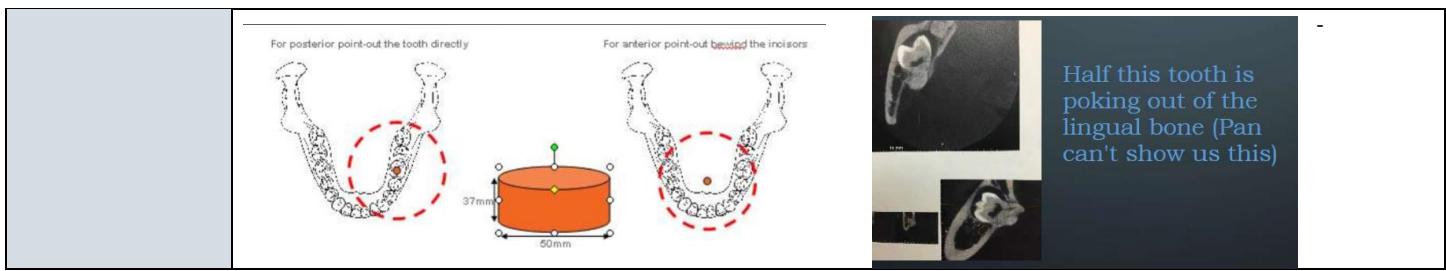
<b>Vertical</b>	 <p>38% of Mandibular 3<sup>rd</sup> molar impactions</p> <ul style="list-style-type: none"> <li>- Can be easy to remove</li> <li>- Can be hard depending on the Pell/Gregory Classification (3<sup>rd</sup> hardest statistically)</li> </ul>	<b>Vertical</b> <ul style="list-style-type: none"> <li>- 63% of impactions</li> <li>- Less complicated</li> </ul>
<b>Distoangular</b>	 <p>6% of mandibular 3<sup>rd</sup> molar impactions</p> <ul style="list-style-type: none"> <li>- Hardest to Extract</li> </ul>	<b>Distoangular</b> <ul style="list-style-type: none"> <li>- 25% of impactions</li> <li>- Less complicated</li> </ul>
<b>Horizontal</b>	 <p>3-13% of mandibular 3<sup>rd</sup> molar impactions</p> <ul style="list-style-type: none"> <li>- 2<sup>nd</sup> Hardest to extract</li> </ul>	<b>Horizontal/Inverted/Transverse/Palatal</b> <ul style="list-style-type: none"> <li>- Very rare, 1%</li> </ul>
<b>Pell/Gregory Classification</b> - Relationship to the <b>anterior</b> border of the ramus		
<b>Class I</b>	 <p>Easiest</p>	Sufficient room anterior to the anterior ramus to erupt
<b>Class II</b>	 <p>Half of the impacted tooth is covered by the ramus</p>	
<b>Class III</b>	 <p>Most challenging</p>	3 <sup>rd</sup> molar is completely embedded in the ramus
<b>Pell/Gregory Classification Again</b> - Relationship to <b>occlusal</b> plane		
<b>Class A</b>	 <p>Occlusal Surface level w/ 2<sup>nd</sup> molar</p>	<b>Winters Lines</b> <i>White Line:</i> Occlusal plane of 1 <sup>st</sup> and 2 <sup>nd</sup> molar <i>Amber Line:</i> Crest of bone distal to 7, and interdental bone btwn 6/7 <i>Red Line:</i> Perpendicular line from Amber down to mesial surface of impacted 8 <i>Used to determine the depth of impaction</i>
<b>Class B</b>	 <p>Occlusal surface is between occlusal plane and cervical line of the 2<sup>nd</sup> molar</p>	
<b>Class C</b>	 <p>Occlusal surface is below the cervical line of the 2<sup>nd</sup> molar</p>	

Factors ↑ difficulty of 3 <sup>rd</sup> molar removal	
- Older Age - Dense calcified bone (↓ flexibility) - Dilacerated Roots - Apical root of Mand. 3 <sup>rd</sup> molar in cortical bone - Position of the IAN - Superiorly positioned Max. 3 <sup>rd</sup> molar - Adjacent teeth damage during removal	- Poor anaesthesia - Atrophic mandible - Limited Access - Location of Max. Sinus - Strong gagger - Large tongue
<b>**IAN nerve damage is actually not super scary (if patient is young)**</b>	
- As long as you don't cut the nerve mechanically the numbness will go away	
<b>**Swelling damage can cause nerve damage though**</b>	

Oroantral Communication	
<b>Risk Factors</b>	- Pneumatized Max. sinus - Divergent roots - Minimal bone between the roots and the sinus
<b>How to avoid</b>	- Avoid apically directly pressure - Adequate preoperative radiographs
<b>Diagnosis</b>	DON'T probe the communication -> Makes it worse - Examine the root tips for attached bone - Examine the extraction site - Nose-Blowing test - Airflow into the mouth - Fluid flow into the nose
<b>If you see anything other than black in the socket, then you are ok 😊. There is still sinus covering the hole -&gt; Black is bad</b>	
<b>Tx</b>	<p><b>Small (&lt;2mm)</b></p> <ul style="list-style-type: none"> <li>- No Tx, sinus precautions only</li> </ul> <p><b>Medium (3-6mm)</b></p> <ul style="list-style-type: none"> <li>- PRF</li> <li>- Gelfoam or Surgicel in the socket</li> </ul> <p><b>Large (&gt;7mm)</b></p> <ul style="list-style-type: none"> <li>- Refer to oral surgeon for flap closure</li> </ul>

## Radiographs

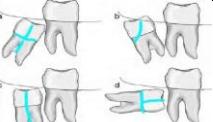
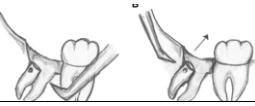
<b>Panoramic Films</b>	<b>Aid us in:</b> <ul style="list-style-type: none"> <li>- ID the presence of 3<sup>rd</sup> molars</li> <li>- Locate unusual positions of teeth</li> <li>- Facilitate in establishing their angulation</li> <li>- Shows vertical relationship to second molar</li> <li>- Identified caries and dentoalveolar bone loss (kinda)</li> <li>- Detect the location of the IAN Canal</li> <li>- Detect bone pathology</li> <li>- Establish the height of the mandible</li> <li>- Show the relationship for the Max 3<sup>rd</sup> and Max sinus</li> <li>- ID the structural stability of the second molar</li> <li>- Locate the relationship of root apices w/dense bone</li> <li>- Detect dilacerated roots</li> </ul>
<b>Cone Beam CT</b>	Using 3D radiographs with a <b>Focused Field of View (FOV)</b> <ul style="list-style-type: none"> <li>- <b>50mm</b> = Makes positioning easy and ensures the tooth you want is always captured</li> <li>- <b>37mm</b> vertical size = Captures 1 jaw at a time to ↓ the irradiated surfaces</li> </ul>

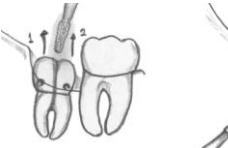
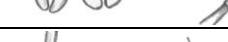


Risk Assessment for 3 <sup>rd</sup> Molar Extraction		
- Age - Location of IAN - BMI - Drug Hx - Anaesthesia Hx - Systemic conditions - Surgical Access Space - Smoking	- Tongue Size - Max. Sinus location - Root Contour - 3 <sup>rd</sup> molar position - Inter-incisal opening - Health of 2 <sup>nd</sup> molar - Bone mass and Density - Poor oral hygiene	
Risk of IAN Damage	<ul style="list-style-type: none"> <li>Superimposition of the IAN canal and the 3M root with <b>Narrowing of the IAN canal</b></li> <li><b>Darkening of the 3M root over the IAN canal</b></li> <li><b>Diversion of the IAN canal or loss of the white cortical outlines of the canal</b></li> </ul> <p>Baseline risk of IAN damage is only ~1% -&gt; Combinations of the above factors ↑ risk from 1.4-12%</p>	
Classifications of Nerve Damage	<p><u>Neuropaxia (1<sup>st</sup> degree)</u></p> <ul style="list-style-type: none"> <li><b>Cause:</b> Minor compression or Traction injury</li> <li><b>Healing:</b> Spontaneous recovery &lt;2months</li> </ul> <p><u>Axonotmesis (2<sup>nd</sup> degree)</u></p> <ul style="list-style-type: none"> <li><b>Cause:</b> Crush or Traction Injury</li> <li><b>Healing:</b> Spontaneous recovery 2-4 months, up to 1 year</li> </ul> <p><u>3<sup>rd</sup> Degree Injury</u></p> <ul style="list-style-type: none"> <li><b>Cause:</b> Traction, Compression, Crush</li> <li><b>Healing:</b> Some spontaneous (not complete recovery) -&gt; Microsurgery indicated if not improved by 3 months</li> </ul> <p><u>4<sup>th</sup> Degree</u></p> <ul style="list-style-type: none"> <li><b>Cause:</b> Traction, Compression, Injection, Chemical</li> <li><b>Healing:</b> Not likely for spontaneous recovery -&gt; Microsurgery after 3 months if no improvement</li> </ul> <p><u>Neurotmesis</u></p> <ul style="list-style-type: none"> <li><b>Cause:</b> Transection, Avulsion, Laceration</li> <li><b>Healing:</b> Extensive fibrosis, neuroma -&gt; <b>Microsurgery needed after 3 months</b></li> </ul>	
If injury happens	<p><b>Recovery:</b> Typically 6-8 weeks</p> <p><b>Total recovery:</b> 6-9 months (could be up to 18 months)</p> <ul style="list-style-type: none"> <li>Younger patients recover very well (&lt;25 years old)</li> </ul>	

## Surgical Technique

1. Anaesthesia	<ul style="list-style-type: none"> <li>IAN + Long Buccal + Infiltration</li> <li>Gow-Gates Block</li> <li>Akinosi Block if Trismus</li> </ul> <p>*Don't use 4% Articaine for Block, ↑ risk of Lingual nerve Paresthesia*</p> <p>- This is kind of contested in the literature though...also by Dr. Esmail</p>	
2. Surgical Exposure (Flap)	<p>Keep flap design conservative to minimize bony exposure</p> <ul style="list-style-type: none"> <li>*****Distal Buccal release behind the 2<sup>nd</sup> molar*****</li> <li>Mesial releasing incision to the impacted tooth site</li> </ul> <p><b>**IMPORTANT**</b></p> <ul style="list-style-type: none"> <li>When extending your flap distal of the 8, bring the incision buccal. The <b>Ramus doesn't extend directly distal!</b> If you go straight back, you will only be in soft tissue and will cut the lingual nerve in half</li> </ul>	
3. Bone Removal	<p>Makes room for the removal</p> <ul style="list-style-type: none"> <li>Keep the troughing minimal though</li> <li>Keep lateral cortex intact and bone distal to 2<sup>nd</sup> molar intact</li> <li>DON'T cut the lingual cortex</li> </ul>	

4. Division or Crowns/Roots	 See below for more specifics
5. Elevation of Tooth Fragments	Maybe necessary to create a purchase point on the root to help elevate it out 
6. Debridement	Irrigate the socket and underneath the flap - Debride wound edges
7. Suture	

Sectioning Techniques for Impacted 3 <sup>rd</sup> Molars	
<b>Mesioangular Impaction</b>	 Remove some buccal bone -> Create a purchase point in the crown – Elevate out <b>OR</b>  Section the D half of the crown -> Give you space to distally roll the tooth out of the socket  <b>OR</b>  Section the Crown and root in half and elevate the 2 pieces out of the socket
<b>Horizontal Impaction</b>	
<b>Vertical Impaction</b>	 Section the distal half to allow space for rolling out the crown and roots <b>OR</b>  Section the Crown and Root in half <b>OR</b>  Remove the crown and pick the roots out individually
<b>Distoangular Impaction</b>	 Remove the D half of the crown and roll it out distally  <b>OR</b>  Section the crown and the roots. Remove in 2 or 3 pieces

## Post Operative Patient Management

It should really be prevention of problems, not management of them -> The best management is prevention 😊

## Pre-Surgical Assessment

- This is super important. Anticipate issues before they happen to prevent them from occurring or being prepared to handle it
- Review Med Hx.
- Clinical and Radiological assessment
- Communicate Post Op Care/Management

<b>Medical Conditions to look out for</b>	<ul style="list-style-type: none"> <li>- Bleeding disorder</li> <li>- Liver Disorder</li> <li>- Diabetes (Type 1 or 2)</li> <li>- Osteoporosis -&gt; Are they taking Bisphosphonates? (Oral, IV, IM)</li> <li>- Cancer -&gt; are they taking Bisphosphonates? (IV)</li> <li>- Immunocompromised? -&gt; Cancer, Leukemia, Organ transplant</li> <li>- Radiation Patient?</li> <li>- Autoimmune Disorders</li> <li>- Elderly</li> </ul>												
Bleeding	<p><b>Home Care instructions listed below</b></p> <ul style="list-style-type: none"> <li>- Tannic acid in <b>black tea bags</b> cause vasoconstriction to ↓ bleeding</li> <li>- Avoid smoking for 12+ hours</li> <li>- No strenuous exercise for 24 hours. ↑ blood pressure may ↑ bleeding</li> </ul> <p><b>Challenges</b></p> <ul style="list-style-type: none"> <li>- Oral tissues are highly vascular and will bleed lots</li> <li>- May be difficult to apply direct pressure to a wound</li> <li>- Negative pressures created by the tongue may dislodge the clot</li> <li>- Salivary enzymes may lyse the clot early</li> </ul> <p><b>Medications that ↑ Bleeding:</b></p> <ul style="list-style-type: none"> <li>- Aspirin, Plavix -&gt; Anti-platelet meds</li> <li>- Coumadin (Warfarin), Pradaxa (Dabigatran), Xarelto (Rivaroxaban), Elquis (Apixaban) -&gt; Anticoagulants</li> <li>- Antibiotics may ↓ Vit. K</li> <li>- Alcohol -&gt; ↓ liver function</li> <li>- Chemotherapeutic agents</li> </ul> <p><b>Hemorrhage control</b></p> <ul style="list-style-type: none"> <li>- <b>Gelfoam</b> (Absorbable gelatin sponge) <ul style="list-style-type: none"> <li>- Forms scaffold for clot formation</li> </ul> </li> <li>- <b>Surgicell</b> (Oxidized regenerated cellulose) <ul style="list-style-type: none"> <li>- Promotes coagulation</li> </ul> </li> <li>- <b>Topical Thrombin</b> <ul style="list-style-type: none"> <li>- Converts fibrinogen to fibrin (bypasses most of the clotting cascade)</li> </ul> </li> <li>- <b>Avitene (Collagen)</b> <ul style="list-style-type: none"> <li>- Promotes platelet aggregation</li> <li>- Available as collagen plug or tape</li> </ul> </li> </ul> <p>*Liver Clots -&gt; Poorly formed clots, should be removed and the surgical site re-assessed*</p>												
Pain	<p><b>Manage patients' expectations -&gt; The pain won't be completely removed!</b></p> <ul style="list-style-type: none"> <li>- ↑ anxious patients will experience ↑ pain</li> </ul> <p><b>Make sure to give pain meds and anti-inflammatories before the LA has worn off</b></p> <ul style="list-style-type: none"> <li>- <b>Mild Pain:</b> NSAIDs, Acetaminophen <ul style="list-style-type: none"> <li>- Ibuprofen 400-800mg q4-6h prn pain -&gt; Max: 3200mg/day</li> <li>- Acetaminophen 500-1000mg q4-6h prn pain -&gt; Max: 4000mg/day <ul style="list-style-type: none"> <li>- Can stagger these two. Take NSAID, 2hrs later take Aceto. 2hrs after than you can take more NSAID, 2hrs after this can take more Aceto etc etc</li> </ul> </li> </ul> </li> <li>- <b>Moderate Pain:</b> Toradol, Tylenol #2, 3, 4 <ul style="list-style-type: none"> <li>- Codeine 15-60mg q4-6h prn pain</li> <li>- Hydrocodone 5-10mg q4-6h prn pain</li> <li>- Toradol 10mg q6h prn pain</li> <li>- *Can add Acetaminophen to these as long as it is at least 500mg*</li> </ul> </li> <li>- <b>Severe Pain:</b> Oxycodone, Percocet <ul style="list-style-type: none"> <li>- Oxycodone 2.5-10mg q4-6h prn pain</li> </ul> </li> </ul> <table border="1" data-bbox="372 1474 1514 1748"> <thead> <tr> <th>Medication</th><th>Components</th></tr> </thead> <tbody> <tr> <td>Tylenol #2</td><td>15mg Codeine/300mg acetaminophen</td></tr> <tr> <td>Tylenol #3</td><td>30mg Codeine/300mg Acetaminophen</td></tr> <tr> <td>Tylenol #4</td><td>60mg Codeine/300mg Acetaminophen</td></tr> <tr> <td>Percodan</td><td>5mg Oxycodone/325mg Aspirin</td></tr> <tr> <td>Percocet</td><td>2.5mg Oxycodone/325mg Acetaminophen 5mg Oxycodone/325mg Acetaminophen 7.5mg Oxycodone/500mg Acetaminophen 10mg Oxycodone/650mg Acetaminophen</td></tr> </tbody> </table>	Medication	Components	Tylenol #2	15mg Codeine/300mg acetaminophen	Tylenol #3	30mg Codeine/300mg Acetaminophen	Tylenol #4	60mg Codeine/300mg Acetaminophen	Percodan	5mg Oxycodone/325mg Aspirin	Percocet	2.5mg Oxycodone/325mg Acetaminophen 5mg Oxycodone/325mg Acetaminophen 7.5mg Oxycodone/500mg Acetaminophen 10mg Oxycodone/650mg Acetaminophen
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Swelling Ecchymosis	<p><b>Max swelling in 36-48 hours</b> -&gt; begins to subside on day 3-4 -&gt; Should resolve after 1 week</p> <ul style="list-style-type: none"> <li>= Bleeding into subcutaneous or submucosal spaces</li> <li>- Appears 2-4 days after surgery</li> <li>- If severe may extend into submandibular -&gt; neck and upper anterior chest</li> <li>- Should resolve in 1-2 weeks</li> </ul> <p>↑ in elderly -&gt; ↓ tissue tone, ↑ capillary fragility, weaker intercellular attachments</p>												

Diet	High calorie, high volume (liquids or soft foods) -> give body the energy needed for recovery <ul style="list-style-type: none"> <li>- <a href="#">Keep it liquid for 24hrs (Consume 2L in first 24 hours)</a></li> </ul> Diabetic patients should try to return to normal insulin and diet ASAP
Trismus	<b>Problems arise with Maximal opening of 10-20mm</b>  Can have several causes: <ul style="list-style-type: none"> <li>- Trauma from tooth extraction</li> <li>- Extensive flap size -&gt; ↑ inflammation</li> <li>- IAN Nerve block -&gt; Trauma and inflammation to the Medial Pterygoid muscle</li> <li>- Hematoma in muscle of mastication (mostly Medial Pterygoid) -&gt; Resolves in 2-3 weeks</li> <li>- Infection</li> </ul>

## Post- Surgery Home Care Instructions

Please read and follow these important post operative instructions for a complication free recovery. If you have any concerns please feel free to contact.

---

### Bleeding

Minor bleeding/oozing may continue for [1-2 days](#). It is normal to see some blood on your pillow in the morning.

- Place a moistened gauze pack over the surgical area and bite down for [30 minutes](#) (Do not leave in while sleeping)
  - o Repeat every hour until bleeding slows down
- Avoid spitting or talking too much for the 1<sup>st</sup> day
- Avoid [sucking actions \(Straws, Smoking etc\)](#) for 5 days
- Avoid strenuous exercise for 1<sup>st</sup> 24hrs.

If you notice excessive [bright red bleeding](#) -> Place a [Moist Black Tea bag](#) over the surgical and bite down for 30 minutes.

- Call surgeon or dentist and inform them of your issue
- 

### Pain

Pain usually begins to [subside after 24-48 hours](#) (discomfort may still persist)

- **Minor Pain:** Over-the-counter medication ([Advil, Ibuprofen, Tylenol](#))
  - o Ibuprofen/Advil: 400-800mg every 4-6 hours (do not exceed 3200mg/day)
  - o Acetaminophen/Tylenol: 500-1000mg every 4-6 hours (do not exceed 4000mg/day)
    - Advil -> 2hrs later take Tylenol -> 2hrs after than you can take more Advil -> 2hrs after this can take more Tylenol -> Repeat as needed
- **Major Pain:** Use prescribed medication as directed

The best way to control pain is to limit it before it becomes severe.

---

### Swelling/Bruising

Swelling is common for [1-7 days](#). If Bruising occurs it should [resolve](#) in 7-10 days.

- Place ice pack wrapped in a cloth on swollen area [20 minutes on, 20 minutes off](#) as needed for the 1<sup>st</sup> 24 hours
  - After 24 hours use moist warm heat for comfort
  - Sleep with your head elevated with 2 pillows
- 

### Diet

After the freezing wears off and the bleeding slows, start with cool clear liquids

- Avoid hot liquids and foods for 24 hours
  - Gradually increase diet to soft foods and shakes
  - If feeling nauseated, try a carbonated beverage. If this does not improve take over-the-counter Gravol
- 

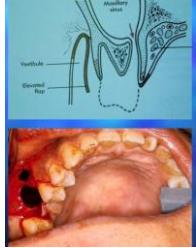
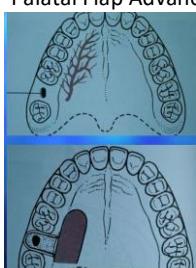
### Other

- Maintain good oral hygiene, but avoid the surgical area
- Gently rinse your mouth with warm salt water after each meal

- Stitches will dissolve gradually over 1-2 weeks
- If hives or an itch develops on your skin, stop the prescribed medication and contact the surgeon
- Do not operate a motor vehicle or operate machinery for 24 hours after anesthesia

If your recover is not improving after 5 days please call for a follow-up appointment

## Complications

<b>Alveolar Osteitis (Dry Socket)</b>	<p><b><u>NOT an infection</u></b></p> <ul style="list-style-type: none"> <li>- Lysis of the blood clot -&gt; Exposure of bone -&gt; Pain and delayed healing</li> <li>- High level of fibrinolytic activity</li> </ul> <p><b><u>Clinically:</u></b></p> <ul style="list-style-type: none"> <li>- Pain develops on <b>3<sup>rd</sup> or 4<sup>th</sup> day post extraction</b></li> <li>- Extraction socket <b>appears empty</b> (Partial or complete loss of clot), <b>Exposed bone</b></li> <li>- Throbbing pain radiating to the ear</li> <li>- Bad odor and taste (from dead blood, not infection)</li> <li>- Painkillers are ineffective and ↑ pain with irrigation</li> </ul> <p><b><u>Occurs in &lt;2% of all extractions</u></b></p> <ul style="list-style-type: none"> <li>- ↑ incidence in smoking</li> <li>- ↑ incidence in women on oral contraceptives</li> <li>- Extensive opening of surgical site</li> <li>- ↑ in Mand/ vs Max sites</li> </ul> <p><b><u>How to avoid:</u></b></p> <ul style="list-style-type: none"> <li>- Clean surgery</li> <li>- Quick surgery</li> <li>- Suture as soon as possible and close tightish to hold the clot in (Figure 8, or at least 2 single interrupted)</li> </ul> <p><b><u>Tx:</u></b></p> <ul style="list-style-type: none"> <li>- Irrigation with monojet syringe</li> <li>- Place medicated dressing: <b>Alveogel (Eugenol + Benzocaine + Balsam of Peru)</b> <ul style="list-style-type: none"> <li>- Eugenol kills nerve endings; Benzocaine numbs the site, Balsam of Peru is the carrier</li> <li>- <b>&gt; Don't pack it too much! Causes osteomyelitis</b></li> </ul> </li> <li>- <b>Do not curette</b> or you will just destroy the clot that is still hanging in there</li> </ul>
<b>Oroantral Communication</b>	<p>Examine the surgical site If persistent communication for &gt;2 week = Surgery</p> <ul style="list-style-type: none"> <li>- Caldwell-Luc procedure</li> <li>- Nasal Antrostomy</li> <li>- Buccal Flap Advancement (shown below)</li> </ul> <div style="display: flex; justify-content: space-around;">   </div> <ul style="list-style-type: none"> <li>- Palatal Flap Advancement</li> <div style="display: flex; justify-content: space-around;">  <p>Provides the Greater Palatine arterial blood supply to healing site</p>  </div> <li>- Metallic foil technique</li> </ul> <p><b><u>Sinus Precautions</u></b></p> <ul style="list-style-type: none"> <li>- Antibiotics</li> <li>- Nasal decongestant spray</li> <li>- Antihistamines</li> </ul>

	<ul style="list-style-type: none"> <li>- Avoid nose-blowing</li> <li>- Avoid sneezing</li> <li>- Avoid sucking a straw</li> <li>- Avoid smoking</li> </ul>
Infection	<p><b>Cardinal Signs of Infection</b> (need 3-5 before we really start considering it)</p> <ul style="list-style-type: none"> <li>- <b>Dolor</b> (Pain, worsening after 3-4 days)</li> <li>- <b>Tumor</b> (Swelling, ↑ after 3-4 days)</li> <li>- <b>Calor</b> (Warmth)</li> <li>- <b>Rubor</b> (Erythema/redness)</li> <li>- <b>Functo laesa</b> (↓ function, Trismus)</li> </ul> <p><b>Indications for Antibiotics</b></p> <ul style="list-style-type: none"> <li>- Rapidly progressive swelling</li> <li>- Diffuse swelling</li> <li>- ↓ Immune defenses</li> <li>- Involvement of <b>facial spaces</b> (Submandibular, Submental etc)</li> <li>- Severe <b>pericoronitis</b></li> <li>- Osteomyelitis</li> </ul> <p><b>Use the narrowest-spectrum drug you can</b></p> <ul style="list-style-type: none"> <li>- Dose: 4-5x Minimum inhibitory concentration</li> <li>- Time: 4x the plasma ½ life</li> <li>- Duration: 3-5 days to resolve symptoms + 2-3 days to make sure = 5-7 days</li> </ul> <p>*Pt comes in w/ infection already -&gt; Give 1g loading dose Amoxicillin right away and Rx 500mg for 7 days.</p>
Allergic Reactions	<p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>- Itching</li> <li>- Hives</li> <li>- Redness</li> <li>- Edema (Lips and eyes)</li> <li>- Breathing issues</li> </ul> <p><b>Management:</b></p> <ul style="list-style-type: none"> <li>- Benadryl 50mg orally -&gt; Most cases</li> <li>- Epinephrine IM or Subcutaneous (0.3mL of 1:1000) -&gt; <b>Anaphylaxis</b></li> <li>- Monitor vitals</li> <li>- Send to hospital/911 if severe</li> </ul> <p>I = <b>Allergic Anaphylaxis and Atopy</b>  II = <b>antiBody</b>  III = <b>immune Complex</b>  IV = <b>Delayed</b></p>
Delayed Healing	<p><b>Many causes:</b></p> <ul style="list-style-type: none"> <li>- Retained Root/crown <ul style="list-style-type: none"> <li>- Take X-Ray, Explore and debride + Irrigate fragment out, Primary closure, Ab + saline rinse</li> </ul> </li> <li>- Necrotic bone</li> <li>- Foreign body (Drill, file, gutta percha, gauze etc)</li> <li>- Glue</li> <li>- ONJ <ul style="list-style-type: none"> <li>- Bisphosphonates!</li> </ul> </li> </ul>
Air Emphysema	<p><b>Associated w/:</b></p> <ul style="list-style-type: none"> <li>- Handpiece air exhaust into surgical site and flap</li> <li>- Mandibular fractures</li> <li>- Lefort I, II, III fractures</li> <li>- Tracheal, Laryngeal, bronchial injuries</li> </ul> <p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>- Sudden soft tissue swelling</li> <li>- <b>Crepitus</b> on palpation</li> <li>- Lack of tenderness</li> <li>- <b>Erythema</b></li> <li>- Airway compromise (Dysphagia, dysphonia, dyspnea)</li> </ul> <p><b>Treatment</b></p> <ul style="list-style-type: none"> <li>- Closure of intraoral wound</li> <li>- Reduction of facial fractures</li> <li>- Antibiotic Proph</li> <li>- Clear Airway obstruction</li> <li>- Avoid coughing, sneezing, nose blowing</li> <li>- Resolves in 2-4 days</li> </ul>



-> Ludwig's Angina  
(Hospital right away)

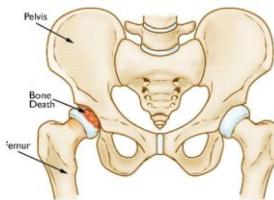
## Osteoradionecrosis

**Definition** = Exposed and Necrotic bone associated w/ ulcerated or necrotic surrounding soft tissue, persists for 3+ months in an area previously irradiated, not caused by tumour recurrence

- Occurs also in Hip (> in men vs women)

Smokers = 2.8x longer healing time and likely to get Dry Socket

- WBC cannot reach the site to combat the inflammation
- Put PRF in socket to prevent dry socket



## Types of Radiation therapy

External Beam	
<b>3D Conformal Radiation Therapy</b>	<ul style="list-style-type: none"> <li>- Delivers beams from many directions to conform to the shape of the tumor</li> <li>- Can deliver high dose of radiation to the tumor while sparing the surrounding tissues</li> </ul>
<b>Intensity-Modulated Radiation Therapy (IMRT)</b>	<ul style="list-style-type: none"> <li>- Many beams, smaller than 3D conformal</li> <li>- Strength of some beams in some areas can be changed for ↑ or ↓ dose depending on the area</li> </ul>
<b>Image-Guided Radiation Therapy (IGRT)</b>	<ul style="list-style-type: none"> <li>- Uses imaging scans for Tx planning before rads and during rads</li> </ul>
<b>Tomotherapy (very new)</b>	<ul style="list-style-type: none"> <li>- Images of tumour taken before Tx -&gt; allows for precise targeting</li> <li>- Rotates around during Tx -&gt; Rads given in spiral pattern</li> </ul>
<b>Stereotactic Radiosurgery</b>	<ul style="list-style-type: none"> <li>- Focused, high energy beams (for small tumors with well defined edges)</li> <li>- Used for brain and CNS tumors where surgery is risky</li> </ul>
<b>Stereotactic Body Radiation Therapy</b>	<ul style="list-style-type: none"> <li>- Small isolated tumors outside brain and CNS -&gt; Often in liver and lung</li> </ul>
<b>**Important Note:</b> Different forms of radiation don't produce the same biological effects. It depends on: <ol style="list-style-type: none"> <li>1. <b>Radiation Type</b> (Atomical origin, level of energy)</li> <li>2. <b>Tissue Type</b></li> <li>3. <b>Radiation Schedule</b> (Fractionation, dose per fraction, total cumulative dose)</li> </ol>	
<b>External Beam</b> = more +ve correlation w/ ORN incidence vs internal implant radiation (Brachytherapy)	

<b>Oral Effects of Radiation</b>	<p><b>Typical Tx fields:</b> Salivary glands, Oral cavity, Jaws</p> <p><b>Short Term:</b></p> <ul style="list-style-type: none"> <li>- Oral Erythema + Ulceration</li> <li>- Candidiasis</li> <li>- Dysgeusia</li> <li>- Parotitis</li> </ul> <p><b>Long Term:</b></p> <ul style="list-style-type: none"> <li>- Hyposalivation</li> <li>- Erythema + Ulcers</li> <li>- Dental Caries</li> </ul> <ul style="list-style-type: none"> <li>- ↓ Taste</li> <li>- Hyposalivation</li> <li>- Acute Sialadenitis</li> <li>- ↓ Taste</li> <li>- Epithelial Atrophy + Fibrosis = Trismus</li> <li>- Osteoradionecrosis</li> </ul>
<b>Pre-Radiation Prep</b>	<p>Consult with radiotherapist to know the field of radiation + Max Dose</p> <ul style="list-style-type: none"> <li>- Perio teeth / PA abscess = Extraction 2 weeks before rads</li> <li>- Ab prophylaxis before and 1 week after (4x/day)</li> </ul> <p>Prepare custom fluoride trays, Rx 0.4% stannous fluoride gel for 3-5mins/day</p> <p>Begin 2-3 month recall schedule -&gt; Check carefully for OHE and root caries</p> <ul style="list-style-type: none"> <li>- Xerostomia creates circumferential cervical caries</li> </ul>

## Osteoradionecrosis

Osteoradionecrosis	
<b>Incidence</b>	<p>2.6% - 22%</p> <ul style="list-style-type: none"> <li>- ↑ incidence in the mandible vs maxilla               <ul style="list-style-type: none"> <li>- Mand. is primarily cortical bone with ↓ vascularity</li> </ul> </li> <li>- Can occur from a few months – 30 years after rads! But &gt;70% of cases develop in first 3 years</li> </ul>
<b>Predisposition/Risk Factors</b>	<p>High radiation dose in particular area (&gt;6500 cGy)</p> <ul style="list-style-type: none"> <li>- Odontogenic infection, Trauma -&gt; These things should be handled before radiation if possible</li> <li>- Site: Mandible has ↓ vascular flow = ↑ ORN               <ul style="list-style-type: none"> <li>- Blood supply to mandible is from periosteum, NOT Inferior Alveolar Artery</li> </ul> </li> </ul>

	<b>Patient Related Factors</b> <ul style="list-style-type: none"> <li>- Active dental disease</li> <li>- ↓ OHE</li> <li>- ↓ Pre-radiation oral care</li> <li>- Alcohol + Tobacco</li> </ul>	<b>Neoplasm Related Factors</b> <ul style="list-style-type: none"> <li>- Anatomic location of tumor (Max vs Mand.)</li> <li>- Clinical state of tumor</li> <li>- Presence of lymph node metastasis</li> </ul>	<b>Treatment Related Factors</b> <ul style="list-style-type: none"> <li>- Field of radiation</li> <li>- Total Rads dose</li> <li>- Dose rate/day</li> <li>- Mode of radiation delivery</li> <li>- Tumour surgery</li> </ul>															
<b>Medication Related</b>																		
<ul style="list-style-type: none"> <li>- <b>Antosteoclastic</b> agents (Bisphosphonates, Denosumab)</li> <li>- <b>Antiangiogenic</b> agents (Bevacizumab, Sunitinib)</li> </ul>																		
<b>Trauma</b>																		
<ul style="list-style-type: none"> <li>- Lingual plate of molars in particular</li> </ul>																		
<b>Odontogenic Infection</b>																		
<ul style="list-style-type: none"> <li>- Osteomyelitis leading to sequestrum formation</li> </ul>																		
<b>Primary Sclerotic Bone disease</b> (Cemento-osseous dysplasia)																		
<b>Viral Infection</b> (Oral shingles)																		
<b>Clinical Features</b>	<u>Hx of radiation + 1+ of the following w/i 3 months:</u> <ul style="list-style-type: none"> <li>- Nonhealing ulcer</li> <li>- Exposed bone</li> <li>- Pain/Dysaesthesia/anaesthesia</li> <li>- Orocutaneous fistula</li> <li>- Pathological Fracture</li> </ul>																	
	<u>Radiographic findings</u> <ul style="list-style-type: none"> <li>- ↑ bone density</li> <li>- Periosteal thickening</li> <li>- Diffuse RL</li> <li>- Sclerosis</li> <li>- Sequestration</li> <li>- Mottled areas of osteoporosis</li> </ul>																	
<b>Cause/ Pathophysiology</b>	<u>Traditional Theory</u> Ultimately -> Breakdown of <b>hypocellular</b> , <b>hypovascular</b> and <b>hypoxic</b> tissues in nonhealing wound containing sequestra <ul style="list-style-type: none"> <li>- "Theory of 3 H's" -&gt; Robert Marx</li> </ul> = Irradiated bone has ↓ cellular viability, Obliteration of vessels and compromised bone turnover																	
	<u>Current understanding</u> = the Radiation-Induced Fibroatrophic Process																	
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<b>Diagnosis</b> Radiotherapy over a critical dose (>5000 cGy) Necrotic soft tissue/bone >3 months Radiographic change Absence of malignancy (confirmed w/ histopathology)																		
<b>Classifications</b>	<table border="1"> <thead> <tr> <th>Stage</th><th>Description</th><th>Tx</th></tr> </thead> <tbody> <tr> <td>1</td><td>Asymptomatic &lt;2.5cm of affected bone</td><td>Medical Tx only</td></tr> <tr> <td>2</td><td>Asymptomatic Possible pathologic fracture or IAN involvement &gt;2.5cm bone affected</td><td>Medical Tx, unless there is dental sepsis or obvious loose necrotic bone</td></tr> <tr> <td>3</td><td>&gt;2.5cm of bone affected Symptomatic w/ no other features</td><td>Debridement of loose necrotic bone and local pedicle flap</td></tr> <tr> <td>4</td><td>&gt;2.5cm affected bone Pathological fracture Involvement of IA Nerve Orocutaneous fistula</td><td>Reconstruction w/ free flap if condition allows</td></tr> </tbody> </table>			Stage	Description	Tx	1	Asymptomatic <2.5cm of affected bone	Medical Tx only	2	Asymptomatic Possible pathologic fracture or IAN involvement >2.5cm bone affected	Medical Tx, unless there is dental sepsis or obvious loose necrotic bone	3	>2.5cm of bone affected Symptomatic w/ no other features	Debridement of loose necrotic bone and local pedicle flap	4	>2.5cm affected bone Pathological fracture Involvement of IA Nerve Orocutaneous fistula	Reconstruction w/ free flap if condition allows
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<b>Tx:</b> <u>Varies:</u> <ul style="list-style-type: none"> <li>- Antibiotics</li> <li>- Surgical Debridement -&gt; keep it conservative (don't disturb the periosteum, preserve the blood supply)</li> <li>- HBO Therapy -&gt; Controversial, studies have shown no effect...but it does produce the best TV shows</li> <li>- Medical alternatives (little evidence currently): <b>Pentoxifyline</b>, <b>Tocopherol</b> and <b>Clondronate</b></li> </ul>																		
<u>Supplemental Management:</u> <ul style="list-style-type: none"> <li>- Strict Oral Hygiene</li> <li>- ↓ smoking</li> <li>- Judicious Ab use -&gt; Doxycycline (Tetracycline) can stimulate Collagen formation 😊</li> </ul>																		
<b>Medication Regime</b> <u>Pentoxifyline</u> : 800mg/day for 6-24 months <u>Tocopherol</u> (Vitamin E): 100 IU/day for 6-24 months <u>Clondronate</u> : 1600mg/day for 6-24 months (5 days per week)																		
																		

### Management of Sequestrate (Necrotic Bone)

- Tell Pt to rub salt on it after meals (helps prevent infection and ↑ blood flow)
- Bring back in 3 weeks (this is how long it takes for changes to happen naturally) -> Painless removal
- Bone usually just falls off

## Hyperbaric Oxygen Therapy (HBOT)

= Tx w/ 100% O<sub>2</sub> (Hyperoxia) at higher than atmospheric pressure



<b>Effects of HBOT</b>	<p>Partial pressure of O<sub>2</sub> ↑ from 200mmHg (1atm) to &gt;2,000mmHg (3atm) = ↑ ↑ in tissue O<sub>2</sub> partial pressure</p> <p>Produces ROS and reactive nitrogen species -&gt; Function as <b>signaling molecules</b> in wound healing pathways</p> <ul style="list-style-type: none"> <li>- ↑ leukocyte function</li> <li>- Amelioration (<b>improvement</b>) of ischemia-reperfusion injury</li> <li>- Neovascularisation (<b>formation of new vessel</b>) from ↑ local growth factor and release of progenitor stem cells</li> </ul> <p><b>Regime:</b></p> <ul style="list-style-type: none"> <li>- Ideally <b>20 sessions before extraction and 10 sessions after</b></li> </ul>
<b>Side Effects</b>	<ul style="list-style-type: none"> <li>- Fatigue and Light-headedness</li> <li>- Lung Damage</li> <li>- Fluid buildup or bursting of middle ears (Important to equalize) -&gt; Middle Ear Barotrauma</li> <li>- Vision change</li> <li>- O<sub>2</sub> poisoning (causing lung failure, fluid in lungs, seizures)</li> <li>- Sinus/paranasal barotrauma</li> <li>- Dental barotrauma (tooth squeeze)</li> </ul> <p>*Despite how bad these sound they are typically mild and self limiting*</p> <p>*Keep it &lt;2hrs, and &lt;3atm*</p>

## Medication Related Osteonecrosis of the Jaw (MRONJ)

Formerly known as BRONJ

<b>Definition</b>	<p>= <b>Osteonecrosis of the jaw associated w/ osteoporosis or cancer drugs</b></p> <ul style="list-style-type: none"> <li>- Bisphosphonates and Antiresorptive medications</li> </ul> <p>Risk of Spontaneous MRONJ is only 0.01-0.04%</p> <ul style="list-style-type: none"> <li>- This ↑ w/ surgical procedures</li> </ul> <p>IV Bisphosphonates ↑ risk: 0.8-12%</p>
<b>Risk Factors</b>	<p><b>Use of Bisphosphonates or antiresorptive drugs</b></p> <ul style="list-style-type: none"> <li>- <b>Length of therapy and Dose are the major factors</b></li> <li>- <b>IV Bisphosphonates ↑ risk vs oral</b></li> </ul> <p>Dental Surgery + Bisphosphonates Periodontal Surgery + Bisphosphonates</p> <p><b>*Implants are mostly safe*</b></p>
<b>Signs/Symptoms</b>	<p>Exposed Necrotic Bone Non-healing extraction site Trismus Localised Pain Swollen Gums Loosened Teeth</p> <p><b>*Looks like periodontal disease, except for the exposed necrotic bone*</b></p>
<b>Diagnosis</b>	<p>Must have 3 specific criteria:</p> <ol style="list-style-type: none"> <li>1. <b>Current or Previous Tx w/ antiresorptive or antiangiogenic agents</b></li> <li>2. <b>Exposed bone</b>, or bone that can be probed through intra/extraloral fistula <b>for &gt;8weeks</b></li> <li>3. <b>No Hx of radiation therapy</b> to the jaws</li> </ol>

Meds that cause it	Bisphosphonates: - Fosamax - Actonel - Boniva - Zometa Antibody Agonist Meds: - Denosumab (Prolia) -> RANKL Inhibitor Antiangiogenic Meds
When Pt starts Bisphosphonates	1. Perform dental exam + Pan Radiograph 2. Restore dentition 3. Ensure proper fit of removable prosthesis 4. Remove abscessed and non-restorable teeth + Teeth w/ severe periodontal disease w/ poor prognosis  *If systemic condition permit: Delay bisphosphonates for 21 days post-extraction*
Treatment	Prevention is key! But if shit hits the fan...  Tx plan ranges from monitor -> pharmacologic intervention -> Major debridement -> Resection if its severe

## Staging and Tx Strategies

**Table 1 Staging and Treatment Strategies**

MRONJ† Staging	Treatment Strategies‡
<b>At risk category</b> No apparent necrotic bone in patients who have been treated with either oral or IV bisphosphonates	<ul style="list-style-type: none"> <li>No treatment indicated</li> <li>Patient education</li> </ul>
<b>Stage 0</b> No clinical evidence of necrotic bone, but non-specific clinical findings, radiographic changes and symptoms	<ul style="list-style-type: none"> <li>Systemic management, including the use of pain medication and antibiotics</li> </ul>
<b>Stage 1</b> Exposed and necrotic bone, or fistulae that probes to bone, in patients who are asymptomatic and have no evidence of infection	<ul style="list-style-type: none"> <li>Antibacterial mouth rinse</li> <li>Clinical follow-up on a quarterly basis</li> <li>Patient education and review of indications for continued bisphosphonate therapy</li> </ul>
<b>Stage 2</b> Exposed and necrotic bone, or fistulae that probes to bone, associated with infection as evidenced by pain and erythema in the region of the exposed bone with or without purulent drainage	<ul style="list-style-type: none"> <li>Symptomatic treatment with oral antibiotics</li> <li>Oral antibacterial mouth rinse</li> <li>Pain control</li> <li>Debridement to relieve soft tissue irritation and infection control</li> </ul>
<b>Stage 3</b> Exposed and necrotic bone or a fistula that probes to bone in patients with pain, infection, and one or more of the following: exposed and necrotic bone extending beyond the region of alveolar bone, (i.e., inferior border and ramus in the mandible, maxillary sinus and zygoma in the maxilla) resulting in pathologic fracture, extra-oral fistula, oral antral/oral nasal communication, or osteolysis extending to the inferior border of the mandible or sinus floor	<ul style="list-style-type: none"> <li>Antibacterial mouth rinse</li> <li>Antibiotic therapy and pain control</li> <li>Surgical debridement/resection for longer term palliation of infection and pain</li> </ul>

† Exposed or probable bone in the maxillofacial region without resolution for greater than 8 weeks in patients treated with an antiresorptive and/or an antiangiogenic agent who have not received radiation therapy to the jaws.

‡ Regardless of the disease stage, mobile segments of bony sequestrum should be removed without exposing unininvolved bone. The extraction of symptomatic teeth within exposed, necrotic bone should be considered since it is unlikely that the extraction will exacerbate the established necrotic process.

\*\*This is the paper used as a gold standard reference in Clinic...be familiar with it or get roasted in clinic

[https://www.aaoms.org/docs/govt\\_affairs/advocacy\\_white\\_papers/mronj\\_position\\_paper.pdf](https://www.aaoms.org/docs/govt_affairs/advocacy_white_papers/mronj_position_paper.pdf)

## Bisphosphonates

\*\*Zoledronic Acid\*\* -> Very common IV Bisphosphonate used to Tx Osteoporosis, High blood calcium from cancer, Bone breakdown from cancer, Paget's Disease

Mechanism of Action	Attached to bone tissue -> attach to and enter osteoclasts where they disrupt intracellular enzymatic functions needed for bone resorption
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## Classifications

Gen.	MOA	Drug	Potency	Admin	Indication
1st	Formation of ATP derivative that impairs osteoclast function + Induces osteoclast apoptosis	<u>Etidronate</u>	1	Oral	Osteoporosis Paget's Disease
		<u>Clodronate</u>	10	Oral IV	Osteoporosis Paget's Disease
		<u>Tiludronate</u>	10	Oral	Paget's Disease
2 <sup>nd</sup>	Inhibits sterol synthesis by inhibiting Farnesyl pyrophosphate synthase (FPPS) enzyme	<u>Pamidronate</u>	100	IV	Osteolytic bone metastases of Breast Cancer, Multiple Myeloma Paget's Disease
		<u>Alendronate</u>	500	Oral	Osteoporosis Paget's Disease
		<u>Ibandronate</u>	1000	Oral IV	Osteoporosis
3 <sup>rd</sup>	Inhibits FPPS enzyme and stabilises conformation changes	<u>Risedronate</u>	2000	Oral IV	Osteoporosis Paget's Disease Osteolytic lesions of Multiple myeloma Hypercalcemia of Malignancy
		<u>Zoledronate</u>	10000	IV	Osteolytic lesions of multiple myeloma and solid tumors Hypercalcemia of malignancy

## Prevention and Management of Complications

### Soft Tissue Injuries

<b>Tearing Mucosal Flap</b>	<p><b>Prevention:</b></p> <ul style="list-style-type: none"> <li>- Adequate flap design and size to ↓ tension</li> <li>- Releasing incisions</li> <li>- ↓ retraction force</li> </ul> <p><b>Tx:</b></p> <ul style="list-style-type: none"> <li>- Reposition and suture (if tear is really bad you might have to cut away the rough edges first)</li> </ul>	
<b>Trauma to adjacent soft tissue</b>	<p><b>Prevention</b></p> <ul style="list-style-type: none"> <li>- Control and support instruments</li> <li>- Control bleeding (↓ slippery)</li> </ul> <p><b>Tx:</b></p> <ul style="list-style-type: none"> <li>- Prevent injection (salt water rinse likely)</li> <li>- Heal via secondary intention</li> </ul>	
<b>Abrasions/Burns</b>	<p>Typically in lips, corners of the mouth etc</p> <ul style="list-style-type: none"> <li>- Rotating shank/bur, metal retractors, elevators, electric cautery</li> <li>- Train your assistant to keep an eye on this for you while you are focused on the surgery</li> </ul> <p><b>Prevention</b></p> <ul style="list-style-type: none"> <li>- Adequate retraction</li> </ul> <p><b>Tx:</b></p> <ul style="list-style-type: none"> <li>- Mucosa will heal in 4-7 days -&gt; Skin in 10-15 days (maybe leave a scar)</li> <li>- Antibiotic ointment</li> </ul>	
<b>Puncture Wounds/Cuts</b>	<p>Slippage of instruments into tissue (elevators, root tip picks, periosteal, scalpels)</p> <p><b>Prevention</b></p> <ul style="list-style-type: none"> <li>- Proper finger rest and support</li> </ul> <p><b>Tx:</b></p> <ul style="list-style-type: none"> <li>- Cleanse the wound and allow for 2<sup>o</sup> healing</li> </ul>	

### Osseous Structure Injuries

Sites to watch out for:

Maxilla	Mandible
Buccal and Labial Cortical Plates <ul style="list-style-type: none"> <li>- Max. Canines</li> <li>- Max Molars</li> </ul> Maxillary Sinus Floor Maxillary Tuberosity	Buccal and Labial cortical plates <ul style="list-style-type: none"> <li>- Mand. Incisors</li> </ul> Mand. lingual cortical bone

<b>Prevention</b>	<p>Proper clinical and radiographic assessment of alveolar process      Assess bone thickness      Assess anatomical structures      Age of the patient      Avoid excessive force -&gt; Finesse is your friend!      Expand the surrounding alveolar bone slowly</p> <p><b>Enlist Open surgical techniques when you need to:</b></p> <ul style="list-style-type: none"> <li>- Soft tissue flap</li> <li>- Bone removal (keep it minimal though)</li> <li>- Section the roots</li> </ul>	
<b>Management</b>	<p><b><u>Max. Tuberity Fracture:</u></b></p> <ul style="list-style-type: none"> <li>- Dissect the bone from the tooth if the bone is completely removed           <ul style="list-style-type: none"> <li>- Smooth edges and reposition soft tissue</li> </ul> </li> <li><b>If severely mobile</b> (but periosteum is still intact)           <ul style="list-style-type: none"> <li>- 6 week splint -&gt; Section the crown, allow the root and tuberosity to heal -&gt; After 6-8 weeks = open surgical removal</li> </ul> </li> </ul>	

## Oroantral Communications

<b>Prevention</b>	<p>Adequate preop. <b>Radiographs</b></p> <ul style="list-style-type: none"> <li>- Pneumatized sinuses?</li> <li>- Minimal bone between roots and sinus?</li> <li>- Divergent roots?</li> </ul>	
<b>Dx</b>	<p>Examine root tips for attached bone + Extraction site      Nose blowing test -&gt; Kinda risky though, you risk making a small communication bigger      Airflow into the mouth      Fluid flow into the nose  <b>DON'T probe into the communication</b></p>	
<b>Management</b>	<p><b><u>Small (&lt;2mm)</u></b></p> <ul style="list-style-type: none"> <li>- No Tx, just sinus precautions</li> </ul> <p><b><u>Moderate (2-6mm)</u></b></p> <ul style="list-style-type: none"> <li>- <b>Figure 8 suture + Surgicel</b></li> <li>- Sinus precautions</li> </ul> <p><b><u>Large (&gt;7mm)</u></b></p> <ul style="list-style-type: none"> <li>- <b>Surgical flap closure -&gt; Buccal advancement flap</b></li> <li>- Sinus Precautions</li> </ul>	<p><b><u>Sinus Precautions/Antral Regime</u></b></p> <ul style="list-style-type: none"> <li>- Antibiotics (Amoxicillin 500mg)</li> <li>- Nasal Decongestant spray (Pseudoephedrine)</li> <li>- Antihistamine (Benadryl 50mg)</li> <li>- Avoid nose blowing</li> <li>- Avoid sneezing (sneeze with open mouth if you must – but close your eyes or they will explode)</li> <li>- No straw sucking (or use a high volume bubble tea straw if you must)</li> <li>- No smoking</li> </ul>
<b>Surgical Tx</b>	<p><b><u>If communication persists for &gt; 2 weeks</u></b></p> <ul style="list-style-type: none"> <li>- Caldwell-Luc procedure</li> <li>- Nasal Antrostomy</li> <li>- Buccal or Palatal flap advancement</li> <li>- Metallic (gold) foil technique -&gt; Place gold foil over communication for 3 months (old method)</li> </ul>	

### What is the difference between a Fistula and a Communication?

- Fistula is epithelial lined (kinda like a healed communication but is still a hole)
- Communications are not epithelial lined! (Fresh holes)

## Injuries to Adjacent Teeth/ Wrong Teeth Extracted

- BE CAREFUL. Too much force in the wrong direction can luxate the wrong tooth or damage restorations
- Also count carefully...people extract the wrong tooth more than you know or would like to admit
  - Especially common in the mixed dentition stage -> if you fuck up, replace the tooth quickly and observe for 4-5 weeks and call ortho immediately with your tail between your legs

## Aspiration

<b>Prevention</b>	<ul style="list-style-type: none"> <li>- 4x4 Gauze throat pack</li> <li>- C-Sponge</li> </ul>
<b>Management</b>	<ol style="list-style-type: none"> <li>1. Turn patient towards the floor</li> <li>2. Maintain the airway and use supplemental O<sub>2</sub></li> <li>3. Encourage Pt to cough and spit</li> </ol>

	<ul style="list-style-type: none"> <li>- If there is no coughing: Tooth has likely been swallowed and will be pooped out in 2-4 days</li> <li>- If violent coughing: Tooth may have been aspirated through vocal cords into trachea and bronchus</li> </ul> <p>4. Send to ER for chest and abdominal radiographs w/ possible need for bronchoscopy procedure</p>
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## Mandible Fracture

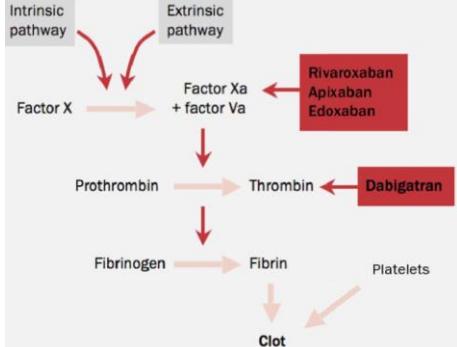
- Pretty rare complication -> Most often associated with impacted 3<sup>rd</sup> molars
- Occurs when you use excessive force in severely atrophic mandibles

Tx: Reduction and Stabilization

## Nerve Injury

<b>Incidence</b>	<p><i>Local Anaesthesia Related:</i></p> <ul style="list-style-type: none"> <li>- 1/400,000 injection -&gt; Quite rare</li> <li>- Results from epineural haematoma or direct injury from the needle</li> </ul> <p><b>**Informed Consent Important! Always mention this possibility**</b></p> <ul style="list-style-type: none"> <li>- Include Diagrams, Radiographs, Written Consent</li> </ul>
<b>Recovery</b>	<p>Usually occurs on its own over 6-8 weeks</p> <ul style="list-style-type: none"> <li>- Could be as long as 6-9 months for full recovery</li> <li>- Regular follow-up appointments</li> </ul> <p><b>Better and faster recovery seen with younger patients (&lt;25 years)</b></p>

## Haemostasis

<b>Challenges</b>	<ul style="list-style-type: none"> <li>- Oral tissue is highly vascular</li> <li>- Difficult to apply direct pressure to the wounds</li> <li>- Negative pressure created by tongue can dislodge the clot</li> <li>- Salivary enzymes may lyse the blood clot</li> </ul>
<b>Bleeding Hx</b>	<p>Ask about bleeding Hx and tendencies</p> <ul style="list-style-type: none"> <li>- Congenital bleeding disorders?</li> <li>- Medications associated with ↑ bleeding:           <ul style="list-style-type: none"> <li>- <b>Anti-platelet Meds</b> <ul style="list-style-type: none"> <li>- Aspirin</li> </ul> </li> <li>- <b>Anticoagulants</b> <ul style="list-style-type: none"> <li>- Warfarin (Coumadin) -&gt; Vitamin K antagonist</li> <li>- Praxada (Dabigatran) -&gt; Direct Thrombin Inhibitor</li> <li>- Xarelto (Rivaroxaban) -&gt; Factor Xa inhibitor</li> <li>- Eliquis (Apixaban)</li> <li>- Lixiana (Edoxaban)</li> </ul> </li> <li>- <b>Antibiotics</b> that ↓ Vit K absorption from gut -&gt; Cephalosporins</li> <li>- <b>Alcohol</b> -&gt; ↓ liver function</li> </ul> </li> <li>- Liver Disease (Hepatitis, Cirrhosis)</li> <li>- Hypertension (Systolic BP&gt;180)</li> </ul> 
<b>Controlling Bleeding</b>	<p><b>Gelfoam</b> -&gt; Absorbable Gelatin sponges</p> <ul style="list-style-type: none"> <li>- Forms a scaffold for clot formation</li> <li>- Cannot be packed though 😞</li> </ul> <p><b>Surgicel</b> -&gt; Oxidised regenerated Cellulose</p> <ul style="list-style-type: none"> <li>- Promotes coagulation</li> <li>- WAY better than Gelfoam, don't be a cheap ass...use it</li> </ul> <p><b>Topical Thrombin</b> -&gt; Directly converts Fibrinogen to Fibrin</p> <ul style="list-style-type: none"> <li>- Applied to a gauze and placed in wound</li> </ul> <p><b>Avitene (Collagen)</b></p> <ul style="list-style-type: none"> <li>- Promotes platelet aggregation</li> <li>- Available as a collagen plug or tape</li> </ul>

## Wound Dehiscence

<b>Prevention</b>	Appropriate soft tissue flap design Atraumatic handling of the soft tissue
<b>Management</b>	<p>Reposition the flap</p> <ul style="list-style-type: none"> <li>- Suture w/o tension!</li> </ul>

## Alveolar Osteitis (Dry Socket)

<b>Presentation</b> <ul style="list-style-type: none"> <li><b>NOT AN INFECTION</b></li> <li>- Occurs in &lt;2% of all extractions</li> <li>- ↑ incidence with smoking and in women taking oral contraceptives</li> </ul> <p>Caused by <b>high level of fibrinolytic activity</b> and lysis of the blood clot</p> <ul style="list-style-type: none"> <li>- Exposure of the bone</li> </ul> <p><b>Pain develops on 3<sup>rd</sup>/4<sup>th</sup> day</b></p> <ul style="list-style-type: none"> <li>- Extraction socket <b>appears empty</b> (or with partial loss of clot) and is source of the pain</li> <li>- <b>Throbbing pain radiates to the ear</b></li> <li>- <b>Bad odor and taste</b> (very characteristic smell when you treat it enough)</li> </ul>	
<b>Treatment</b> <ul style="list-style-type: none"> <li><b>Alveogel</b></li> <li>- <b>Eugenol</b> (Kills the nerve endings)</li> <li>- <b>Benzocaine</b> (Topical anaesthetic)</li> <li>- <b>Balsam of Peru</b> (Carrier for the medicament)</li> </ul> <p>-&gt; Place alveogel in socket and change it for 1-2 days</p> <ul style="list-style-type: none"> <li>- It will come out on its own through, so you don't necessarily need to change the dressing if the pain has stopped</li> </ul>	

## Infections

<b>Prevention</b> <ul style="list-style-type: none"> <li>Fast Aseptic surgery</li> <li>Appropriate prophylactic antibiotics when indicated</li> </ul>	
<b>Signs and Symptoms</b> <ul style="list-style-type: none"> <li>Need 3/5 before we REALLY start considering infection</li> <li>- Pain (Dolor)</li> <li>- Swelling (Tumor)</li> <li>- Warmth (Calor)</li> <li>- Erythema (Rubor)</li> <li>- Loss of function (Trismus) (Functo Laesa)</li> </ul>	
<b>Indications for Antibiotics</b> <ul style="list-style-type: none"> <li>- <b>Rapid progressive</b> swellings</li> <li>- <b>Diffuse</b> swelling</li> <li>- <b>Compromised Host Defenses</b></li> <li>- Involvement of <b>Facial Space</b> (More on that later)</li> <li>- Severe <b>Pericoronitis</b> causing trismus</li> <li>- <b>Osteomyelitis</b></li> </ul>	
<b>Send to the ER if:</b> <ul style="list-style-type: none"> <li>- Difficulty <b>Breathing</b></li> <li>- Difficulty <b>Swallowing</b></li> <li>- <b>Dehydration</b></li> <li>- Moderate to Severe <b>Trismus</b> (&lt;25mm interincisal opening)</li> <li>- <b>Swelling extended beyond alveolar process</b></li> <li>- Elevated <b>Temps</b> &gt;38.3°</li> <li>- <b>Malaise</b> and toxic appearance</li> <li>- <b>Compromised host defenses</b></li> <li>- Need for GA</li> <li>- Failed prior treatment</li> </ul>	

## Air Emphysema

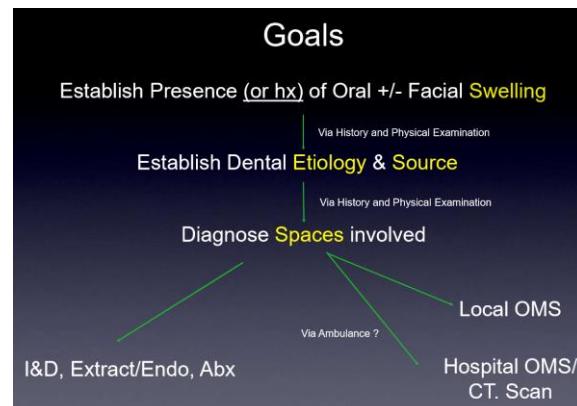
<b>Presentation</b> <ul style="list-style-type: none"> <li>Sudden onset of soft tissue swelling</li> <li>Crepitus on palpation</li> <li>Lack of tenderness</li> <li>Erythema</li> <li>Airway Compromise (Dysphagia, Dysphonia, Dyspnoea)</li> </ul>	
<b>Tx</b> <ul style="list-style-type: none"> <li>Closure of intraoral wound</li> <li>Reduction of the facial fractures</li> <li>Antibiotics</li> <li>Manage airway obstruction</li> <li>Avoid coughing, sneezing, nose blowing</li> </ul> <p><b>Resolves in 2-4 days</b></p>	

# Odontogenic Infection

2 Major sources of the Infection:

Periapical	<u>Pulpal Necrosis</u> -> Bacteria Spreads into periapical tissues -> Spreads through cancellous bone and thins the cortical plate -> spreads into soft tissue - Level of infection depends on penetration <b>above</b> or <b>below</b> the muscle attachments - Vestibular Infection vs Facial space infection
Periodontal	<u>Deep periodontal pocket</u> -> Inoculation of bacteria into the soft tissue

<u>Principles of Management</u>
<ul style="list-style-type: none"> <li>- Assess the <b>Severity</b></li> <li>- Evaluate host defenses</li> <li>- Determine the setting for care           <ul style="list-style-type: none"> <li>- (GP office, OS office, Hospital?)</li> </ul> </li> <li>- Surgical Tx</li> <li>- Support medically</li> <li>- Antibiotic therapy</li> </ul>



## Diagnostic Principles

1. Establish Etiology	- Recent Extraction? - Dental pain? - Dental Tx?						
2. Establish the Source	<p>Percussion test -&gt; Imaging is deceiving</p> <p><b>Maxillary Infections:</b> - Typically spread through bone <b>buccally</b></p> <p><b>Mandibular Infections:</b> - Anterior teeth spread <b>buccally</b> - Posterior teeth spread through bone <b>lingually</b></p>						
3. Hx and Physical Exams	<p>Onset of swelling/pain Duration Rapidity</p> <p><b>Signs and Symptoms</b></p> <ul style="list-style-type: none"> <li>- <u>Local</u>: Pain, Swelling, Warmth, Erythema, Loss of Function</li> <li>- <u>Systemic</u>: Leukocytosis (<math>\uparrow</math> WBC), Malaise, Lymphadenopathy, Fever</li> </ul> <p>Past Medical Hx</p> <ul style="list-style-type: none"> <li>- Compromised Host Defenses?</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #f2c082; width: 30%;">Uncontrolled Metabolic Disorders</td> <td>End-Stage renal disease Alcoholism + Malnutrition Poorly controlled diabetes</td> </tr> <tr> <td style="background-color: #f2c082;">Suppressing Diseases</td> <td>Leukemia Lymphoma Malignant tumor HIV</td> </tr> <tr> <td style="background-color: #f2c082;">Suppressing Drugs</td> <td>Chemo drugs Immunosuppressants Organ Transplant drugs</td> </tr> </table> <p><b>Physical Exam:</b></p> <ul style="list-style-type: none"> <li>- High Temps? (38.3-38.9°C)</li> <li>- Tachycardia (HR up to 100bpm)</li> <li>- <math>\uparrow</math> RR (Up to 18 breathes/min)</li> <li>- Toxic Appearance -&gt; Fatigues and Lethargic</li> <li>- Intraoral exam</li> <li>- Rads</li> </ul>	Uncontrolled Metabolic Disorders	End-Stage renal disease Alcoholism + Malnutrition Poorly controlled diabetes	Suppressing Diseases	Leukemia Lymphoma Malignant tumor HIV	Suppressing Drugs	Chemo drugs Immunosuppressants Organ Transplant drugs
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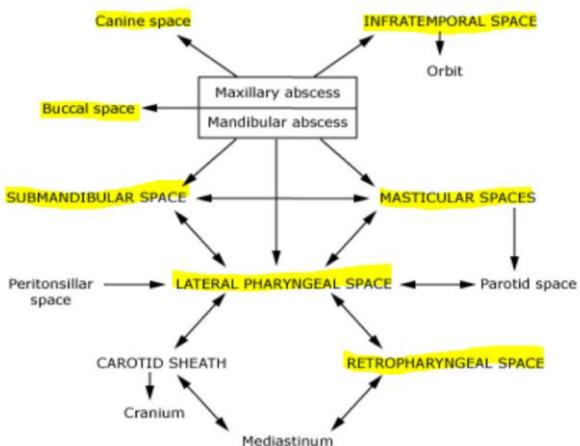
## 4 Stages of Infection

<b>1. Inoculation</b>	<b>Duration:</b> - 0-3 days <b>Signs/Symptoms</b> - Soft, Mildly tender, Doughy
<b>2. Cellulitis</b>	<b>Duration</b> - 3-5 days <b>Signs/Symptoms</b> - Very painful - Hard, Red, Acutely tender area - Large, Diffuse zone of swelling and redness
<b>3. Abscess</b>	<b>Duration</b> - 5-7 Days <b>Signs/Symptoms</b> - Less painful than cellulitis - Soft, Fluctuant, Tender - Purulent - Small, Circumscribed region
<b>4. Resolution</b>	Immune system is able to combat the infection - Healing and repair of tissue

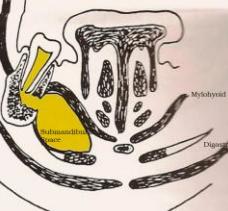
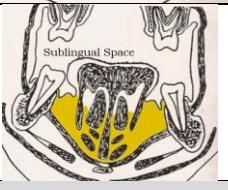
Cellulitis Vs Abscess		
	Cellulitis	Abscess
<b>Duration</b>	Acute	Chronic
<b>Pain</b>	Generalized and Severe	Localized
<b>Size</b>	Large	Small
<b>Localization</b>	Diffuse borders	Well circumscribed
<b>Palpation</b>	Doughy/Indurated/hard	Fluctuant
<b>Pus?</b>	Nope	Yup
<b>Seriousness</b>	Greater	Less
<b>Bacterial Composition</b>	Aerobic	Anaerobic

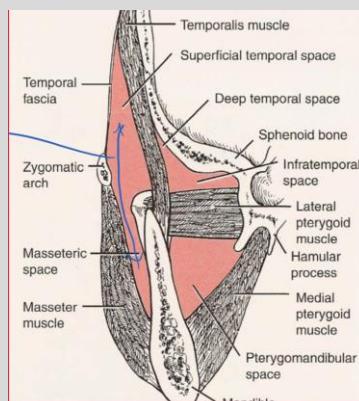
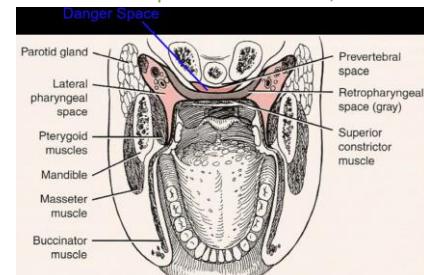
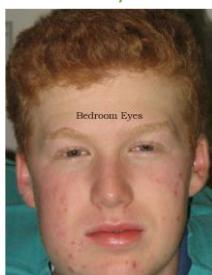
## Facial Spaces

- Buccal
  - Canine
  - **Masticator** (Masseter, Pterygoid, Temporal)
  - Submandibular, Sublingual, Submental
- Lateral Pharyngeal
  - Pretracheal, Retropharyngeal -> Danger Space!



\*\*These are all arranged in different groups for ease\*\*

Groupings of Facial Spaces			
Vestibular/Canine Space	<p><u>Characteristics:</u></p> <ul style="list-style-type: none"> <li>- Cheek Swelling</li> <li>- <b>Vestibular Fullness</b> (this is the differentiator vs Buccal space)</li> <li>- No ↓ in mouth opening</li> </ul> <p><u>Location:</u></p> <ul style="list-style-type: none"> <li>- <b>Medial</b> side of Buccinator m. insertion</li> </ul>	 	
Buccal Space	<p><u>Characteristics:</u></p> <ul style="list-style-type: none"> <li>- Cheek Swelling</li> <li>- <b>No vestibular fullness</b></li> <li>- ↓ mouth opening (but no Trismus)</li> </ul> <p><u>Location:</u></p> <ul style="list-style-type: none"> <li>- <b>Lateral</b> side of Buccinator m. Insertion</li> </ul>		 <p>-&gt; Also showing signs of Toxicity here</p>
	<pre>     graph TD       A[Cheek Swelling] --&gt; B[Vestibular Fullness]       A --&gt; C[No Vestibular fullness]       B --&gt; D[Vestibular Space]       C --&gt; E[Buccal Space]       D --&gt; F[IntraOral I&amp;D]       E --&gt; G[IntraOral Vs ExtraOral I&amp;D]       F --&gt; H[Extraction/Endo +/-Antibiotics]       G --&gt; H     </pre> <p style="text-align: center;">BOTTOM LINE</p> <p>* I&amp;D = Incise and Drain*</p>		
Submandibular/Submental Space	<p><u>Characteristics:</u></p> <ul style="list-style-type: none"> <li>- Dysphagia, Odynophagia, Difficulty controlling secretions</li> <li>- Unable to palpate border of mandible</li> <li>- Submandibular skin -&gt; Warm, swollen, erythematous, tender</li> </ul> <p><u>Location:</u></p> <ul style="list-style-type: none"> <li>- <b>Inferior</b> to Mylohyoid m. attachment</li> </ul>	 	
Sublingual Space	<p><u>Characteristics:</u></p> <ul style="list-style-type: none"> <li>- Dysphagia, Odynophagia, Difficulty controlling secretions</li> <li>- FOM elevation or fullness</li> <li>- ↓ Tongue mobility</li> </ul> <p><u>Locations:</u></p> <ul style="list-style-type: none"> <li>- <b>Superior</b> to Mylohyoid m. insertion</li> </ul>		
	<pre>     graph TD       A[Neck and Floor of mouth Swelling] --&gt; B[Submandibular skin &amp; mandibular border]       A --&gt; C[Floor of the mouth]       B --&gt; D[Submandibular Space]       C --&gt; E[Sublingual Space]       D --&gt; F[OR Time !!]       E --&gt; G[OR Time !!]       F --&gt; H[Extraoral I&amp;D]       G --&gt; I[CT Scan]       H --&gt; J[IntraOral or ExtraOral I&amp;D]       I --&gt; K[Extraction +/-Antibiotics]       J --&gt; K     </pre> <p style="text-align: center;">BOTTOM LINE</p> <p>OR = Operating Room</p>		
			<p>**Involvement of both spaces = Ludwigs Angina -&gt; This is VERY serious as it could effect the airway. Tx in Hospital immediately**</p> 

Masticator Space																
Temporal Spaces	<p><u>Characteristics:</u></p> <ul style="list-style-type: none"> <li>- Trismus (&lt;10-15mm interincisal opening)</li> <li>- Temporal Tenderness</li> </ul> <p><u>Location:</u></p> <p>Superficial Temporal Space</p> <ul style="list-style-type: none"> <li>- Superficial to Temporalis m.</li> </ul> <p>Deep Temporal Space:</p> <ul style="list-style-type: none"> <li>- Deep to Temporalis m.</li> </ul>															
Masseteric Space	<p><u>Characteristics</u></p> <ul style="list-style-type: none"> <li>- Trismus (&lt;10-15mm Interincisal Opening)</li> <li>- Preauricular/Ramus swelling and tenderness</li> </ul> <p><u>Location:</u></p> <ul style="list-style-type: none"> <li>- Lateral Ramus</li> </ul>															
	 <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">BOTTOM LINE</td> </tr> <tr> <td style="text-align: center;">Trismus</td> </tr> <tr> <td style="text-align: center;">Masticator Space</td> </tr> <tr> <td style="text-align: center;">CT Scan</td> </tr> <tr> <td style="text-align: center;">OR Time !!</td> </tr> <tr> <td style="text-align: center;"><b>Masseteric Space</b></td> </tr> <tr> <td style="text-align: center;"><b>Sup/Deep Temporal Space</b></td> </tr> <tr> <td style="text-align: center;"><b>Pterygoid Space</b></td> </tr> <tr> <td style="text-align: center;">Extraoral I&amp;D</td> </tr> <tr> <td style="text-align: center;">Extraoral I&amp;D</td> </tr> <tr> <td style="text-align: center;">IntraOral I&amp;D</td> </tr> <tr> <td style="text-align: center;">Extraction +/-Antibiotics</td> </tr> </table>	BOTTOM LINE	Trismus	Masticator Space	CT Scan	OR Time !!	<b>Masseteric Space</b>	<b>Sup/Deep Temporal Space</b>	<b>Pterygoid Space</b>	Extraoral I&D	Extraoral I&D	IntraOral I&D	Extraction +/-Antibiotics			
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Lateral + Retro Pharyngeal Spaces	<p><u>Location:</u></p> <ul style="list-style-type: none"> <li>- Posterior to Superior Constrictor, but Anterior to Alar layer of Prevertebral Fascia</li> </ul>   <p>-&gt; The look of the guy who is about to steal your girl</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">BOTTOM LINE</td> </tr> <tr> <td style="text-align: center;">Dysphagia</td> </tr> <tr> <td style="text-align: center;">Odynophagia</td> </tr> <tr> <td style="text-align: center;">Difficulty swallowing or breathing</td> </tr> <tr> <td style="text-align: center;">Lateral +/- Retropharyngeal Space</td> </tr> <tr> <td style="text-align: center;">Referral to Local Vs Hospital OMS depends on ...</td> </tr> <tr> <td style="text-align: center;">Time, Hospital privileges saves time</td> </tr> <tr> <td style="text-align: center;">i.v. Steroids</td> </tr> <tr> <td style="text-align: center;">Pre-intubation Aspiration ?</td> </tr> <tr> <td style="text-align: center;">CT Scan</td> </tr> <tr> <td style="text-align: center;">OR Time !!</td> </tr> <tr> <td style="text-align: center;">IntraOral I&amp;D</td> </tr> <tr> <td style="text-align: center;">Tracheotomy ?</td> </tr> <tr> <td style="text-align: center;">Extraoral I&amp;D</td> </tr> <tr> <td style="text-align: center;">Extraction +/-Antibiotics</td> </tr> </table>	BOTTOM LINE	Dysphagia	Odynophagia	Difficulty swallowing or breathing	Lateral +/- Retropharyngeal Space	Referral to Local Vs Hospital OMS depends on ...	Time, Hospital privileges saves time	i.v. Steroids	Pre-intubation Aspiration ?	CT Scan	OR Time !!	IntraOral I&D	Tracheotomy ?	Extraoral I&D	Extraction +/-Antibiotics
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## A Very Nice Summary:



## Microbiology of Odontogenic Infection

### Microbial Composition:

- Aerobic: 6%
- Anaerobic: 50%
- Mixed 44%

### So What is happening?

1. Initiated by Aerobic bacteria
  - Gain access to tissue
  - Aerobic causes cellulitis
  - Creates Hypoxia + Acidosis = prime environment for anaerobes
2. Followed by Anaerobes
  - Tissue destruction -> Pus formation
  - Enzymes that destroy antibiotics

## Principles of Therapy

1. Determine Severity	<p><b>Hx</b></p> <ul style="list-style-type: none"> <li>- Onset</li> <li>- Duration</li> <li>- Rapidity</li> <li>- Loss of Function</li> </ul> <p><b>Physical</b></p> <ul style="list-style-type: none"> <li>- Vital Signs</li> <li>- Swelling assessment</li> <li>- Assess Airway!</li> </ul>
2. Evaluate Host Defenses	Does patient have any <b>systemic issues that ↓ their immunity?</b> <ul style="list-style-type: none"> <li>- Diabetes, Alcoholism, Steroid therapy, Chemotherapy, Malignancy, HIV, Malnutrition, Organ transplants</li> </ul>
3. Determine if they should go to the ER	<ul style="list-style-type: none"> <li>- <b>Airway Compromise</b></li> <li>- <b>Rapid progression</b></li> <li>- <b>Secondary Facial space involvement (2+ spaces)</b></li> <li>- <b>Fever</b></li> <li>- <b>Medical Management of underlying condition</b></li> <li>- <b>Severe Trismus (&lt;10-15mm)</b></li> <li>- <b>Toxic Appearance</b></li> <li>- <b>Difficulty swallowing or speaking</b></li> <li>- <b>Need for Operating room / GA</b></li> </ul>
4. Tx w/ Surgery	<p><b>Provide Drainage</b></p> <ul style="list-style-type: none"> <li>- Never let the sun set on pus! Also never let the sun go down on me</li> <li>- Get it alllllll out or it will recur</li> <li>- Keep the space open w/ drain after drainage -&gt; <b>Create aerobic environment to ↓ growth on anaerobes</b></li> </ul> <p><b>Technique:</b></p> <ol style="list-style-type: none"> <li>1. Pick the site most affected (<b>hardest and most full of pus</b>)</li> <li>2. Apply <b>anesthesia</b> (LA, IV sedation, GA)</li> </ol> <div style="float: right;"> <p>DON'T LET THE SUN GO DOWN ON ME ELTON JOHN</p> </div>

	<p>3. Disinfect site with <b>Betadine</b>          4. Aspirate 2mL of pus for culture/sensitivity          5. Incision &lt;1cm          6. Blunt dissection into the abscess cavity (w/ hemostat opening) to open up lobulations          7. Place <math>\frac{1}{4}</math>" sterile Penrose drain for 2-5 days</p> <p><b>Optional:</b></p> <ul style="list-style-type: none"> <li>- Gain patient consent for video release. Film it and become a Youtube star (Dr. Pimple Popper is looking at you) to a niche market</li> </ul> <p><b><u>Remove the cause of the infection</u></b></p> <ul style="list-style-type: none"> <li>- Endo Tx -&gt; <b>Vestibular/Buccal/Canine Spaces</b></li> <li>- Extraction -&gt; <b>All other spaces</b> (cannot rely on endo)</li> <li>- Remove foreign bodies</li> <li>- Debride non-viable bone</li> </ul>				
<b>5. Support Medically</b>	Fluids Nutrition Analgesics Rest				
<b>6. Choose and Rx Antibiotics</b>	<p><b>1<sup>st</sup> deem if it is necessary</b></p> <ul style="list-style-type: none"> <li>- Use empiric therapy + choose narrowest spectrum drug</li> </ul> <p><b>Dose:</b></p> <ul style="list-style-type: none"> <li>- <b>3-4x the Minimum Inhibitory Concentration</b></li> </ul> <p><b>Time Interval:</b></p> <ul style="list-style-type: none"> <li>- 4x the plasma half life</li> </ul> <p><b>Duration:</b></p> <ul style="list-style-type: none"> <li>- <b>3-5 days to resolve symptoms + 2-3 days to ensure everything is dead</b> (V. important to keep taking them even if you think the infection is done) -&gt; <b>5-7 days total</b></li> </ul> <table border="1"> <thead> <tr> <th style="background-color: red;">Not Indicated</th> <th style="background-color: green;">Indicated</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>- Chronic <b>localized</b> abscess</li> <li>- Minor vestibular abscess</li> <li>- Dry Socket (<b>this isn't an infection!</b>)</li> <li>- Root canal sterilization</li> <li>- Mild pericoronitis</li> </ul> </td> <td> <ul style="list-style-type: none"> <li>- Rapid progression</li> <li>- Diffuse swelling (Cellulitis)</li> <li>- Lymphadenopathy</li> <li>- Compromised host defenses</li> <li>- Involvement of Facial spaces</li> <li>- Severe Pericoronitis</li> <li>- Osteomyelitis</li> </ul> </td> </tr> </tbody> </table>	Not Indicated	Indicated	<ul style="list-style-type: none"> <li>- Chronic <b>localized</b> abscess</li> <li>- Minor vestibular abscess</li> <li>- Dry Socket (<b>this isn't an infection!</b>)</li> <li>- Root canal sterilization</li> <li>- Mild pericoronitis</li> </ul>	<ul style="list-style-type: none"> <li>- Rapid progression</li> <li>- Diffuse swelling (Cellulitis)</li> <li>- Lymphadenopathy</li> <li>- Compromised host defenses</li> <li>- Involvement of Facial spaces</li> <li>- Severe Pericoronitis</li> <li>- Osteomyelitis</li> </ul>
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## Antibiotics

Bactericidal (Kills)	Bacteriostatic (Prevents growth)
<ul style="list-style-type: none"> <li>- Penicillins</li> <li>- Clindamycin</li> <li>- Cephalosporin</li> <li>- Metronidazole</li> <li>- Aminoglycosides</li> <li>- Vancomycin</li> <li>- Ciprofloxacin</li> </ul>	<ul style="list-style-type: none"> <li>- Erythromycin</li> <li>- Clindamycin</li> <li>- Clarithromycin</li> <li>- Azithromycin</li> <li>- Tetracycline</li> <li>- Sulfa</li> </ul>

<b>Penicillin</b>	G+ Aerobes Anaerobes
<b>Amoxicillin Ampicillin</b>	<ul style="list-style-type: none"> <li>↑ G+ Cocci</li> <li>- Not really worth changing from Penicillin though</li> </ul>
<b>Amox/Clav (Augmentin) - Dr. Esmail's fav</b>	<ul style="list-style-type: none"> <li>↑ Staph + G- species</li> <li>- This combo is good for a broader spectrum alternative to Penicillins</li> </ul>
<b>Zosyn</b>	Covers all odontogenic bacteria
<b>Clindamycin</b>	G+ Anaerobes
<b>Flagyl</b>	All Anaerobes

## Dosages of Antibiotics

<b>Penicillin</b>	500mg QID - Kids: 25-50mg/kg/day
<b>Amoxicillin</b>	500mg TID - Kids: 20-50mg/kg/day
Azithromycin	500mg Day 1 -> 250mg Day 2-5 - Kids: 10 mg/kg Day 1 -> 5mg/kg Day 2
Clarithromycin	500mg BID - Kids: 7.5mg/kg/day
Metronidazole	500mg TID or QID - Kids: 7.5mg/kg/day
Clindamycin	150-600mg QID - Kids: 15-30mg/kg/day
Augmentin	875/125mg BID - Kids: 46-90mg/kg/day
Moxifloxacin	400mg 1x/day - Kids: NOT for kids

### Indications for Endocarditis Proph

- Prosthetic Heart Valves
- Previous Endocarditis
- Cyanotic Congenital Heart Disease
  - Unrepaired CHD (palliative shunts, conduits)
  - Repaired congenital heart defects w/ prosthetic material
  - Repaired w/ residual defects at site of prosthetic patch/device
- Cardiac transplant recipients w/ cardiac valvulopathy

### Dental Procedures Indicated:

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>- Extractions</li> <li>- Implant Placement</li> <li>- Retraction Cord placement</li> <li>- Intraligamentary LA</li> </ul> | <ul style="list-style-type: none"> <li>- Periodontal Surgery</li> <li>- Endo Tx beyond Apex</li> <li>- Ortho band placement</li> <li>- Scaling and Root Planing</li> </ul> |
|--|--|

Drug	Dosage (1hr before Tx)
<b>Amoxicillin</b>	Adult: 2g Kids: 50mg/kg
<b>Penicillin Allergy?</b>	
<b>Clindamycin</b>	Adult: 600mg Kid: 20mg/kg
<b>Cephalexin</b>	Adult: 2g Kid: 50mg/kg
<b>Azithromycin/Clarithromycin</b>	Adult: 500mg Kid: 15mg/kg
<b>Can't take Oral meds?</b>	
<b>Ampicillin</b>	Adult: 2g IM or IV 30 min prior Kid: 50mg/kg IM or IV 30 mins prior
<b>Cant take Penicillin OR oral meds?</b>	
<b>Clindamycin</b>	Adult: 600mg IV Kid: 20mg/kg IV
<b>Cefazolin</b>	Adult: 1g IM or IV Kid: 25mg IM or IV

## Preprosthetic Surgery

- Objective = create proper supporting structures for subsequent placement of prosthetic appliances (Removable or Fixed)
  - o Implants have changed the game!

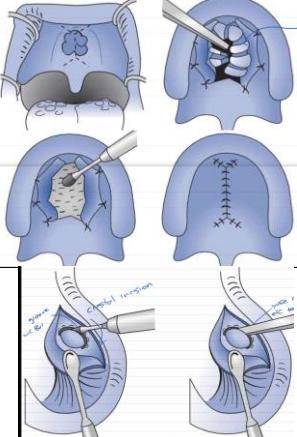


<b>Patient Evaluation:</b> <ul style="list-style-type: none"> <li><b>Chief Complaint:</b> <ul style="list-style-type: none"> <li>- Esthetics? Function?</li> </ul> </li> <li><b>Supporting Bony tissue:</b> <ul style="list-style-type: none"> <li>- Palpation, Radiographs</li> <li>- Look for pathology, and anatomy (pneumatized sinuses)</li> </ul> </li> <li><b>Dental/Skeletal Relationship</b></li> <li><b>Interarch distance</b> (Is there enough space for a prosthesis?)</li> <li><b>Supporting Soft Tissue</b> <ul style="list-style-type: none"> <li>- Hypermobility?</li> <li>- Adequate KT?</li> <li>- Adequate vestibular depth?</li> </ul> </li> </ul>	
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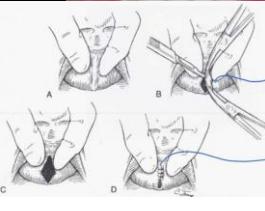
## Alveoloplasty

<b>Definition</b>	<p>Alveolar <a href="#">bone recontouring to facilitate prosthetic reconstruction or insertion</a></p> <ul style="list-style-type: none"> <li>- Can be done at the time of extraction (Primary) or after (Secondary) -&gt; involves creating mucoperiosteal flap w/ crestal incision</li> </ul> <p>*If there are no bony irregularities, <a href="#">digital compression of the socket is preferred = ↓ post op resorption*</a></p> <ul style="list-style-type: none"> <li>- You expanded it...put it back</li> </ul> <p>When closing the soft tissue, do not distort the adjacent tissue or eliminate any buccal vestibular depth</p>	
<b>Instruments</b>	<p>Bony recontouring -&gt; Usually use the <a href="#">rongeurs and bone files</a></p> <ul style="list-style-type: none"> <li>- Can use <a href="#">surgical handpieces and burs</a> though + Saline irrigation</li> </ul>	
<b>Conservative surgical reduction</b>	<p>Reduce the entire buccal plate to recontour the undercut...not super conservative OR</p> <p><a href="#">Interseptal alveoplasty</a> (conserves the cortical bone 😊) and use digital pressure to <a href="#">break the labial cortical bone and reposition it buccally</a></p>	
<b>Undercuts?</b>	<ol style="list-style-type: none"> <li>1. Chop off the bony ridge above the undercut -&gt; Might give us a nice thicccc width for implant placement. Vs a thin old fin of resorbed bone</li> <li>2. Tunnel the mucoperiosteum in the undercut and fill with graft material</li> </ol>	

## Tori Removal

<b>Definition</b>	<p>Tori = unilocular or multilocular bony masses found on the hard palate or on the lingual aspect of the anterior mandible.</p> <ul style="list-style-type: none"> <li>- Usually no issue, but can pose a big problem for making dentures (Complete or Partial)</li> </ul> <p><b>Indications for Removal:</b></p> <ul style="list-style-type: none"> <li>- Preprosthetic</li> <li>- Chronic Trauma</li> <li>- Symptomatic</li> <li>- Necrotic bone</li> <li>- Functional impairment</li> </ul>	
<b>Removal</b>	<ol style="list-style-type: none"> <li>1. <b>Y-Incision</b> is done on the palate -&gt; Avoid the Greater palatine artery and nerve!</li> <li>2. Tori is shaved down with bur (in most cases) -&gt; But if it is large and in charge enough you may use a <b>bur to section it, and then use a chisel and mallet to separate the pieces</b> <ul style="list-style-type: none"> <li>- Chisel method <b>risks you taking a pieces of the sinus floor with you though</b>. Must score each piece before you chisel it to define the breaking point</li> </ul> </li> <li>3. Smooth the area with a file when you are done</li> <li>4. Reposition the flap and compress to avoid hematoma development</li> </ol>	 
<b>Exostoses</b>	<p>These are bony protuberances (like the tori) on the facial/buccal aspect of the max./Mand.</p> <ul style="list-style-type: none"> <li>- The principles of removing these are the same</li> </ul>	

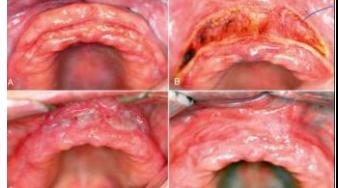
## Frenectomy

<b>Definition</b>	<p><b>Labial Frena</b> = thin bands of CT covered by mucosa extending from lip to alveolar periosteum</p> <ul style="list-style-type: none"> <li>- Issues when there is ↑↑ fibrous tissue causing diastema or interfering with denture fabrication</li> </ul> <p><b>Lingual Frena</b> = Same same but from tongue to FOM</p> <ul style="list-style-type: none"> <li>- Interferes with dentures and can cause <b>ankyloglossia</b> (Tongue tie)</li> </ul>	
<b>Procedure</b>	<ol style="list-style-type: none"> <li>1. Pinch the frenum to prevent movement during incision</li> <li>2. Make a vertical "diamond" incision cutting along the backside of the frenum or by making an inferior incision followed by a superior incision</li> <li>3. Suture it up (involving the periosteum at the height of the vestibule)</li> </ol>	 
<b>Z-Plasty</b>	<p>Do this when you <b>don't have a lot of vestibular width or space</b></p> <ul style="list-style-type: none"> <li>- Cut limbs at 60 degrees and of equal length to the central incision -&gt; This gives you 75% of the central incision length</li> </ul>	

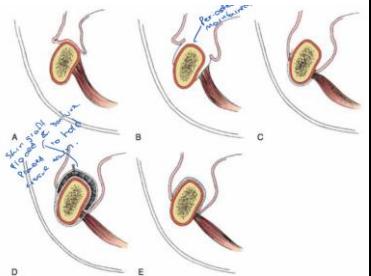
## Maxillary Tuberosity Reduction

<b>Why though?</b>	Tissue could be mobile and have excess Vertical <b>bony hyperplasia</b> Excess bony <b>undercuts</b>
<b>Now what?</b>	Create a crestal elliptical incision -> undermine the mucosa -> remove the fibrous tissue -> Close the tissue

## Fibrous Hyperplasia / Epulis Fissuratum

<b>Cause</b>	Mostly an <b>ill fitting denture</b> <ul style="list-style-type: none"> <li>- Make sure you do a <b>soft reline and/or make a new denture</b> or this issue will just come back again</li> <li>- If you catch it early enough and do the reline you will avoid the surgery all together 😊</li> </ul>
<b>Tx</b>	<b>Cut the excess tissue out using scalpel, electrocautery or laser</b> <ul style="list-style-type: none"> <li>- Want to maintain vestibular depth and avoid excessive scar formation (mostly likely these things will happen with extensive electrocautery)!</li> <li>- Make a surgical stent/denture with a soft liner to wear during healing to keep the vestibular height</li> </ul> 

## Vestibule and FOM Extension Procedures

<b>Transitional Flap Vestibuloplasty (Lip Switch)</b>	Take the tissue from your lip and move it to the alveolar ridge and then take a periosteal flap from the ridge and attach it to the lip	
<b>FOM Lowering (Labial vestibuloplasty)</b>	<p><b>Goal:</b></p> <ul style="list-style-type: none"> <li>- ↑ mechanical resistance to displacement forces on a denture (↑ sulcus depth ↑ lateral displacement control)</li> <li>- Create a more stable denture seating area -&gt; Split thickness skin graft produces a non-displaceable tissue that covers the entire denture bearing area</li> <li>- Skin as a load bearing area instead of mucosa -&gt; ↑ pain threshold of the tissue and tends to form a hyperkeratosis/callus</li> </ul> <p><b>Procedure:</b></p> <ul style="list-style-type: none"> <li>- Flap tissue on the lingual and labial of the ridge (<b>maintaining the periosteum on the bone though</b>) at the depth you want the vestibule to be. Stitch it at that level</li> <li>- Place the partial thickness skin graft harvested from the arm on the denture bearing area</li> <li>- Place the denture ontop during healing to hold the tissue down during healing and maintain the nice vestibule you just created</li> </ul> 	

	<p><b>You can do a crazy technique where you stich the mucosa down using stiches run under the mandible:</b></p> <ul style="list-style-type: none"> <li>- Create your flaps on the Lingual and Labial of the ridge.</li> <li>- Pass a special needle externally under the inferior border of the mandible to the lingual aspect of the bone until you penetrate the mouth</li> <li>- Run the suture thread through the needle and pull through -&gt; Reposition under the mandible and then follow it up along the labial surface of the bone until you penetrate</li> <li>- Now you can pass the suture through the flap on the labial side -&gt; When you tie it it will be pulled down to deepen the vestibule</li> <li>- </li> </ul>
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## Gingivectomy

<b>Indications</b>	<ul style="list-style-type: none"> <li>- Eliminate deep gingival pockets</li> <li>- Recontour gingival tissue to achieve physiological gingival shape</li> <li>- Reduce gingival hyperplasia</li> </ul>
<b>Tools</b>	<ul style="list-style-type: none"> <li>Can use either a scalpel OR electrocautery</li> <li>Bonus of the electrocautery is that it coagulates the tissues/blood as you go along</li> </ul>

## Extractions and Socket Grafting

There may be significant bone loss following extractions -> This makes things less than awesome for placing implants

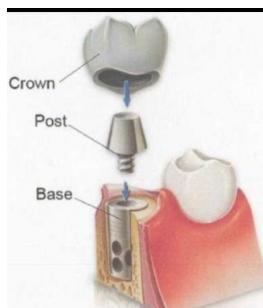
- B-L width can ↓ 25% in the 1<sup>st</sup> year and up to 30-40% within 3 years
- Most bone loss occurs within 1<sup>st</sup> year

Socket Grafting can preserve or maintain the alveolar bone to facilitate implant placement in the future (if it is not already planned)

<b>Criterial for Membranes</b>	<ul style="list-style-type: none"> <li>- Used in areas with significant bony defects</li> <li>- Prevent soft tissue ingrowth into the graft site, therefore preventing resorption of the graft before bone can be formed 😊</li> </ul>
<b>Bone Graft Materials</b>	<p><u>Autograft</u></p> <ul style="list-style-type: none"> <li>- Harvested from the Ramus, Tuberosity, Chin, or Iliac Crest</li> <li>- <b>Ramus</b> is the most common site to take material from</li> <li>- To repair clefts or for doing orthognathic surgery they will take from the Iliac Crest</li> </ul> <p><u>Allograft</u></p> <ul style="list-style-type: none"> <li>- Mineralized or Demineralized</li> <li>- Cortical (↓ bone turnover and ↑ volume preservation) vs Cancellous (turns into bone faster) <ul style="list-style-type: none"> <li>- Probably just go for 50/50 split of the cortical:cancellous</li> </ul> </li> </ul> <p><u>Xenograft</u></p> <ul style="list-style-type: none"> <li>- Usually porcine derived -&gt; Have to keep religion in mind</li> <li>- Bio-Oss -&gt; doesn't turnover or remodel, bone just grows around it</li> <li>- Coralline HA</li> </ul> <p><u>Alloplast</u></p> <ul style="list-style-type: none"> <li>- Synthetic HA</li> <li>- Bioactive Glass</li> </ul>

How can it be used?	 	<p>Comes dehydrated. Must reconstitute in either the patient's blood or in sterile saline</p> <p>Place graft into the socket and cover with a "collaplug" to prevent epithelium from filling up the socket</p> <p>Cover with stich to hold it all in</p> <p>Sometimes a carrier can be added to make the graft more of a pliable putty -&gt; This can allow us to create a nice alveolar contour</p> 
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## Implants



Endosteal implants are placed into residual alveolar bone to replace lost or missing dentition

- Secured in bone through osseointegration
  - Osseointegration = a direct structural and functional connection between ordered, living bone and the surface of a load carrying implant
  - Important to understand Surgical preparation of site, installation of the prosthesis and long term tissue adaptation to the functional demands of the implant

Single Implants	Splinted Implants	Fixed Hybrid Prosthesis	Implant Supported Crown and Bridge
			

### Cement vs Screw retained implant crowns?

**Cement retained** is not great -> Usually the abutment margins on a crown are super sub gingival -> This makes excess cement really hard to clean out = inflammatory reaction that may compromise the implant

**Screw Retained** -> Easier to retrieve, however the implant placement is more technique sensitive, there is no wiggle room for the implant crown and how it will fit on

<b>Criteria for Implant Placement</b>	<ul style="list-style-type: none"> <li>- Good bony foundation (Quality and quantity, location)           <ul style="list-style-type: none"> <li>- Is bone augmentation needed prior?</li> </ul> </li> <li>- Healthy periodontium</li> <li>- Oral mucosa healthy</li> <li>- Not impeded by anatomic limitations (Nerves, Sinuses, Adjacent teeth)</li> </ul>
<b>Ridge Classification</b>	<p><b>A:</b> Most of the alveolar ridge is present</p> <p><b>B:</b> Moderate residual ridge resorption</p> <p><b>C:</b> Advanced Residual ridge resorption</p> <p><b>D:</b> Some resorption of the <b>basal</b> bone</p> <p><b>E:</b> Extreme Resorption of the <b>basal</b> bone</p>
<b>Bony Quality</b>	<p>We could have 4 scenarios</p> <ol style="list-style-type: none"> <li>1. Entire jaw is comprised of homogenous compact bone -&gt; Not very vascular 😞</li> <li>2. Thick layer of compact bone surrounds a core of dense trabecular bone -&gt; Pretty good situation 😊</li> <li>3. Thin layer of cortical bone surrounds a core of dense trabecular bone of favorable strength</li> <li>4. Thin layer of cortical bone surrounds a core of low density trabecular bone</li> </ol>

## Apicoectomy

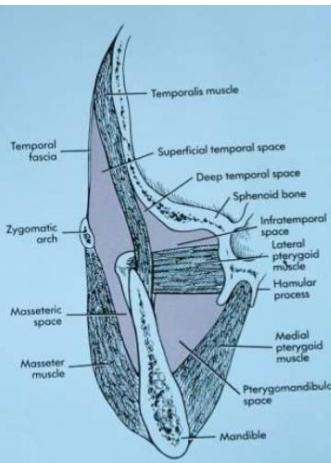
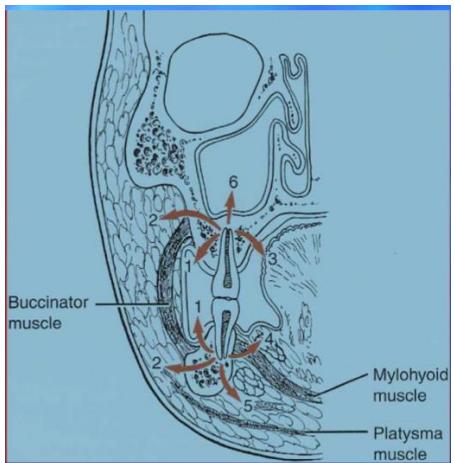
<b>Indications</b>	<ul style="list-style-type: none"> <li>- Fractures of the apical 3<sup>rd</sup> of the root</li> <li>- Continued drainage and infection after re-instrumentation (redoing the RCT)</li> <li>- Extruded root canal filling material causing infection</li> <li>- Chronic infection when the canal system is blocked           <ul style="list-style-type: none"> <li>- Calcified Canals</li> <li>- Broken Files</li> <li>- Large Posts</li> </ul> </li> </ul>
	<p>The diagram illustrates the four stages of an apicoectomy:</p> <ol style="list-style-type: none"> <li><b>Initial State:</b> Shows an abscess at the apex of the root and retracted gum tissue.</li> <li><b>Procedure:</b> Shows the removal of inflamed and infected tissue from the apex of the root.</li> <li><b>Post-operative:</b> Shows the resulting bone cavity and the suture line where the tissue has been closed.</li> <li><b>Healed State:</b> Shows the final healed bone structure.</li> </ol>

OMFS440

# Complex Odontogenic Infections

## Goals

1. Establish the presence +/- history of Oral and/or Facial **swelling or trismus**
2. Establish the dental **Etiology & Source**
  - a. Recent Extraction?
  - b. Dental Pain?
  - c. Hx of Dental Tx?
  - d. Endo Testing (Percussion, Probing)
3. Diagnose **Spaces involved**
  - a. **Maxillary Infections -> Drain Buccally (in general)**
  - b. **Mandibular Infections -> Anteriors drain buccally ; Posterior drain Lingually (in general)**
4. Establish best Management
  - a. Extract/Endo, Incise & Drain, Antibiotic support
  - b. Referral to Oral Surgeon
  - c. Immediate referral to Hospital +/- Ambulance



## Facial Spaces

- Infections erode through the **thinnest** adjacent bone to cause infections of the adjacent tissues -> Relationship between the muscle attachments dictates which space will be involved

## Progression of infection

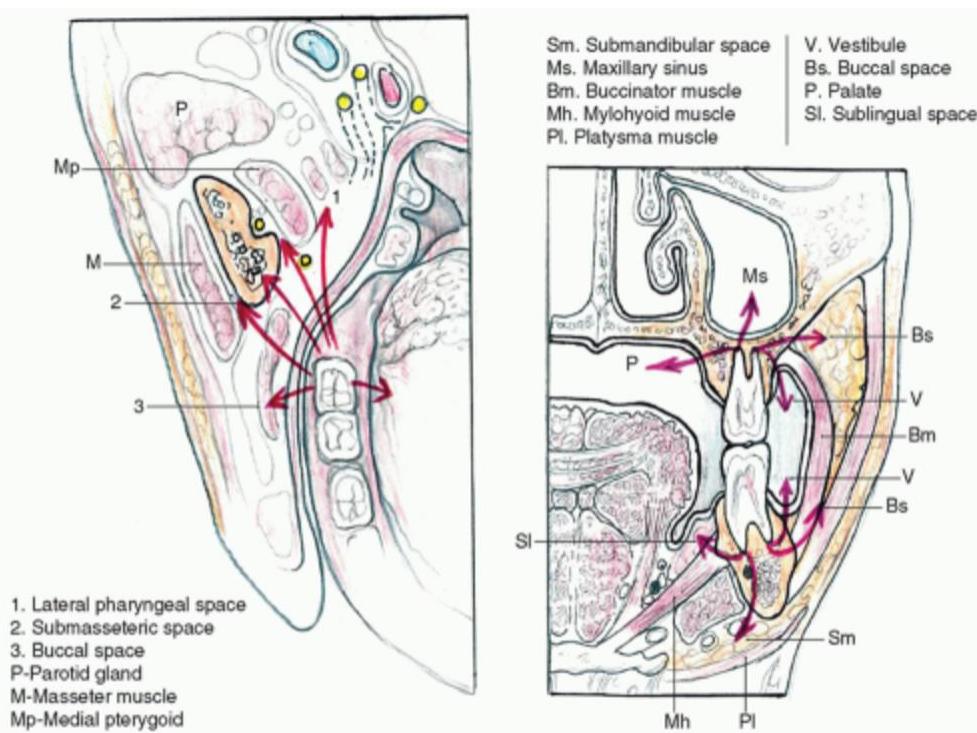
1. **Exudation** of tissue fluid -> Makes loose areolar tissue edematous
2. **Induration**: PMN leukocytes, lymphocytes, macrophages migrate into infected space
3. **Infection Stages**: Edema -> Cellulitis -> Abscess
4. **Abscess formation**: Liquefactive necrosis of WBC and connective tissues

		<b>Severity</b>
- No threat to airway or vital structures		<b>Low</b> <ul style="list-style-type: none"> <li>- Vestibular</li> <li>- Buccal</li> <li>- Subperiosteal</li> <li>- Space of the body of the mandible</li> <li>- Infraorbital</li> </ul>
<ul style="list-style-type: none"> <li>- Hinders access to airway (trismus or elevation of tongue)</li> <li>- Intubation for GA can be difficult</li> </ul>		<b>Moderate</b> <ul style="list-style-type: none"> <li>- Perimandibular space</li> <li>- Submandibular</li> <li>- Sublingual</li> <li>- Submental</li> <li>- Masticator space</li> <li>- Submassesteric</li> <li>- Pterygomandibular</li> <li>- Superficial temporal</li> <li>- Deep temporal</li> </ul>

High/Severe	
- Compresses or deviates the airway	- Deep neck spaces
- Damages vital organs (brain, heart, lungs, skin)	- Lateral pharyngeal
	- Retropharyngeal
	- Pretracheal
	- Danger space
	- Mediastinum
	- Intracranial infection
	- Cavernous sinus thrombosis
	- Brain abscess
	- Necrotizing faciitis

## Common Patterns of Spread

Maxillary Teeth	Mandibular Teeth
<ul style="list-style-type: none"> <li>- Infraorbital</li> <li>- Buccal</li> <li>- Intratemporal</li> <li>- Maxillary sinus</li> <li>- Cavernous Sinus Thrombosis</li> </ul> <p>**Lose nasolabial fold with Infraorbital space infections**</p> <p>*can feel induration intraorally with Infraorbital space infections*</p>	<ul style="list-style-type: none"> <li>- Space of the body of the mandible</li> <li>- Perimandibular spaces</li> <li>- Submandibular</li> <li>- Sublingual</li> <li>- Masticator space</li> <li>- Submasseteric</li> <li>- Pterygomandibular</li> <li>- Superficial temporal</li> <li>- Deep temporal</li> </ul> <p>*Submandibular space infection...Pt will have problems opening and we cannot feel the inferior border of the mandible*</p>

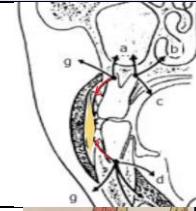
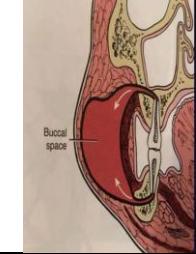


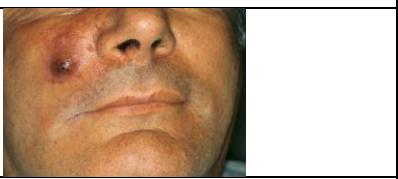
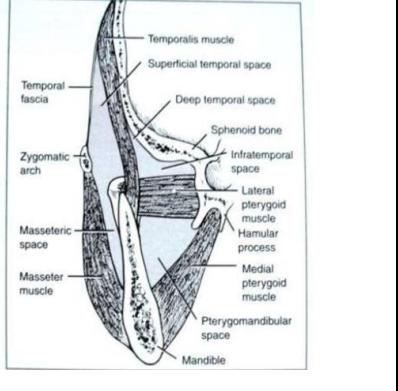
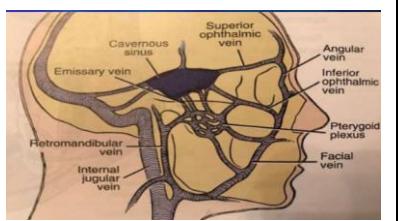
**Figure 53.2** Various routes of spread for odontogenic infections.

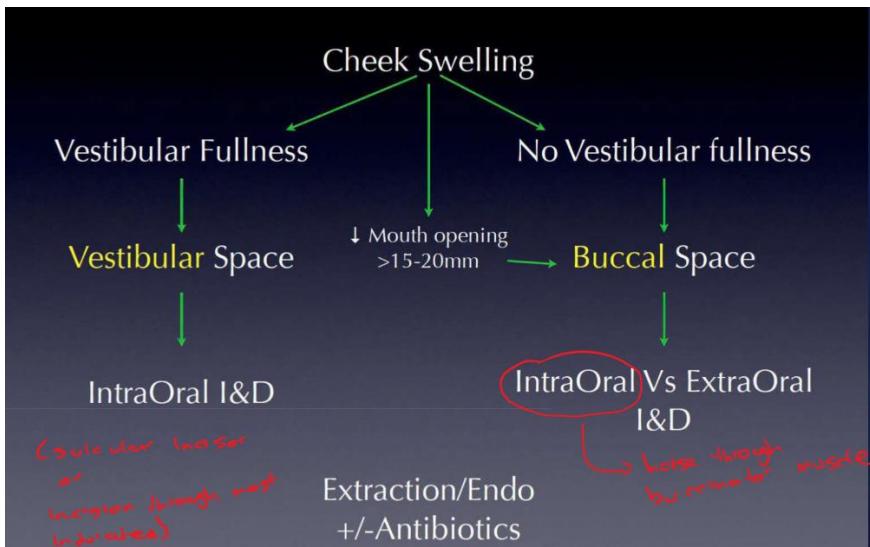
## Spaces Summary

Space	Likely Cause	Contents	Adjacent Spaces	I&D Approach
Buccal	Upper Premolars and Molars Lower Premolars	Parotid duct Anterior facial arteries and veins Transverse facial A & V's Buccal Fat Pad	Infraorbital Pterygomandibular Infratemporal	Intraoral (small) Extraoral
Infraorbital	Upper Canine	Angular A & V's Infraorbital nerve	Buccal	Intraoral
Submandibular	Lower Molars	Submandibular gland Facial A & V's Lymph nodes	Sublingual Submental Lateral pharyngeal Buccal	Extraoral
Submental	Lower Anteriors Fracture of symphysis	Anterior Jugular vein Lymph Nodes	Submandibular (bilateral)	Extraoral
Sublingual	Lower premolars and molars Direct trauma	Sublingual glands Wharton's Duct Lingual nerve Sublingual A & V's	Submandibular Lateral Pharyngeal Visceral (trachea and esophagus)	Intraoral Extraoral
Pterygomandibular	Lower 3 <sup>rd</sup> molars Angle of the mandible fracture	Mand. Division of trigeminal nerve (V3) Inferior Alveolar A & V	Buccal Lateral pharyngeal Deep temporal Parotid Peritonsillar	Intraoral Extraoral
Submasseteric	Lower 3 <sup>rd</sup> molars Angle of the mandible fracture	Masseteric A & V	Buccal Pterygomandibular Superficial temporal Parotid	Intraoral Extraoral
Infratemporal and Deep Temporal	Upper Molars	Pterygoid Plexus Internal maxillary A & V Mandibular Div. of Trigeminal nerve (V3) Skull base foramina	Buccal Superficial Temporal Interior petrosal sinus	Intraoral Extraoral
Superficial Temporal	Upper Molars Lower Molars	Temporal Fat pad Temporal branches of Facial Nerve (CN VII)	Buccal Deep temporal	Intraoral Extraoral
Lateral Pharyngeal	Lower 3 <sup>rd</sup> molars Tonsillar infection in neighboring spaces	Carotid artery Internal jugular vein Vagus nerve Cervical sympathetic chain	Pterygomandibular Submandibular Sublingual Peritonsillar Retropharyngeal	Intraoral

## Infections from Maxillary Teeth

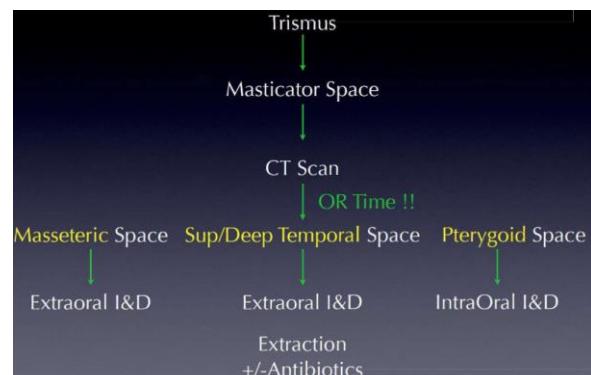
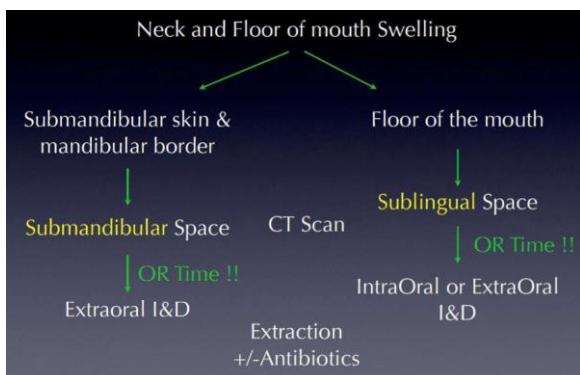
Space	Features	Images
Vestibular Space	<ul style="list-style-type: none"> <li>- Cheek Swelling</li> <li>- <b>Vestibular Fullness</b></li> <li>- <b>No decrease in mouth opening</b></li> <li>- Drainage <b>medial of buccinator insertion</b></li> </ul>	
Buccal Space	<ul style="list-style-type: none"> <li>- <b>Swelling below zygomatic arch and above inferior border of the mandible</b></li> <li>- <b>No vestibular fullness</b></li> <li>- <b>↓ Mouth opening (&lt;15-20mm)</b></li> <li>- <b>Pain on opening</b></li> <li>- Drainage <b>superior to the attachment of the buccinator</b> (in maxilla)</li> <li>- Bound by overlying skin laterally and the buccinator muscle medially</li> </ul>	

<b>Palatal Space</b>	<ul style="list-style-type: none"> <li>- Don't always assume palatal swelling is salivary gland pathosis (still need vitality and probing tests)</li> <li>- Usually not the drainage path (bone is thicker here)</li> <li>- Palatal root infection may erode the bone here</li> </ul>	
<b>Infraorbital Space</b>	<ul style="list-style-type: none"> <li>- Space between levator anguli oris and levator labii superioris</li> <li>- Usually Canine teeth are involved</li> <li>- Considered an extension from the buccal space</li> <li>- <b>Nasolabial fold fullness/swelling</b></li> </ul>	
<b>Infratemporal Space</b>	<p><u>Borders:</u></p> <ul style="list-style-type: none"> <li>- Medial: Lateral pterygoid plate</li> <li>- Superior: Base of skull</li> </ul> <p><u>Contents:</u></p> <ul style="list-style-type: none"> <li>- Branches of interior maxillary artery,</li> <li>- Pterygoid venous plexus,</li> <li>- Emissary veins</li> </ul> <p style="color: red;">**Blood born infections can travel through these vessels to form Cavernous Sins Infection**</p> <p><u>Common Causes:</u></p> <ul style="list-style-type: none"> <li>- Maxillary 3<sup>rd</sup> molar</li> </ul>	
<b>Maxillary Sinus</b>	<p>*20% of maxillary sinusitis cases are odontogenic in origin*</p> <ul style="list-style-type: none"> <li>- Periapical or Periodontal infections of <b>posterior maxillary teeth</b> can erode through floor of sinus</li> <li>- <b>May spread superiorly into ethmoid sinus or the orbital floor</b> -&gt; Periorbital infection</li> </ul>	
<b>Cavernous Sinus</b> (very rare but very serious)	<p>Occurs if:</p> <ul style="list-style-type: none"> <li>- <b>Infection erodes into infratemporal vein</b> (in the infratemporal space)</li> <li>- <b>Infection erodes into inferior ophthalmic vein</b> (in max. sinuses) -&gt; through superior orbital fissure -&gt; <b>Cavernous sinus</b></li> </ul> <p>Cavernous Sinus Thrombosis:</p> <ul style="list-style-type: none"> <li>- Intravascular inflammation -&gt; <b>Clotting pathways stimulated by invading bacteria</b></li> </ul>	

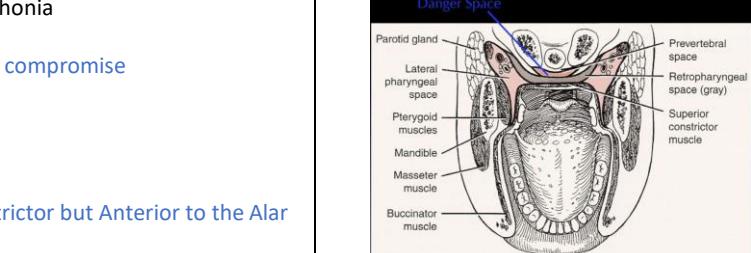
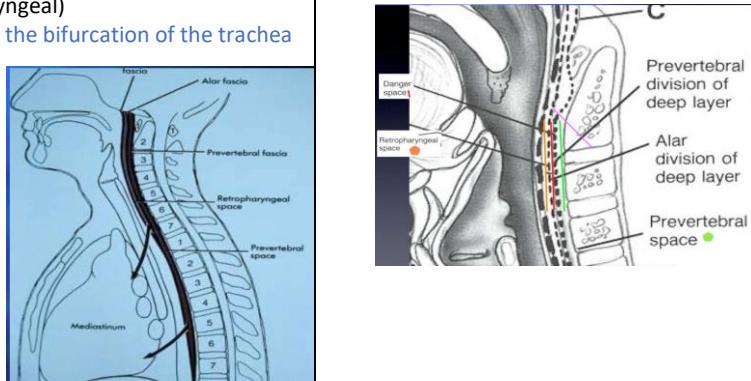


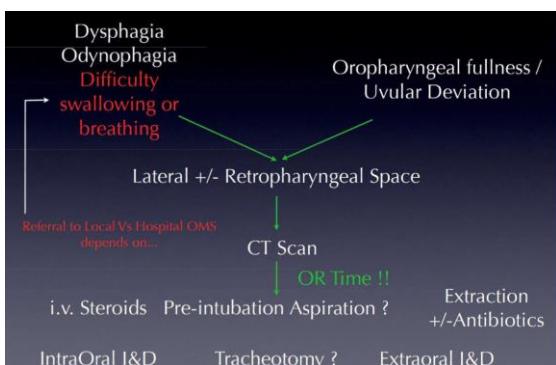
## Infections from Mandibular Teeth

Space	Features	Images
<b>Submandibular Space</b>	<p>*Extraoral swelling, cannot palpate the border of the mandible*</p> <p><b>Borders:</b></p> <ul style="list-style-type: none"> <li><u>Anterior</u>: Anterior belly of Digastric muscle</li> <li><u>Posterior</u>: Posterior belly of digastric muscle, styloid, and stylopharyngeous muscles</li> <li><u>Superior</u>: Mandible</li> <li><u>Inferior</u>: Digastric tendons</li> </ul> <p><b>Origin:</b></p> <ul style="list-style-type: none"> <li>Lingual perforation from mandibular molars and premolars</li> <li><b>Inferior to Mylohyoid</b> = Submandibular space</li> <li><b>Superior to mylohyoid</b> = Sublingual space</li> </ul>	
<b>Sublingual Space</b>	<p>*Bilateral FOM swelling with elevated tongue*</p> <p>Lies between FOM mucosa and the mylohyoid muscle</p> <ul style="list-style-type: none"> <li>Communicates with submandibular space <i>posteriorly</i> (wraps around mylohyoid muscle)</li> </ul> <p><b>Origin:</b></p> <ul style="list-style-type: none"> <li>Premolars and Molars</li> </ul>	
<b>Submental Space</b>	<p>*No FOM swelling*</p> <p>Lies between superficial investing fascia and anterior bellies of the digastric muscles</p> <p><b>Origin:</b></p> <ul style="list-style-type: none"> <li>Mandibular Anteriors</li> </ul>	
<b>Ludwig's Angina</b>	<p>*Submandibular + Sublingual + Submental Spaces bilaterally involved*</p> <p>= Rapidly spreading cellulitis that can obstruct the airway and spread into the posterior deep spaces of the neck</p> <p><b>Clinically:</b></p> <ul style="list-style-type: none"> <li>Trismus</li> <li>Drooling</li> <li>Difficulty swallowing and breathing</li> </ul>	
<b>Masticator Space</b>	<p>*Major Sign: Trismus (&lt;10-15mm opening)*</p> <p>Formed by splitting the superficial layer of the deep cervical fascia surrounding the muscles of mastication</p> <p><b>4 Compartments:</b></p> <ol style="list-style-type: none"> <li>Masseteric Space</li> <li>Pterygomandibular Space</li> <li>Superficial Temporalis Space</li> <li>Deep Temporalis Space</li> </ol>	



## Deeper Spaces

Space	Features	Images
Lateral and Retropharyngeal Space	<p><b>S/S:</b></p> <ul style="list-style-type: none"> <li>- Dysphagia, Odynophagia, Dysphonia</li> <li>- Drooling</li> <li>- Difficulty breathing and airway compromise</li> <li>- Uvular Deviation</li> <li>- Oropharyngeal fullness</li> </ul> <ul style="list-style-type: none"> <li>- Posterior to the Superior Constrictor but Anterior to the Alar layer of prevertebral fascia</li> <li>- Lateral Pharyngeal space ends at the hyoid bone (but is continuous with the retropharyngeal)</li> <li>- <b>Retropharyngeal space ends at the bifurcation of the trachea (T1-T2)</b></li> </ul>  	
Danger Space	<p><b>S/S:</b></p> <ul style="list-style-type: none"> <li>- Upper chest/lower neck erythema</li> <li>- Increased malaise</li> <li>- Toxic appearance</li> <li>- Difficulty breathing</li> </ul> <p><b>Location:</b></p> <ul style="list-style-type: none"> <li>- Between Alar and Prevertebral layers of the prevertebral fascia</li> <li>- Base of skull down to the Mediastinum</li> </ul>	
Pre-vertebral Space	<p><b>Locations</b></p> <ul style="list-style-type: none"> <li>- Between prevertebral layer of prevertebral fascia and the vertebral bodies</li> </ul> <p><b>Etiology:</b></p> <ul style="list-style-type: none"> <li>- Vertebral bodies' infections (Staph in IV drug users, TB etc)</li> </ul>	
Deep Cervical Necrotizing Fasciitis	<p><b>**Implement Broad spectrum IV antibiotics ASAP and provide airway support**</b></p> <p>Mortality Rate: 20% (w/ tx) ; 73% (w/o tx)</p> <p><b>Patho:</b></p> <ul style="list-style-type: none"> <li>- Mixed aerobic and anaerobic bacteria <ul style="list-style-type: none"> <li>- Strep. Pyogenes, Staph. Aurus, Strep. Viridans, Prevotella, Peptostreptococci, Bacteroides, and Clostridium</li> </ul> </li> </ul>	



### Referral for Aggressive Tx

- Rapidly progressive infection
- Dyspnea (Difficulty breathing)
- Dysphagia (Difficulty swallowing)
- Dehydration
- Deep Fascial Space involvement
- Elevated temperature
- Trismus (<20mm)
- Malaise and toxic appearance
- Compromised host defenses

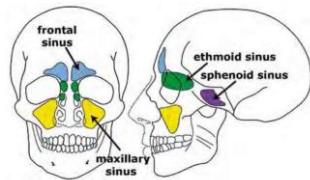
## Other Infections

<b>Osteomyelitis</b>	<p>= <b>Inflammation of the bone</b></p> <ul style="list-style-type: none"> <li>- Usually begins in the medullary cavity (Cancellous bone)</li> <li>- Spreads to the cortical bone and eventually into the periosteum</li> <li>- Invasion of bacterial causes ST inflammation and edema</li> <li>- Compromises the blood supply and then causes tissue necrosis</li> <li>- Ischemia and cellular bone components necrosis</li> </ul> <p><b>*Failure of microcirculation in the cancellous bone is a critical factor*</b></p> <p><b>Mandible more common than maxilla</b> -&gt; B/c ↓ blood supply</p> <ul style="list-style-type: none"> <li>- Mandibular blood supply = inferior alveolar artery (Dr. Matthew said before that it was the periosteum...). B/c of dense cortical bone, mand. Cancellous bone is more likely to become ischemic</li> </ul> <p><b>Causes and predisposing factors:</b></p> <ul style="list-style-type: none"> <li>- Poor host defense</li> <li>- Diabetes, Alcoholism, IV drugs, Malnutrition, Leukemia, Sickle cell disease, Chemo</li> </ul> <p><b>Bacteria involved:</b></p> <ul style="list-style-type: none"> <li>- Streptococci, Peptostreptococcus, Fusobacterium, Prevotella</li> </ul> <p><b>Radiography:</b></p> <ul style="list-style-type: none"> <li>- Little radiographic changes for 10-12 days</li> <li>- ↑ Radiolucency, patchy "moth-eaten" appearance</li> <li>- Radiopaque areas = sequestra of bone that have not been resorbed</li> </ul> <p><b>Tx:</b></p> <ul style="list-style-type: none"> <li>- Surgical removal of causative factors (Exo of teeth, Loose bone, Reduction and stabilization of fracture)</li> <li>- Antibiotics: Clindamycin, Penicillin, Fluoroquinolones -&gt; 6wks -6 months of Tx</li> </ul>	
<b>Air Emphysema</b>	<p>= Air entering deeper tissue planes</p> <ul style="list-style-type: none"> <li>- Severity is related to the depth of layer involved</li> <li>- Can lead to onset of infection due to bacterial contamination</li> <li>- Can be a sign of necrotizing faciitis</li> </ul>	
<b>Actinomycosis</b>	<p><b>**<i>Actinomyces israelii, A. naeslundii, A. Viscosus</i>**</b></p> <ul style="list-style-type: none"> <li>- <b>Anaerobic bacteria</b> (once thought to be an anaerobic fungus)</li> <li>- Low virulence = Uncommon infection</li> </ul> <p>Usually multiple sinus tracts develop as bacteria burrows through tissue planes</p> <p><b>Tx:</b></p> <ul style="list-style-type: none"> <li>- I&amp;D + Antibiotic therapy -&gt; IV Penicillin, Doxycycline, Clindamycin</li> </ul>	
<b>Candidiasis</b>	<p>= <i>Candida Albicans</i></p> <p><b>Risks:</b></p> <ul style="list-style-type: none"> <li>- Compromised host defenses (AIDS, Chemotherapy, Diabetes, Leukemia etc)</li> <li>- Prolonged use of antibiotics (especially penicillin)</li> </ul>	

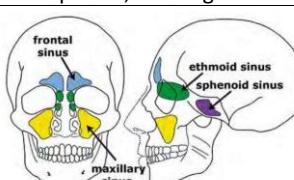
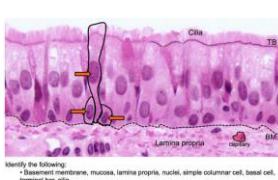
	<p><b>Tx:</b></p> <ul style="list-style-type: none"> <li>- Topical antifungals -&gt; Nystatin or Clotrimazole (lozenges)           <ul style="list-style-type: none"> <li>- <b>4-5x/day for 2 weeks</b></li> </ul> </li> <li>- Check dentures and clean well</li> </ul> <p><b>Subtypes:</b></p> <table border="1"> <tbody> <tr> <td><b>Pseudomembranous</b></td><td>White patches that can be rubbed off, exposing an underlying red raw surface</td><td></td></tr> <tr> <td><b>Erythematous Candidiasis</b></td><td>Raw surface or loss of filiform papillae of the tongue</td><td></td></tr> <tr> <td><b>Angular Cheilitis</b></td><td>White ulcerated patches in the corners of the mouth</td><td></td></tr> </tbody> </table>	<b>Pseudomembranous</b>	White patches that can be rubbed off, exposing an underlying red raw surface		<b>Erythematous Candidiasis</b>	Raw surface or loss of filiform papillae of the tongue		<b>Angular Cheilitis</b>	White ulcerated patches in the corners of the mouth	
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<b>MRONJ</b>		<p><b>Dx:</b></p> <ul style="list-style-type: none"> <li>- Presence of necrotic bone for 8 weeks</li> <li>- No Hx of radiation</li> <li>- Previous (or current use) of Bisphosphonates PO or IV</li> </ul> <p><b>Rank-L inhibitors:</b></p> <ul style="list-style-type: none"> <li>- Denosumab (Prolia or Xgeva)</li> </ul> <p><b>Antiangiogenic Medications:</b></p> <ul style="list-style-type: none"> <li>- Tyrosine Kinase inhibitors</li> </ul> <p><b>Bisphosphonates</b></p> <ul style="list-style-type: none"> <li>- Inhibit osteoclast functions</li> <li>- Low GI absorption of oral = cumulative effect in bone over time</li> <li>- IV's accumulate in bone much quicker (bypasses GI absorption)</li> <li>- <math>\frac{1}{2}</math> life &gt; 10 years</li> </ul> <table border="1"> <thead> <tr> <th>Oral</th><th>IV</th></tr> </thead> <tbody> <tr> <td>Alendronate (Fosamax) Risedronate (Actonel) Ibandronate (Boniva)</td><td>Ibandronate (Boniva) Zoledronate (Zometa) Pamidronate (Aredia)</td></tr> </tbody> </table>	Oral	IV	Alendronate (Fosamax) Risedronate (Actonel) Ibandronate (Boniva)	Ibandronate (Boniva) Zoledronate (Zometa) Pamidronate (Aredia)				
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<p><b>Osteoporosis:</b></p> <ul style="list-style-type: none"> <li>- PO Bisphosphonates / SC Denosumab           <ul style="list-style-type: none"> <li>- &lt;4yrs, no other risk factors -&gt; NO DRUG HOLIDAY</li> <li>- &lt;4yrs, had steroids or other risk factors (Perio disease, immunocompromise, anemia, DM, Steroid use) -&gt; YES 2 month drug holiday</li> <li>- &gt;4yrs -&gt; YES, 2 month drug holiday</li> </ul> </li> </ul> <p><b>Cancer:</b></p> <ul style="list-style-type: none"> <li>- Poor data to suggest drug holiday</li> </ul>										

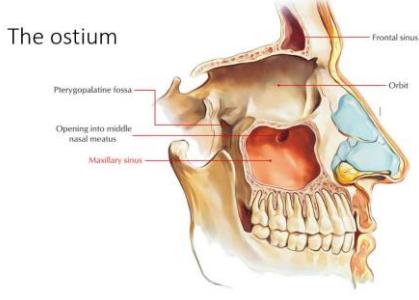
# Odontogenic Diseases of the Maxillary Sinus

Some initial definitions:

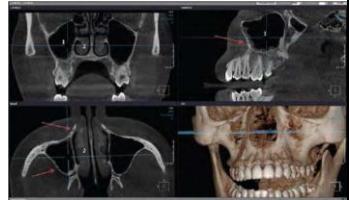
<b>Sinus</b>	= air cavities in the cranial bones - Usually 4 pairs in the skull: <b>Frontal, Maxillary, Ethmoid, Sphenoid</b>	
<b>Dental Sinus</b>	= lesion characterized by a soft, erythematous papule (red spot) that develops on the alveolar process in association with a non-vital tooth + accompanied by a dental abscess	
<b>Fistula</b>	= <b>Epithelial tracts that connects 2 external surfaces</b> - Ex: Oroantral fistula	

## Sinuses

<b>Embryology</b>	Develop as <b>pneumatization of bone and out-pocketing of the respiratory nasal epithelium</b> - Formation begins at <b>10 weeks</b> (Gestational Age) -> Primary pneumatization - In fetal development Secondary pneumatization enlarges the spaces								
	<b>Maxillary Sinus:</b> - <b>Largest</b> of the 4 pairs - Develops at 60-70 days embryonic development (about 10 <sup>th</sup> week) - Forms as an outpouching of lateral wall of ethmoid area of the nasal capsule (w/i the infundibulum and posterior to the uncinate process) - Primary pneumatization progresses as invagination expands into the cartilaginous nasal capsule - Secondary pneumatization: 5 <sup>th</sup> month fetal development, as invaginations expand into the maxillary bone								
<b>Anatomy</b>	4 Pairs of paranasal sinuses: - <b>Frontal Sinus</b> - <b>Sphenoid Sinus</b> - <b>Ethmoidal Sinus</b> - <b>Maxillary Sinus</b>								
	  Maxillary Sinus Ostium -> Drains into the infundibulum -> Joins the hiatus semilunaris -> drains into the <b>middle meatus</b> - Ostiomeatus Unit = Frontal sinus ostium, frontal sinus drainage pathway, maxillary sinus ostium, infundibulum, and middle meatus - Described as a 4 sided Pyramid extending anteriorly to the 1 <sup>st</sup> premolar or canine								
<table border="1"> <tr> <td><b>Base</b></td><td>Vertically on the medial surface to form lateral nasal wall</td></tr> <tr> <td><b>Apex</b></td><td>Extends laterally into zygomatic process</td></tr> <tr> <td><b>Upper wall (roof)</b></td><td>Floor of the orbit</td></tr> <tr> <td><b>Posterior wall</b></td><td>Follows the length of the maxilla and dips into the max. tuberosity</td></tr> </table> <ul style="list-style-type: none"> <li>- Volume = 15-20mL</li> <li>- Function: <b>Moisten inspired air, lighten the skull, provide vocal resonance</b></li> </ul>		<b>Base</b>	Vertically on the medial surface to form lateral nasal wall	<b>Apex</b>	Extends laterally into zygomatic process	<b>Upper wall (roof)</b>	Floor of the orbit	<b>Posterior wall</b>	Follows the length of the maxilla and dips into the max. tuberosity
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 <p><b>Schneiderian Membrane:</b> Sinus lining of <b>Respiratory Pseudo-stratified ciliated columnar epithelium</b> - Secretes mucus - Cilia beat at 1000 strokes/min and moves mucous 6mm/min. -&gt; Draws mucus up to the osteum for drainage into the nasal cavity</p>									

<b>Maxillary Ostium</b>	<p>Located high on the medial wall (2.4mm diameter)</p> <ul style="list-style-type: none"> <li>- Infection ↓ function of the cilia and leads to stasis of mucous -&gt; this further ↑ risk of bacterial infection</li> <li>- Location of the ostium high on the wall predisposes the maxillary sinus to stasis</li> </ul> <p>The location doesn't really make much sense....but it did before we learned to walk upright on 2 legs</p> <p>Stasis Tx:</p> <ul style="list-style-type: none"> <li>- Neti Pot!</li> </ul>  <p>-&gt; That's hot</p>	 <p>The ostium</p> <p>Frontal sinus</p> <p>Pterygopalatine fossa</p> <p>Opening into middle nasal meatus</p> <p>Maxillary sinus</p> <p>Orbit</p>
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## Examinations:

<b>Clinical</b>	<ul style="list-style-type: none"> <li>- Visual exam of face, intraoral vestibule -&gt; Check for redness or swelling</li> <li>- Check for <a href="#">nasal discharge</a></li> <li>- <a href="#">Percussion</a> -&gt; Tap lateral walls of sinus externally over cheek bones</li> <li>- <a href="#">Palpation</a> -&gt; Intraorally on the lateral surface of maxilla (Btwn canine fossa and zygomatic buttress)</li> <li>- <a href="#">Transillumination</a> -&gt; Place bright light against mucosa on the palatal or facial surfaces of the sinus. If filled with fluid it will not glow</li> </ul> 
<b>Radiographic</b>	<p>Can use PA and Pan for conventional images...if need more info then use CBCT</p>    <p><b>Waters View</b></p> <ul style="list-style-type: none"> <li>- Head tipped 37° to the central beam -&gt; places the maxillary sinus above the temporal bones to ↓ overlap</li> </ul> <p><b>Lateral Ceph:</b></p> <ul style="list-style-type: none"> <li>- May also be useful, tip the Pt head again so there is no superimposition</li> </ul> <p><b>If there are issues you will see:</b></p> <ul style="list-style-type: none"> <li>- Air filled level, Thickened mucosa on any or all walls, or complete opacification of the sinus</li> <li>- May see perforation of the walls or expansion also</li> </ul> 

## Sinusitis

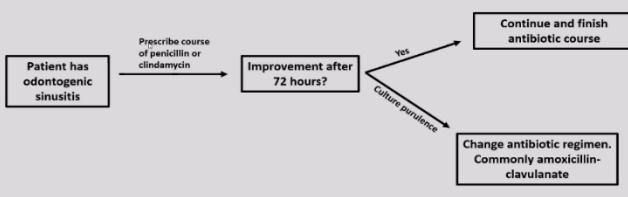
<b>Non-Odontogenic</b>							
<ul style="list-style-type: none"> <li>- Non-odontogenic infections -&gt; Inflammation from infection, or allergy</li> <li>- Pansinusitis = inflammation of most or all of the paranasal sinuses simultaneously</li> </ul>							
<b>Maxillary Sinusitis</b>	<p><b>Microbiology:</b></p> <ul style="list-style-type: none"> <li>- Aerobic, Anaerobic, or Mixed bacterial etiologies are all possible</li> </ul> <table border="1" data-bbox="332 1522 1530 1733"> <thead> <tr> <th data-bbox="332 1522 915 1586">Important Aerobes Most commonly the issue</th><th data-bbox="915 1522 1530 1586">Important Anaerobes</th></tr> </thead> <tbody> <tr> <td data-bbox="332 1586 915 1733">Strep. Pneumoniae, Haemophilus influenzae, Branhamella catarrhalis</td><td data-bbox="915 1586 1530 1733">Strep. Viridans Staph aureus Enterobacteriaceae Porphyromonas Prevotella</td></tr> </tbody> </table> <p><b>S/S:</b></p> <ul style="list-style-type: none"> <li>- <a href="#">Epiphora</a> (Excessive tear formation)</li> <li>- <a href="#">Decreased ocular movement</a></li> <li>- <a href="#">Exophthalmos</a> (bulging of the eyes)</li> <li>- <a href="#">Pain</a> (especially with postural change)</li> </ul> <p><b>Predisposing Factors:</b></p> <ul style="list-style-type: none"> <li>- Deviated nasal septum</li> <li>- Immunocompromise</li> </ul>			Important Aerobes Most commonly the issue	Important Anaerobes	Strep. Pneumoniae, Haemophilus influenzae, Branhamella catarrhalis	Strep. Viridans Staph aureus Enterobacteriaceae Porphyromonas Prevotella
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	<p><b>Tx:</b></p> <ul style="list-style-type: none"> <li>- Early humidification of inspired air to loosen dried secretions</li> <li>- Systemically administered decongestants (Pseudoephedrine) and Nasal Sprays</li> </ul>				
<b>Acute Sinusitis</b>	<ul style="list-style-type: none"> <li>= Moderate to severe, constant pain over antrum/cheek</li> <li>- <b>Commonly mistaken as dental pain</b></li> </ul> <p><b>S/S:</b></p> <ul style="list-style-type: none"> <li>- Pyrexia</li> <li>- Rapidly developing <b>pain/pressure/fullness</b></li> <li>- Tenderness on <b>posture change</b> (leaning head forward, going down stairs)</li> <li>- Mucopurulent discharge from nose</li> <li>- <b>Facial swelling and edema of cheek</b></li> <li>- Check and teeth tender to percussion -&gt; DO EPT to ensure tooth vitality</li> </ul> <p><b>Treatment:</b></p> <ul style="list-style-type: none"> <li>- Broad-spectrum Ab to target H. influenzae, A. Aureus, S. pneumoniae -&gt; <b>Amoxicillin, Trimethoprim-Sulfamethoxazole, Amox-Clav, Azithromycin, Defuroxime</b></li> <li>- Nasal decongestants</li> <li>- Inhalations</li> <li>- Analgesics</li> </ul>				
<b>Chronic Sinusitis</b>	<ul style="list-style-type: none"> <li>= Persisting inflammation of sinus for <b>at least 3 months</b> <ul style="list-style-type: none"> <li>- Episodes of sinus disease that respond initially to Tx, but then return or never respond to Tx</li> </ul> </li> </ul> <p><b>Predisposing factors:</b></p> <ul style="list-style-type: none"> <li>- Poor drainage</li> <li>- Nasal polyps</li> <li>- Deviated septum (due to trauma, cocaine abuse, virulent infection)</li> <li>- Smoking</li> <li>- Immunocompromise</li> <li>- Asthma</li> <li>- Allergic rhinitis</li> </ul> <p><b>S/S:</b></p> <ul style="list-style-type: none"> <li>- ↓ smell and taste</li> <li>- Dull nagging pain (<b>this is a big difference vs acute sinusitis</b>)</li> <li>- Dental Pain</li> <li>- Headache</li> <li>- Halitosis</li> <li>- Swelling of cheek</li> <li>- Earache</li> <li>- ↑ snoring</li> </ul> <p><b>Treatment:</b> -&gt; More difficult than acute</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #90EE90;"> <th style="text-align: center; padding: 2px;">Surgical</th> <th style="text-align: center; padding: 2px;">Medical</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;"> <ul style="list-style-type: none"> <li>- Surgical cleansing is rarely successful and should not be attempted</li> <li>- <b>Dilation of the Ostium</b> -&gt; use balloon catheter</li> <li>- <b>Functional Endoscopic Sinus Surgery</b> -&gt; 90% success</li> </ul> </td> <td style="padding: 2px;"> <ul style="list-style-type: none"> <li>- <b>Long-term Ab</b> (6 weeks doxycycline or another macrolide)</li> <li>- Topical <b>nasal steroids</b></li> <li>- <b>DON'T</b> use topical nasal decongestants (rebound effect makes things worse)</li> </ul> </td> </tr> </tbody> </table>	Surgical	Medical	<ul style="list-style-type: none"> <li>- Surgical cleansing is rarely successful and should not be attempted</li> <li>- <b>Dilation of the Ostium</b> -&gt; use balloon catheter</li> <li>- <b>Functional Endoscopic Sinus Surgery</b> -&gt; 90% success</li> </ul>	<ul style="list-style-type: none"> <li>- <b>Long-term Ab</b> (6 weeks doxycycline or another macrolide)</li> <li>- Topical <b>nasal steroids</b></li> <li>- <b>DON'T</b> use topical nasal decongestants (rebound effect makes things worse)</li> </ul>
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<b>Odontogenic</b>	<ul style="list-style-type: none"> <li>- About 10-12% of all maxillary sinusitis'</li> <li>- Can spread to other paranasal sinuses if left untreated -&gt; can lead to <b>orbital cellulitis, cavernous sinus thrombosis, meningitis, osteomyelitis, intracranial abscess and even death!</b></li> </ul> <p><b>Main causative microbes:</b></p> <ul style="list-style-type: none"> <li>- Aerobic and anaerobic Strep.</li> <li>- Anaerobic bacteroides, Enterobacteriaceae, Peptococcus, Peptostreptococcus, Porphyromonas, Prevotella, Eubacterium</li> </ul> <p><b>Tx:</b></p> <ul style="list-style-type: none"> <li>- Antibiotics to target the aerobic and anaerobic Strep + Bacteroides and Enterobacteriaceae -&gt; Penicillin, Clincamycin, Metronidazole</li> </ul>				

# Antimicrobial Management

- Antibiotics should be effective against odontogenic infection
  - Penicillin
  - Clindamycin
  - Metronidazole
- If possible obtain purulent sample
  - May necessitate antibiotic change
  - 25% produce beta lactamase

# Decision Tree



## Antral Pseudocysts

Differential Dx	<p><b>Pseudocysts</b> -&gt; found in 2-10% of pan radiographs</p> <ul style="list-style-type: none"> <li>- An accumulation of serum (not sinus mucus) under the sinus mucosa</li> <li>- <b>No Tx required</b></li> </ul> <p><b>Mucous retention cysts</b></p> <ul style="list-style-type: none"> <li>- Blockage of ducts within the sinus glands. Accumulated mucus get surrounded by epithelium.</li> </ul> <p><b>Mucoceles</b></p> <ul style="list-style-type: none"> <li>- Cystic lesion lined with epithelium</li> <li>- Common cause is actually sinus surgery when sinus lining is separated from the sinus</li> <li>- <b>Tx: Surgical removal + Biopsy</b></li> </ul>
Management	Usually they are asymptomatic -> No surgical intervention

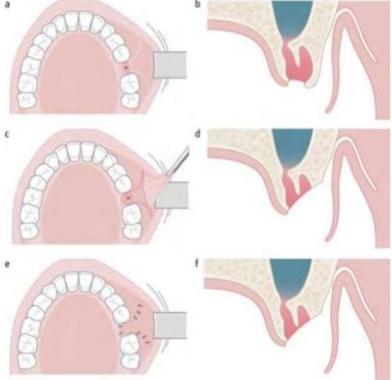
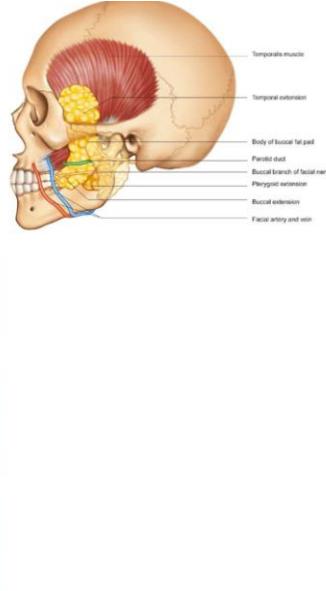
## Operative Complications involving the Sinus

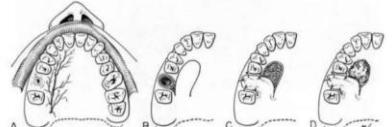
### Oroantral Communications

**Maxillary 2<sup>nd</sup> molar** = Closest relationship with the floor of the Max. antrum

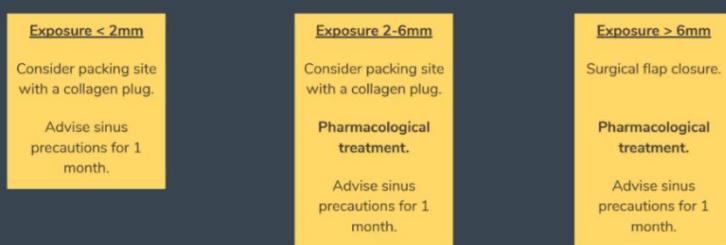
- 2<sup>nd</sup> molar -> 1<sup>st</sup> Molar -> 3<sup>rd</sup> Molar -> 2<sup>nd</sup> Premolar -> 1<sup>st</sup> Premolar -> Canine

Oroantral Communication/Fistula	<p><b>Communication (OAC)</b> – Open communication between oral cavity and the maxillary sinus</p> <ul style="list-style-type: none"> <li>- Most common in 3-4<sup>th</sup> decades</li> <li>- <b>Small OAC resolve spontaneously</b> -&gt; refrain from blowing nose for 2-3 weeks</li> </ul> <p><b>Fistula (OAF)</b> – Communication between oral cavity and the maxillary sinus lined by epithelium</p> <ul style="list-style-type: none"> <li>- Result of an OAC that has failed to heal spontaneously -&gt; connection has epithelialized</li> <li>- Dental abscess, cyst, foreign body, or defect &gt;5mm may prevent closure of the OAC</li> </ul>
Pre-disposing factors	<ul style="list-style-type: none"> <li>- Proximity of the tooth roots to the antrum floor</li> <li>- <b>Infra-occluded</b> (submerged teeth)</li> <li>- Lone-standing molar tooth (<b>Pneumatization on either side</b>)</li> <li>- <b>Hypercementosis</b> or root shape -&gt; Bulbous roots or bony sclerosis</li> <li>- Loss of periapical bone b/c periodontal disease, periapical granuloma or cyst</li> <li>- Surgery within or <b>close to the sinus</b></li> <li>- Impacted Max. 3<sup>rd</sup> molars</li> <li>- <b>Intraoperative root fracture</b></li> <li>- Tuberosity fracture</li> <li>- Use of <b>excessive force</b></li> <li>- Cleft lip and Palate -&gt; associated soft tissue deficiencies prevent simple closure of defects</li> </ul>
Diagnosis	<p><b>At the time of surgery:</b></p> <ul style="list-style-type: none"> <li>-Antral lining at apex of the socket moves in time with respiration</li> <li>-<b>Bubbles</b> emanate from the socket</li> <li>-“Hollow” sound when using aspiration in the socket</li> <li>-Piece of concave bone, or fractured tuberosity attached to the roots</li> <li>-Post op radiograph shows defect in the antral floor -&gt; <b>This is not necessary for Dx though</b></li> </ul> <p><b>Post Surgery:</b></p> <ul style="list-style-type: none"> <li>-Maxillary sinusitis development after surgery</li> <li>-Regurgitation of fluids and foods into the nose</li> <li>-Nose bleeds</li> <li>-Chronic sinusitis and pain</li> <li>-Prolapse of antral mucosa into the mouth</li> </ul>
Management	<p><b>Conservative Approach</b></p> <ul style="list-style-type: none"> <li>- Gentle irrigation of socket -&gt; <b>debridement of sharp bone and removal of local irritants</b> (plaque, calculus etc)</li> <li>- Suture loose edges of the wound</li> </ul>

	<ul style="list-style-type: none"> <li>- Place <b>resorbable hemostatic agent</b> (Surgicel oxidized regenerated cellulose) into socket           <ul style="list-style-type: none"> <li>- This may provoke foreign body reaction in a few patients, and low pH can cause postop pain</li> </ul> </li> <li>- Can take alginate impression (with protective gauze over OAC) -&gt; Use to make vacuform splint to protect           <ul style="list-style-type: none"> <li>- <b>Wear 24hr/day for 2 weeks with Antral Precautions for 2 weeks</b></li> </ul> </li> <li>- Antibiotics (Penicillin) + Antihistamine + Systemic decongestant for 7-10 days</li> </ul>
<b>Surgical Management of OAC</b>	
<b>Factors to consider</b>	<ul style="list-style-type: none"> <li>- Size of defect</li> <li>- Previous surgery</li> <li>- Medical and smoking status</li> <li>- OHE</li> <li>- Pre-existing sinus pathology</li> <li>- Operator experience</li> <li>- Surgical technique chosen</li> </ul> <p><b>ONLY go surgical if:</b></p> <ul style="list-style-type: none"> <li>- Prior Tx failed</li> </ul>
<b>Buccal Advancement Flap</b> = Most common technique	<ul style="list-style-type: none"> <li>- High success rate! 93%</li> </ul> <p><b>Technique:</b></p> <ol style="list-style-type: none"> <li>1. Excise the fistula</li> <li>2. Lift a broad base 3-sided trapezoid flap</li> <li>3. <b>Incise the periosteum along the base of the flap horizontally to allow tension free closure</b></li> <li>4. Flap sutured to palatal mucosa with mattress suture</li> </ol> <p><b>Disadvantages:</b></p> <ul style="list-style-type: none"> <li>- ↓ buccal sulcus depth</li> <li>- Problems with future prosthetic rehab</li> <li>- Postop. Pain and swelling</li> </ul>  <ul style="list-style-type: none"> <li>a) Oroantral defect of #26 socket; mesial and distal incisions including the socket defect indicated.</li> <li>b) Axial view of the defect and the elevated buccal advancement flap.</li> <li>c) Raised flap near-vertical (with a slight angle for a wider base and to optimise the blood supply. Ensure the oranoantral fistula track is carefully excised to ensure fresh clean margins for repair.</li> <li>d) Axial view.</li> <li>e) Once the buccal flap is elevated, underscore the periosteum using a blade lightly to advance the buccal flap over the socket. The aim is to get the mucosal flap passively sitting over the fistula to maximise healing without tissue tension. It is not generally recommended to perform an 'alveolectomy' to improve passive advancement of the mucosal flap, as the authors would promote bone retention where possible, but this is an option.</li> <li>f) Axial section of the buccal advancement flap sutured passively in place</li> </ul>
<b>Buccal Fat Pad Advancement</b>	<p><b>Fat Pad = vascularized, lobulated mass of fatty tissue surrounded by a slight capsule</b></p> <ul style="list-style-type: none"> <li>- Found in the buccal tissue space -&gt; Mostly below and anterior to zygomatic arch and slightly superior and distal than the occlusal level of the 2<sup>nd</sup> and 3<sup>rd</sup> Max. molars</li> <li>- <b>Blood Supply:</b> Branches of the <b>superficial temporal, maxillary and facial arteries</b></li> </ul> <p><b>Technique:</b></p> 

	<p>a) Buccal incision, starting from the defect superiorly and posteriorly up into the buccal sulcus.</p> <p>b) Continue the incision down through the periosteum of the attached gingivae and up into approximately 1 cm of non-attached gingivae.</p> <p>c) Elevate subperiosteally under the mesial incision, reflecting the flap away from the buccal aspect of the lateral maxillary wall.</p> <p>d) Incise into the periosteum high under the zygomatic arch to release the buccal fat pad. Incise approximately 1 cm with a blade initially, then use curved scissors or a haemostat to carefully perform a blunt dissection superiorly and laterally until the fat pad herniates through the periosteum.</p> <p>e) Once the fat pad is exposed and released, continue careful blunt dissection to elevate it without compromising the stem (whereby the base or vascular supply will be lost).</p> <p>f) Continue dissection until the fat pad sits passively over the oroantral defect.</p> <p>g) Suture the fat pad passively over the defect, and ideally close it with an adjunctive second layer mucosal advanced flap).</p> <p>i) (and j) axial views.</p>				
	<table border="1"> <thead> <tr> <th style="background-color: #669966; color: white;">Advantages</th> <th style="background-color: #CC0000; color: white;">Disadvantages</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>- Close to surgical site</li> <li>- Quick Procedure</li> <li>- Good blood supply</li> <li>- Sulcus depth is unaffected</li> <li>- High success rate</li> </ul> </td><td> <ul style="list-style-type: none"> <li>- ↑ Postop pain and swelling</li> <li>- ↓ Mouth opening</li> <li>- Partial necrosis</li> </ul> </td></tr> </tbody> </table>	Advantages	Disadvantages	<ul style="list-style-type: none"> <li>- Close to surgical site</li> <li>- Quick Procedure</li> <li>- Good blood supply</li> <li>- Sulcus depth is unaffected</li> <li>- High success rate</li> </ul>	<ul style="list-style-type: none"> <li>- ↑ Postop pain and swelling</li> <li>- ↓ Mouth opening</li> <li>- Partial necrosis</li> </ul>
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<b>Palatal Pedicle Rotation Flap (Palatal finger flap)</b>	<p>Broad-based partial thickness flap extends anterior to the defect and is rotated to cover the defect</p> <ul style="list-style-type: none"> <li>- Leaves denuded area in the palate covered by periosteum -&gt; re-epithelialization will occur spontaneously, but can be covered with Whitehead's varnish on gauze, or Coe-Pak to protect during healing</li> </ul> <p><b>Indication:</b> Large defects, or defects with previous failure</p> <p><b>Blood Supply:</b> Greater palatine artery</p>  <table border="1"> <thead> <tr> <th style="background-color: #669966; color: white;">Advantages</th> <th style="background-color: #CC0000; color: white;">Disadvantages</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> <li>- Can raise a large amount of tissue with adequate blood supply</li> <li>- KT and thickness of palatal tissues resemble the crestal ridge tissues well</li> </ul> </td><td> <ul style="list-style-type: none"> <li>- Large area of exposed bone on the donor site (flap must be big enough to rotate and cover the defect)</li> </ul> </td></tr> </tbody> </table>	Advantages	Disadvantages	<ul style="list-style-type: none"> <li>- Can raise a large amount of tissue with adequate blood supply</li> <li>- KT and thickness of palatal tissues resemble the crestal ridge tissues well</li> </ul>	<ul style="list-style-type: none"> <li>- Large area of exposed bone on the donor site (flap must be big enough to rotate and cover the defect)</li> </ul>
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<b>Tongue Flap</b>  Only done for huge defects -> sucks a lot for the patient	<ul style="list-style-type: none"> <li>- Raise finger flap from the tongue -&gt; Suture the top of the flap into the defect (with flap is still attached to tongue)</li> <li>- Intermaxillary fixation for 2-3 weeks allows for healing -&gt; flap is divided from its base and sutured to defect (primary closure of the tongue as well)</li> </ul> 				

## Oroantral Communication Algorithm



## Pharmacological treatment

1. **Antibiotic** - prevent possible infection
  - a. Amoxicillin/clavulanate 250-500 mg TID, 5 days
  - b. If allergic to penicillin: clindamycin 300-450 mg QID, 5 days
2. **Antihistamine** - reduce congestion and inflammation
  - a. OTC 2nd-gen antihistamine (e.g. loratadine, fexofenadine, cetirizine)
3. **Nasal decongestant** - alpha-adrenergic activity leading to nasal vasoconstriction
  - a. e.g. phenylephrine
4. **NSAIDs/Acetaminophen** - pain management

## Maxillary Tuberosity Fractures

Fairly common complication, especially if:

- Old Patient with long standing maxillary molars
- Maxillary 3<sup>rd</sup> molar removal
- Maxillary molar exo with divergent roots or hypercementosis
- Exo of maxillary molars around pneumatized sinus
- Excessive force used

<b>Management</b>	<p><b>Option 1:</b> -&gt; Best if the fracture is large and incorporates the antral floor or adjacent teeth</p> <ul style="list-style-type: none"> <li>- Rigidly splint the tooth in situ -&gt; retry the exo in 6-8 weeks</li> </ul> <p><b>Option 2:</b></p> <ul style="list-style-type: none"> <li>- Removal of fractured tuberosity</li> <li>- Careful subperiosteal dissection of the mucoperiosteum off of the fragment</li> </ul> <p><b>Option 3:</b></p> <ul style="list-style-type: none"> <li>- Proceed w/ exo by surgically separating the tooth from as much of the bone as possible</li> <li>- This option is hard, and depends on adequate residual bone with undisturbed blood supply</li> </ul>
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## Displacement of object into the sinus

- Easily avoidable if you use appropriate techniques
- Palatal root of maxillary molars is the most commonly displaced

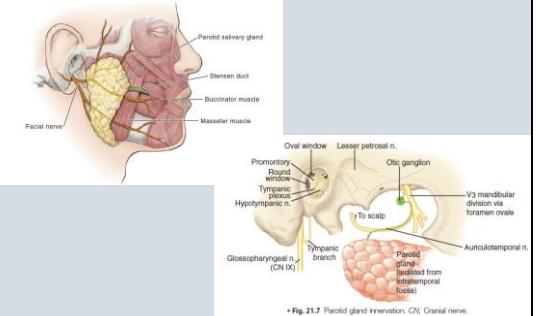
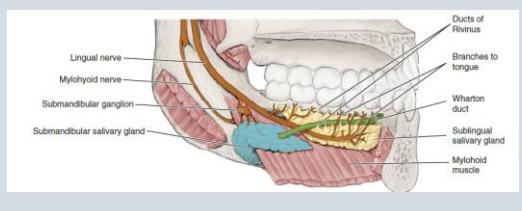
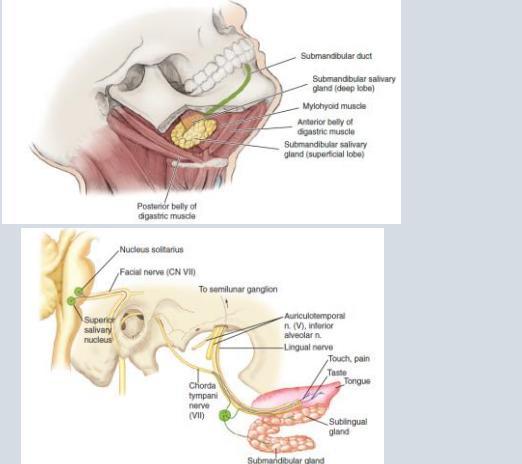
<b>Management</b>	<p>Immediate removal of foreign body is recommended</p> <ul style="list-style-type: none"> <li>- Double check that the patient did not feel themselves swallow or aspirate the fragment</li> <li>- Check the lingual sulci and oropharynx and the suction apparatus used</li> </ul> <ol style="list-style-type: none"> <li>1. Take a radiograph to determine the position of the root -&gt; PA, Occipitomental, occlusal or CBCT (this is the best)           <ul style="list-style-type: none"> <li>- If you still can't find it -&gt; Chest X-Ray</li> </ul> </li> <li>2. If there is an OAC -&gt; gently try to suction the fragment out (fine-tip suction)           <ul style="list-style-type: none"> <li>- If you can't get it right away -&gt; refer to specialist</li> </ul> </li> <li>3. Oral Surgeon may increase the size of the OAC to get the fragment out, or do a Caldwell-Luc anterior approach</li> </ol>
<b>Caldwell-Luc approach</b>	<ul style="list-style-type: none"> <li>- Raise a buccal flap to expose the maxillary wall</li> <li>- Create a bony window above and slightly posterior to the apex of the canine root -&gt; now you have direct vision into the sinus from the front</li> </ul>
<b>FESS</b>	<p>Endoscopic Sinus Surgery is very useful for accessing the maxillary sinus</p> <ul style="list-style-type: none"> <li>- Through an enlarged middle meatal antrostomy the entire maxillary sinus can be accessed</li> </ul>

## Maxillary Sinus Pathology

<b>Keratocystic Odontogenic Tumor (KCOT)</b>	<p>= Rare, accompanied by painless expansion of maxilla and complicated by sinusitis</p> <ul style="list-style-type: none"> <li>- Associated with mutations in the PTCH gene (Hedgehog signaling pathway)</li> </ul>
<b>Fibrous Dysplasia</b>	<p>Radiopaque lesion when in the sinus</p> <p>Orange-peel/ground glass appearance when its within the bone</p> <p>*If multiple bones involved (Polyostotic) consider McCune-Albright Syndrome*</p> <ul style="list-style-type: none"> <li>- Café au lait spots + endocrine disorder + polycystic ovaries + precocious puberty and pituitary adenoma</li> </ul>
<b>Paget's Disease</b>	<p>= 2<sup>nd</sup> most common metabolic bone disease (after osteoporosis)</p> <ul style="list-style-type: none"> <li>- Most common after 60 yrs (3% prevalence)</li> </ul> <p><b>Features:</b></p> <ul style="list-style-type: none"> <li>- ↑ bone resorption and bone deposition = bone pain and deformities           <ul style="list-style-type: none"> <li>- Antiresorptive drugs ↓ the depletion of Ca and are indicated as Tx</li> </ul> </li> <li>- Sclerosis of skull foramina may cause cranial nerve involvement</li> </ul> <p><b>Radiology:</b></p> <ul style="list-style-type: none"> <li>- Cotton-ball radiopaque sclerotic deposits</li> <li>- Radiolucent areas and loss of lamina dura</li> </ul>

# Management of Salivary Gland Disorders

- Salivary lesions can be either obstructive or neoplastic -> Always remember cancer, unless you can rule it out it is a possibility
- Minor Glands begin to form on the 40<sup>th</sup> day In utero ; Major Glands develop on the 35<sup>th</sup> day in utero

Glands	
<ul style="list-style-type: none"> <li>- Produce 1000-1500mL of saliva per day, this ↓ gradually as we age after 20yrs because ↑ intraparenchymal fibrosis and ↓ neural stimulation</li> </ul>	
<b>Parotid Gland</b> - 25% of total saliva	<p><b>Acini:</b> Mostly Serous (watery)</p> <p><b>Largest Major gland</b></p> <ul style="list-style-type: none"> <li>- Superficial to the posterior aspect of the masseter and ascending rami</li> <li>- Major branch of CN VII (Facial nerve) divides the gland (this is why IAN blocks if deposited in the parotid can cause facial paralysis)</li> </ul> <p><b>Stensons Duct:</b></p> <ul style="list-style-type: none"> <li>- 1-3mm diameter and 6cm long.</li> <li>- Travels anteriorly through the gland superficial to the masseter, then curves mesially to pierce the buccinator muscle and penetrate oral mucosa around 16-17</li> </ul> <p><b>Innervation:</b></p> <ul style="list-style-type: none"> <li>- Preganglionic CN IX (Glossopharyngeal) travels with Lesser Petrosal Nerve to <u>Otic Ganglion</u> -&gt; Post ganglionic nerves via the auriculotemporal nerve to Parotid gland</li> </ul>  <p>* Fig. 21.7 Parotid gland innervation: CN, Cranial nerve.</p>
<b>Sublingual</b> - 3-4% of total saliva	<p><b>Acini:</b> Mostly Mucous</p> <p><b>Location:</b></p> <ul style="list-style-type: none"> <li>- Superior to mylohyoid in the sublingual space</li> </ul> <p><b>Bartholin Ducts:</b></p> <ul style="list-style-type: none"> <li>- Acinar ducts throughout the gland -&gt; Coalesce to form 8-20 ducts of Rivinus -&gt; Opens into anterior FOM via plica sublingualis, or indirectly through Wharton Duct</li> </ul> <p><b>Innervation:</b></p> <ul style="list-style-type: none"> <li>- Originates in Superior salivatory nucleus and travels via the Facial Nerve (Chorda Tympani) to submandibular ganglion -&gt; Post ganglionic travels w/ lingual nerve to Sublingual Gland</li> </ul> 
<b>Submandibular</b> - 70% of total saliva	<p><b>Acini:</b> Even mix of serous + Mucous</p> <ul style="list-style-type: none"> <li>- Highest Ca<sup>2+</sup> concentration</li> </ul> <p>Posterosuperior portion of the gland wraps above the posterior border of mylohyoid muscle where Wharton's Duct is formed</p> <p><b>Wharton Duct</b></p> <ul style="list-style-type: none"> <li>- Runs anterior along the superior surface of mylohyoid muscle -&gt; Risks injury w/ 3<sup>rd</sup> molar exo because of the proximity to medial surface of the internal oblique ridge</li> <li>- Lingual nerve wraps under Wharton duct and splits to give sensory to anterior 2/3 of tongue (Glossopharyngeal gives sensation to posterior 1/3rd (Chorda tympani gives taste to anterior 2/3rds)</li> <li>- 2-4mm diameter and 5cm long</li> <li>- Opens into the FOM via a muscular punctum -&gt; Important to prevent retrograde flow of bacteria</li> </ul> <p><b>Innervation:</b></p> <ul style="list-style-type: none"> <li>- Originates in Superior salivatory nucleus and travels via the Facial Nerve (Chorda Tympani) to submandibular ganglion -&gt; Post ganglionic travels directly to Submandibular Gland</li> </ul> 

## Diagnostics

<b>Radiology</b>	<b>Plain Films:</b> <ul style="list-style-type: none"> <li>- Used to identify salivary stones (only 80-85% of stones are RO on radiographs)               <ul style="list-style-type: none"> <li>- 30-50% Parotid, and 10-20% submandibular sialoliths are radiolucent</li> </ul> </li> <li>- Mandibular occlusal image = most useful for sublingual and submandibular calculi</li> <li>- Panoramic = can show stones in the parotid gland and posterior submandibular stones</li> </ul>
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	<ul style="list-style-type: none"> <li>- Occlusal, frontal, lateral, lateral oblique, Pan can all be useful though</li> </ul> <p><b>Sialography -&gt; Gold Standard</b></p> <ul style="list-style-type: none"> <li>- Not many radiologists have the expertise to do this now though</li> <li>- Can detect both RO and RL stones + mucous plugs</li> <li>- Can detect extent of destruction of ducts or gland parenchyma</li> <li>- Can be therapeutic because the gland is dilated during the procedure and small blockages may be cleared</li> </ul> <p>Steps:</p> <ol style="list-style-type: none"> <li>1. Cannulation of duct w/ catheter</li> <li>2. Inject contrast medium (Water soluble or oil based, both have 25-40% iodine, but water soluble is better for the body)</li> <li>3. Take radiographs and various time points             <ol style="list-style-type: none"> <li>a. <u>Ductal Phase</u>: Immediately after injection -&gt; shows the major ducts</li> <li>b. <u>Acinar Phase</u>: Minutes after ducts are fully RO -&gt; Gland becomes RO</li> <li>c. <u>Evacuation Phase</u>: &gt;5min after -&gt; Assesses clearance of gland</li> </ol> </li> </ol> <p><b>Contraindications for Sialography:</b></p> <ul style="list-style-type: none"> <li>- Acute salivary gland infection -&gt; disrupted ductal epithelium may allow extravasation of media into soft tissue</li> <li>- Hx of <b>iodine sensitivity</b></li> <li>- Preceeding <b>thyroid gland study</b> -&gt; retained iodine may interfere w/ interpretation of thyroid gland scans</li> </ul>
<b>Other Images/Scans</b>	<p><b>CT Scan</b></p> <ul style="list-style-type: none"> <li>- Reserved for assessment of mass lesions in salivary glands</li> <li>- Less invasive vs Sialography though and requires less expertise</li> <li>- Can show calculi that are posterior in submandibular duct</li> <li>- CBCT -&gt; high sensitivity and specificity</li> </ul> <p><b>MRI</b></p> <ul style="list-style-type: none"> <li>- Better than CT for soft tissue details of the salivary gland</li> </ul> <p><b>Ultrasonography</b></p> <ul style="list-style-type: none"> <li>- Low cost, high resolution, non invasive -&gt; Most common method for nodular lesions and to guide biopsy</li> </ul> <p><b>FDG-PET</b></p> <ul style="list-style-type: none"> <li>- Low value between benign and malignant lesions and for salivary gland malignancies</li> <li>- Useful for initial tumor staging and evaluation of nodal involvement by cervical lymph nodes</li> </ul>
<b>Salivary Scintigraphy (Radioactive Isotope Scanning)</b>	*uses Technetium-99m with intravenous injection -> taken up by salivary glands to assess biological turnover* <ul style="list-style-type: none"> <li>- Poor resolution of images though</li> <li>- <b>Mostly used for Dx of Sjogrens Syndrome</b></li> </ul>
<b>Salivary Gland Endoscopy</b>	<ul style="list-style-type: none"> <li>- Endoscopic camera used to Dx the issues, and also can be used to dilate small strictures and flush mucous plugs</li> <li>- Balloon Catheters can dilate ductal constructions</li> <li>- <u>Laser lithotripsy</u> can be used through the endoscope to fragment large stones into smaller ones for basket retrieval</li> </ul>
<b>Fine Needle Aspiration Biopsy</b>	<ul style="list-style-type: none"> <li>= <b>high accuracy for differentiating between benign and malignant lesions</b></li> <li>- Use 20 gauge or smaller needle</li> <li>- Specificity: 96%-100% ; Sensitivity: 85%-99%</li> <li>- Improvement in sampling technique and improved cytological interpretation has ↑↑ diagnostic value of FNAB</li> </ul>
<b>Salivary Gland Biopsy</b>	<b>Usually used in the Dx of Sjogrens</b> <ul style="list-style-type: none"> <li>- Use circular chalazion clamp for isolation + hemostasis</li> <li>- Remove 5-10 minor salivary glands in the lower lip</li> <li>- Assess "focus score" -&gt; Focus = 50+ lymphocytes aggregated. If Focus score is &gt;1 = Sjogrens</li> </ul>

## Sialothiasis

<b>Sialolith</b>	
<b>What is it?</b>	Mineralized salivary stone obstructing the salivary gland duct
	<ul style="list-style-type: none"> <li>- 2x more common in men (peak incidence 30-50)</li> <li>- <b>85% in Submandibular gland</b>; 10% in Parotid; 5% in sublingual</li> </ul> <p><b>Etiology:</b></p> <ul style="list-style-type: none"> <li>- Obstruction, ↓ salivary flow rate, dehydration, change in pH</li> </ul>

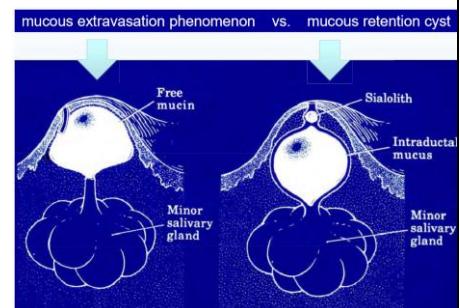
Diagnostic Methods	<p><b>Clinical Exam:</b></p> <ul style="list-style-type: none"> <li>- Palpation of the gland</li> <li>- Bimanual palpation along the course of the duct</li> <li>- Visual confirmation of ↓ salivary flow</li> <li>- Assessment of the type of ductal discharge (Mucous, pus etc)</li> <li>- Imagine (as above)</li> <li>- FNAB</li> <li>- Biopsy</li> </ul>	
Symptoms	<ul style="list-style-type: none"> <li>- Pain + swelling of submandibular gland at mealtimes</li> <li>- Tenderness to palpation</li> <li>- Cervical lymphadenopathy</li> <li>- Fever, Malaise</li> <li>- ↓ salivary flow</li> </ul>	
Dx		<p>Occlusal Radiograph →</p> <p><b>Occlusal film</b> Clinical diagnosis? Obstructive sialadenitis due to sialolith</p>
Management	<p><b>If Stone is in the anterior duct:</b></p> <ul style="list-style-type: none"> <li>- Milk the gland with <b>bimanual palpation</b> to express the stone</li> <li>- <b>Dilate duct</b> with lacrimal probes</li> </ul> <p><b>Posterior Stone:</b></p> <ul style="list-style-type: none"> <li>- <b>Surgical Excision</b> (Sialolithotomy) through FOM <ul style="list-style-type: none"> <li>- Caution with the lingual nerve posteriorly!</li> </ul> </li> <li>- <b>Surgical excision of the submandibular gland</b> if the blockage is too distal (reflection of the submandibular duct over the posterior mylohyoid)</li> <li>- Stone removal via <b>sialoendoscopy</b></li> <li>- Extracorporeal or intracorporeal <b>shockwave lithotripsy</b> (good luck finding a hospital that has this for sialoliths though)</li> <li>- Fluoroscopically guided <b>basket retrieval</b></li> <li>- Laser surgery using CO<sub>2</sub> laser</li> </ul>	

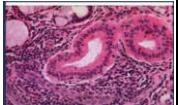
#### Salivary Duct Stenosis

**Tx** Strictures of the submandibular or parotid duct can be opened using balloon dilation under fluoroscopic guidance

#### Mucous Extravasation Phenomenon

Mucous Retention/Extravasation Cysts	
Etiology	<p>= changes to minor salivary glands -&gt; accumulation and local swelling</p> <ul style="list-style-type: none"> <li>- Mostly mechanical injury (on the lower lip) from biting lip</li> <li>- Can be secondary to chronic inflammation</li> </ul> <p>Extravasation Mucocele: Broken salivary duct w/ spillage of mucous into soft tissue around gland</p> <p>Retention Mucocele: ↓ of glandular secretions from blockage of salivary glands -&gt; build up of mucous behind the blockage</p>
Ddx	Local fibrous hyperplasia Mucocele Mesenchymal neoplasm Salivary gland neoplasm



	 <p>Excisional Biopsy -----&gt;</p> <p>Watch out for labial nerve branches</p>  	
<b>Labial Gland Biopsy</b>	<ol style="list-style-type: none"> <li>1. LA to freeze the area</li> <li>2. ½ inch incision on either side of the inner lip -&gt; May use a Chalazion clamp to aid in hemostasis and grabbing the lip</li> <li>3. Remove 5-7 glands w/ sterile tweezers</li> <li>4. Suture closed</li> </ol> <p><b>Sjogrens Syndrome:</b></p> <ul style="list-style-type: none"> <li>- Biopsy finding -&gt; Focal lymphocytic sialadenitis</li> <li>- Presence of 1+ tight clumps (Foci) of lymphocytes (&gt;50) adjacent to normal gland tissue and surrounding a duct in 4mm square tissue</li> </ul>	 
<b>Ranula</b>		
<b>What is it?</b>	<p>= Mucous retention cyst in the <b>floor of the mouth</b></p> <ul style="list-style-type: none"> <li>- <b>Most common lesion of the Sublingual gland</b></li> </ul>  <p><b>Presentations:</b></p> <ul style="list-style-type: none"> <li>- FOM swelling</li> <li>- Plunging ranula w/ intraoral and cervical involvement</li> <li>- Cervical ranula w/o intraoral involvement</li> <li>- Thoracic Ranula (extreme) that extends into subcutaneous planes of the anterior chest wall</li> </ul>	
<b>Tx</b>	<p><b>Marsupialization</b></p> <ul style="list-style-type: none"> <li>- <b>Suture the opening of the window to the floor of the mouth</b> (inside of the ranula becomes the new FOM)</li> <li>- High chance for recurrence b/c the wound closes over itself when the pt. closes their mouth (to prevent this suture gauze soaked in Whiteheads Varnish packed into the wound to prevent closure)</li> </ul> <p><b>Enucleation</b></p> <p><b>Excision w/ removal of ipsilateral sublingual gland</b></p> <p>Cryotherapy</p> <p>Laser ablation (CO<sub>2</sub>) or excision (diode)</p> <p><b>**Due to the vascularity and vital structures in the FOM Its usually best to refer these cases</b></p> <ul style="list-style-type: none"> <li>- Consent needs to include warnings for altered sensation in the anterior 2/3 of the tongue and bleeding from the veins that envelope the lingual nerve</li> </ul>	

## Infections:

- Often a mixed bacterial flora
- **Most common bacteria:** *S. aureus*

<b>Parotitis</b>	
- Often mixed bacterial flora	
<b>Viral Vs Bacterial</b>	<p><b>Viral:</b></p> <ul style="list-style-type: none"> <li>- <b>Non suppurative communicable disease (Mumps)</b></li> <li>- <b>Painful non-erythematous swelling 2-3 weeks after the initial virus exposure</b></li> <li>- Infection is bilateral and preceded by prodromal symptoms for 1-2 days <ul style="list-style-type: none"> <li>- Fever, malaise, loss of appetite, chills, headache, sore throat, preauricular tenderness</li> </ul> </li> <li>- Lab results: ↑ serum titers for mumps, influenza, leukopenia, lymphocytosis and serum amylase</li> </ul> <p><b>Bacterial:</b></p> <ul style="list-style-type: none"> <li>- <b>Purulent discharge</b> (Test w/ culture testing and antibiotic sensitivity)</li> <li>- <b>Rapid onset swelling + erythema and pain</b></li> </ul>
<b>Tx:</b>	<p><b>Bacterial:</b></p> <ul style="list-style-type: none"> <li>- IV fluid hydration + Antibiotics + Analgesics</li> </ul>

	<p><b>Viral Parotitis:</b></p> <ul style="list-style-type: none"> <li>- Resolves 5-12 days after onset</li> <li>- Supportive care for fever, headache and malaise</li> </ul>
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## Others

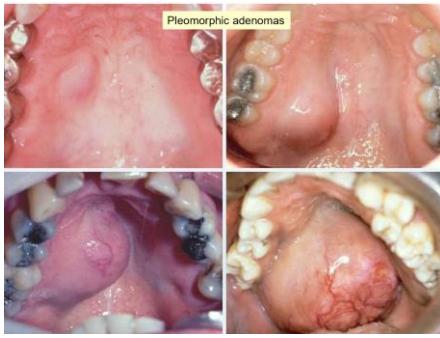
<b>Necrotizing Sialometaplasia</b>					
<b>What is it?</b>	= Non-neoplastic inflammatory condition of the salivary glands - Usually affects minor salivary glands of the palate - Represents clinically a malignant carcinoma -> But its not!				
<b>Etiology</b>	- Ischemia of the salivary gland tissue, leading to infarction -> usually from trauma, LA injection, Smoking, Diabetes, Pressure from dentures				
<b>Ddx</b>	 <ul style="list-style-type: none"> <li>- Chronic infection (TB, Histoplasmosis)</li> <li>- Malignancy (SCC, Adenocarcinoma)</li> <li>- Trauma</li> <li>- Necrotising sialometaplasia</li> <li>- Syphilis</li> <li>- Wegener granulomatosis</li> <li>- Behcet's disease</li> </ul>				
<b>Management</b>	Incisional Biopsy to diagnose - Excisional is over treatment -> Usually self-resolving lesion within 6-10 weeks				
<b>Sjogrens Syndrome</b>					
<b>What?</b>	= Multisystem disease - Strong autoimmune influence - 9:1 female predilection				
<b>Symptoms</b>	<p>1<sup>st</sup> -&gt; arthritic complaints      2<sup>nd</sup> -&gt; Ocular symptoms      Late -&gt; Salivary symptoms          - Parotid is most affected</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; background-color: #d3d3d3;">Primary Sjogrens (Sicca Syndrome)</th> <th style="text-align: center; background-color: #d3d3d3;">Secondary Sjogrens</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;"> <ul style="list-style-type: none"> <li>- Xerostomia</li> <li>- Keratoconjunctivitis Sicca (dry eyes)</li> </ul> </td> <td style="padding: 5px;">           Primary + Associated w/  <ul style="list-style-type: none"> <li>- Rheumatoid arthritis</li> </ul> </td> </tr> </tbody> </table>	Primary Sjogrens (Sicca Syndrome)	Secondary Sjogrens	<ul style="list-style-type: none"> <li>- Xerostomia</li> <li>- Keratoconjunctivitis Sicca (dry eyes)</li> </ul>	Primary + Associated w/ <ul style="list-style-type: none"> <li>- Rheumatoid arthritis</li> </ul>
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<ul style="list-style-type: none"> <li>- Xerostomia</li> <li>- Keratoconjunctivitis Sicca (dry eyes)</li> </ul>	Primary + Associated w/ <ul style="list-style-type: none"> <li>- Rheumatoid arthritis</li> </ul>				
<b>Testing</b>	Labial minor salivary gland biopsy <ul style="list-style-type: none"> <li>- <b>Biopsy finding -&gt; Focal lymphocytic sialadenitis</b></li> <li>- Presence of 1+ tight clumps (Foci) of lymphocytes (&gt;50) adjacent to normal gland tissue and surrounding a duct in 4mm square tissue</li> </ul> <p><b>Schirmer Test -&gt; Lacrimal flow</b></p>				
<b>Treatment</b>	<ul style="list-style-type: none"> <li>- Artificial tears</li> <li>- Salivary Substitutes</li> <li>- Cholinergics -&gt; Pilocarpine, or Biotene</li> </ul>				

## Salivary Gland Neoplasms

- 80-85% are in Major glands, and 75-80% of those are benign

### Benign

<b>Pleomorphic Adenoma</b>	
** Most common benign salivary gland neoplasm**	
<ul style="list-style-type: none"> <li>- 45-75% of all salivary gland tumors, and 70-80% of all benign salivary gland tumors</li> <li>- Occurs in all ages, but most commonly in 30's-60's</li> <li>- 3:2 Male:Female ratio</li> </ul>	

<b>Clinical presentation</b>	<p><b>Rubberly feeling mass</b></p> <ul style="list-style-type: none"> <li>- Leaves a crater in the bone after excision</li> <li>- Tumor <b>doesn't invade the periosteum</b> (so no bone resection needed)</li> </ul> <p><b>Location</b></p> <ul style="list-style-type: none"> <li>- <b>Most common in the Parotid (80%)</b></li> <li>- When it affects the minor glands -&gt; commonly on the hard palate</li> </ul> <p><b>Histology:</b></p> <ul style="list-style-type: none"> <li>- Ductal Epithelial Cells + Myoepithelial cells</li> </ul>	
<b>Management</b>	Surgical excision w/ a good margin to prevent recurrence	
<b>Monomorphic Adenoma</b>		
<ul style="list-style-type: none"> <li>- Uncommon</li> </ul>		
<b>Clinical Presentation</b>	<ul style="list-style-type: none"> <li>- Found in the <b>upper lip</b> (mucoceles rarely occur in the upper lip, so if you see a lump, be very concerned)</li> <li>- Also found in the Parotid</li> </ul>  <p>Firm (non- fluid filled) and encapsulated (doesn't move around much)</p>	
<b>Management</b>	Surgical Excision	

## Malignant Salivary Gland Neoplasms

- 50% of minor salivary gland neoplasia are malignant

Site	Frequency	Malignancy
Parotid	60%	15%
Submandibular	15%	30%
Sublingual	1%	100%
Minor	30%	50%

### Signs and Symptoms:

- Rapid growth
- Pain
- Peripheral facial nerve paralysis
- Skin involvement
- Nodal metastasis
- Hx of cutaneous cancer

### Mucoepidermoid Carcinoma

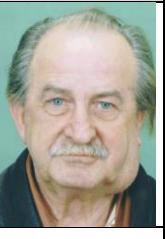
\*\*Most common malignant salivary gland tumor\*\*

- Found mostly in the Parotid gland
- 10% of Major salivary gland tumors, 20% of minor salivary gland tumors

<b>Clinical Presentation</b>	<ul style="list-style-type: none"> <li>- Found mostly during middle age (45 years old) -&gt; 3:2 female to male</li> <li>- Submucosal mass that may be painful or ulcerated</li> <li>- May have bluish tinge because of the mucous content</li> </ul> <p><b>Histologically:</b></p> <ul style="list-style-type: none"> <li>- Contains 3 cell types: Mucous, Epidermoid, Intermediate</li> <li>- Grade corresponds to the proportion of cell types: Higher the grade = ↑ epidermoid cells</li> </ul>	
<b>Tx</b>	Wide Surgical Excision w/ margin of unaffected tissue	
<b>Polymorphous Low-Grade Adenocarcinoma</b>		

\*\*2<sup>nd</sup> most common malignant salivary gland tumor\*\*

- Found in the submandibular, sublingual, and minor salivary glands

<b>Clinical Presentation</b>	<p><b>*Most common at the junction of the hard and soft palate</b></p> <ul style="list-style-type: none"> <li>- 3:1 male to female</li> <li>Mean age: 56 years old</li> </ul> <p><b>Presentation:</b></p> <ul style="list-style-type: none"> <li>- Slow growing, asymptomatic masses that may become ulcerated</li> <li>- Invades and propagates along nerves -&gt; paresthesia in the area of the involved nerve</li> </ul>	 <p>Polymorphous low-grade adenocarcinoma</p>
<b>Tx</b>	Wide surgical excision	
<b><u>Adenoid Cystic Carcinoma</u></b>		
<p>**3<sup>rd</sup> most common malignancy</p> <ul style="list-style-type: none"> <li>- 50% in parotid, 50% in minor glands of the palate</li> </ul>		
<b>Key Features</b>	<ul style="list-style-type: none"> <li>= High grade salivary gland malignancy</li> <li>- Slow growing, non-ulcerated masses w/ chronic dull pain</li> <li>- Spreads through perineural spaces -&gt; Hard to determine the full extent of the lesions!</li> <li>- 70% 5-year survival, 10% 15 year survival</li> </ul> <p>Subtypes -&gt; All show some cribiform (<b>Swiss Cheese</b>) areas</p> <ol style="list-style-type: none"> <li>1.Tubular/Cribiform (Grade I)</li> <li>2.Cribiform, &lt;30% solid (Grade II)</li> <li>3.Solid, &gt; 30% solid (Grade III) -&gt; Poorest prognosis</li> </ol>	
<b>Tx:</b>	Wide Surgical Excision + Radiation Therapy	<ul style="list-style-type: none"> <li>- Prognosis is still poor</li> </ul>
<b><u>Myoepithelial Carcinoma</u></b>		
<b>Clinical Presentation</b>	<p>*All involve the tail of the parotid gland*</p> <ul style="list-style-type: none"> <li>- Extraorally it looks like the ear lobe is involved (characteristic presentation)</li> </ul>	 
<b>Management</b>	Surgical Excision	<ul style="list-style-type: none"> <li>- Do it early when it is small, otherwise you risk Facial Nerve paralysis!</li> </ul>