SURGICAL EXTRACTIONS & MANAGEMENT OF COMPLICATIONS IN ORAL SURGERY

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(Special acknowledgment to Jeffrey A. Elo, D.D.S., M.S., *Diplomate of the American Board of Oral & Maxillofacial Surgery*)

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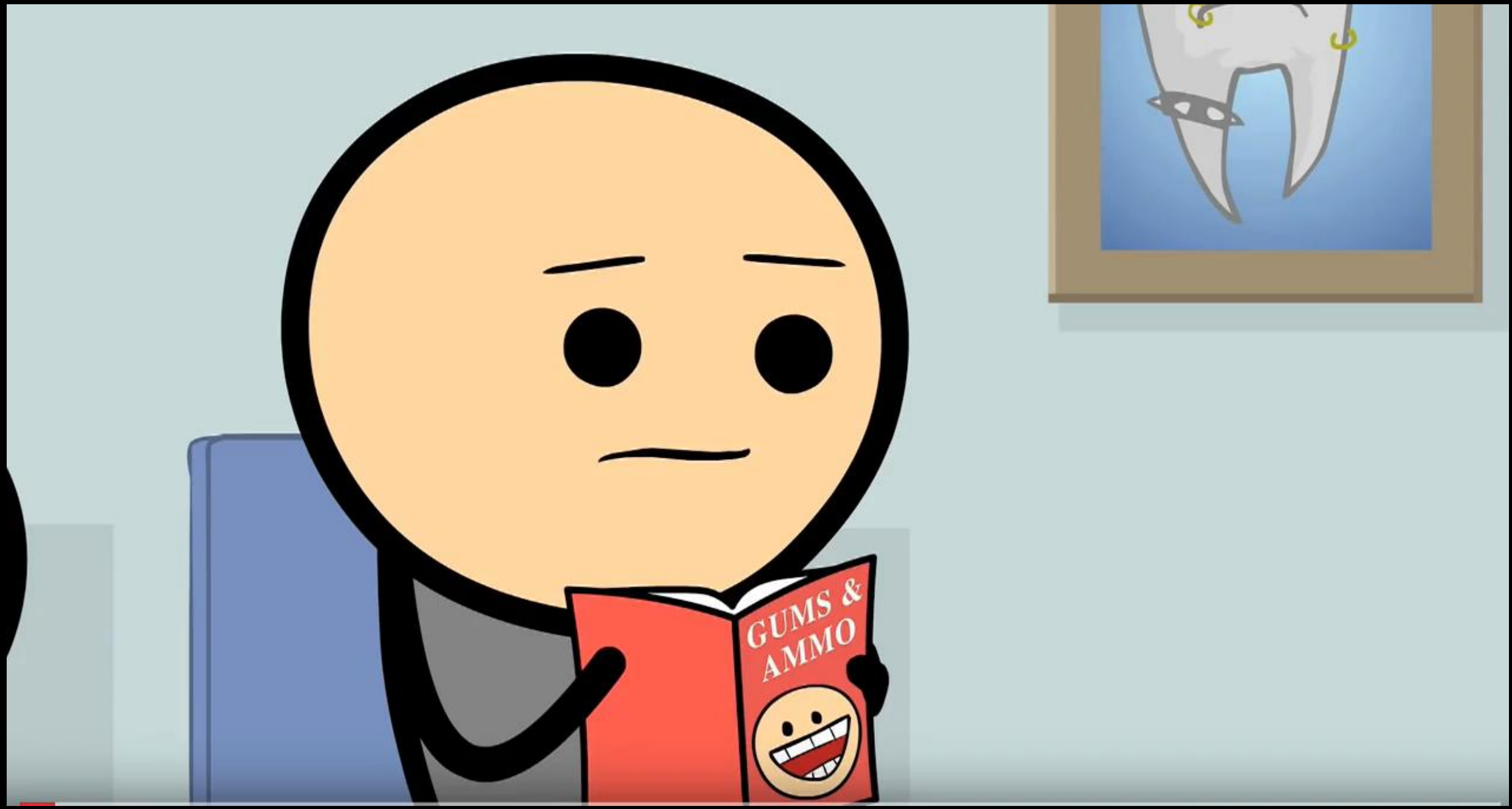
Objectives

- Identify clinical indications for surgical extraction and recognize cases requiring flap elevation, bone removal, or tooth sectioning.
- Evaluate medical history and radiographic findings to assess surgical risk and proximity to vital structures.
- Demonstrate proper surgical principles including flap design, atraumatic bone removal, and controlled tooth sectioning along with proper ridge preservation materials.
- Recognize and manage intraoperative complications such as root fracture, oroantral communication, nerve injury, and excessive bleeding.
- Implement postoperative protocols to prevent and manage complications including alveolar osteitis, infection, and delayed healing.

To Get The Most From This Presentation

- Listen with Intention - It is NO coincidence that you are here
- Be Open to Learning New Information
- Have fun learning
- Please keep cell phones muted. Thank you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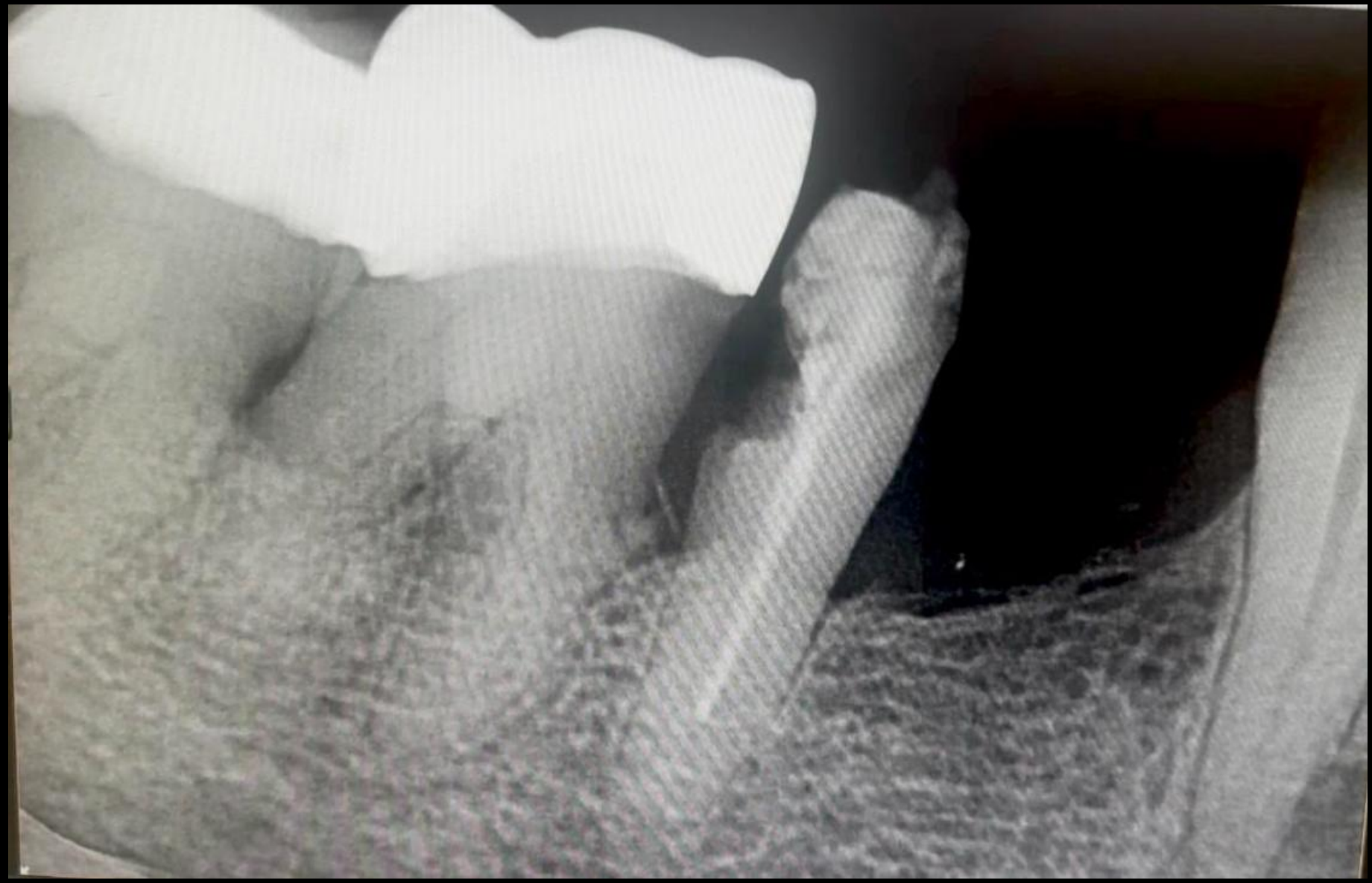


Can we determine complexity for extractions of this type during our consults?

Atraumatic Extraction Kit

Atraumatic Extraction kit containing 8pcs instruments - Atraumatic Extraction Luxating Elevator, Periotomes, Apical Retention Forceps, Serrated Curettes for atraumatic luxation with clean socket during dental extraction.

1: F1001N	Black Titanium Apical Upper Universal
2: F1026	Black Titanium Apical Lower Universal Premolars Serrated
3: E1061	Extraction Spade Elevator Straight-Diamond Coated Tip
4: E1033	Atraumatic Extraction Elevator 77R
5: S1301	Flexible Periotome - Root Extractor
6: S1300	Flexible Periotome - Straight
7: S1112S	Serrated Surgical Curette 3.2mm
8: S1110S	Serrated Surgical Curette 2.4mm
9: S1152	Crile-Wood Needle Holder T/C (Tungsten Carbide) 15CM
10: S1180	Dental Surgical Minnesota Retractors
11: F1006	Lower Molar Modifed Cow Horn Beak
12: S1124	Surgical Bone Files-Miller BF1X

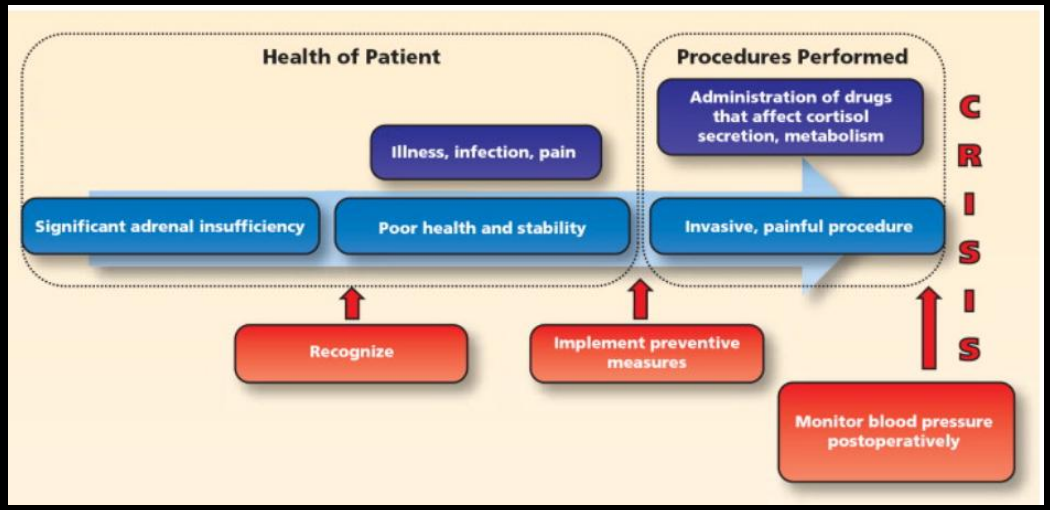
DoWell Dental Products, Inc.

Review Medical History

- The first step in planning surgery is a careful review of the patient's medical history
- Complications arise by missing risk factors such as bleeding disorders or bone metabolism issues

Medical History

Pre-operative Evaluation



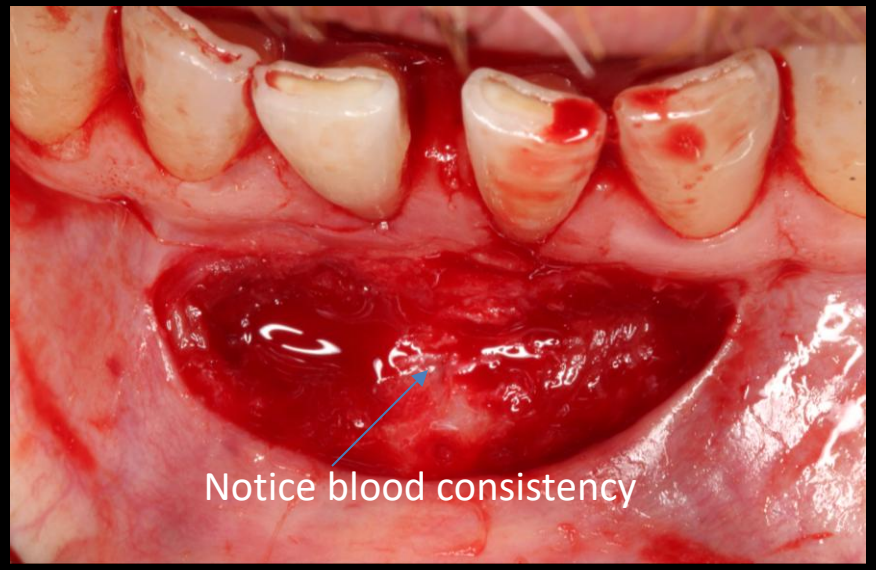
Khalaf et al. Risk of adrenal crisis in dental patients. JADA,144, 152-160

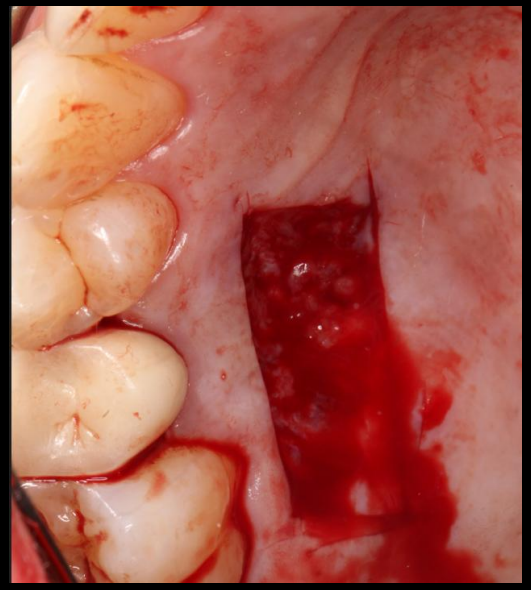
- Cerebrovascular disease - Cerebrovascular accident (CVA) like TIA
- Epilepsy - Seizures
- Endocrine evaluation - Diabetics (uncontrolled vs controlled), Thyroid disorder, Cushing disease, Adrenal insufficiency
- Immunocompromised patients - HIV (CD4 levels), Cancer, Lupus, RA etc.
- Renal evaluation- ESRD, Dialysis patients (avoid NSAIDS)

Medical History International Normalized Ratio (INR)

- INR is a means to measure the status of therapeutic anticoagulation
- Normal anticoagulated status for most medical indications INR of 2.0 to 3.0
- Reasonable to perform extractions on patients with an INR of 3.0 or less without reducing the anticoagulant dose
- Is it safe to proceed without an updated INR for bleeding disorder pts ?

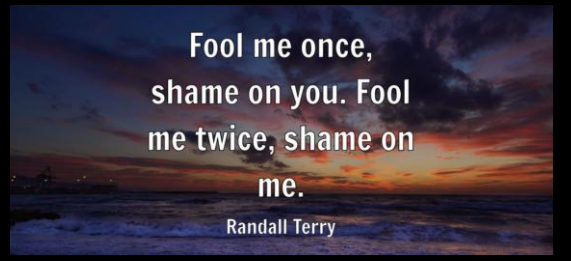
Medical History





- Proceed at your own risk!

Medical History



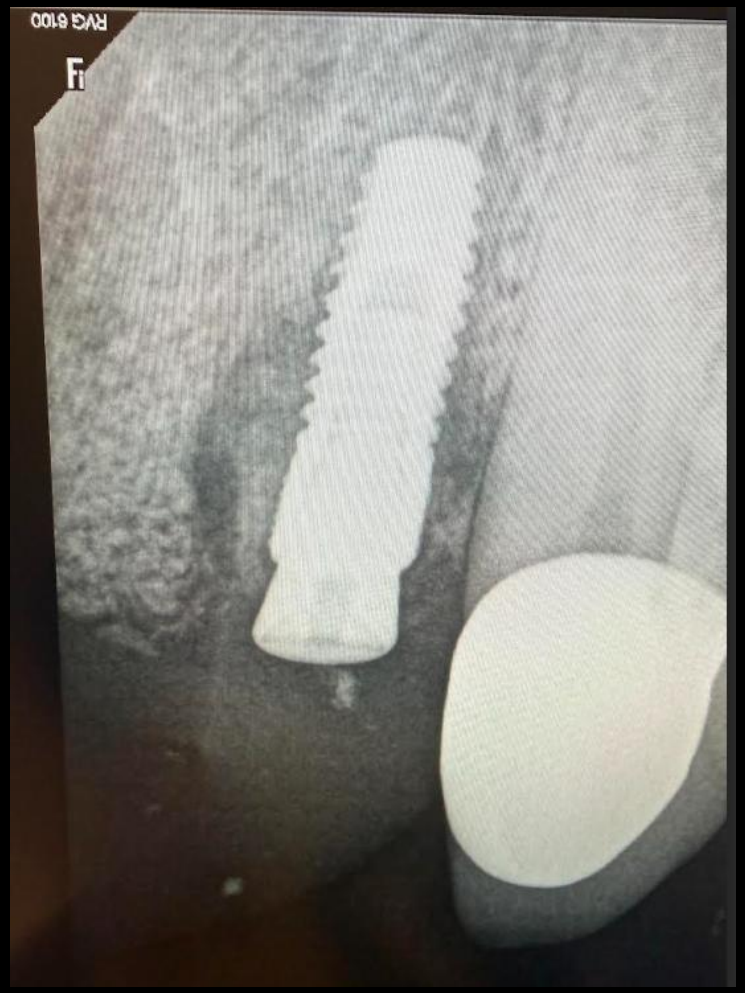
- Weak fibrin clot in a patient recently off anticoagulation

Medical History

- Diabetic pts have lower osteoblastic activity, bone density & defective bone mineral apposition rate per studies
- Consider post antibiotic therapy & request a most current HbA1c report

Medical History

- Implants placed on a pt with HbA1c greater than 8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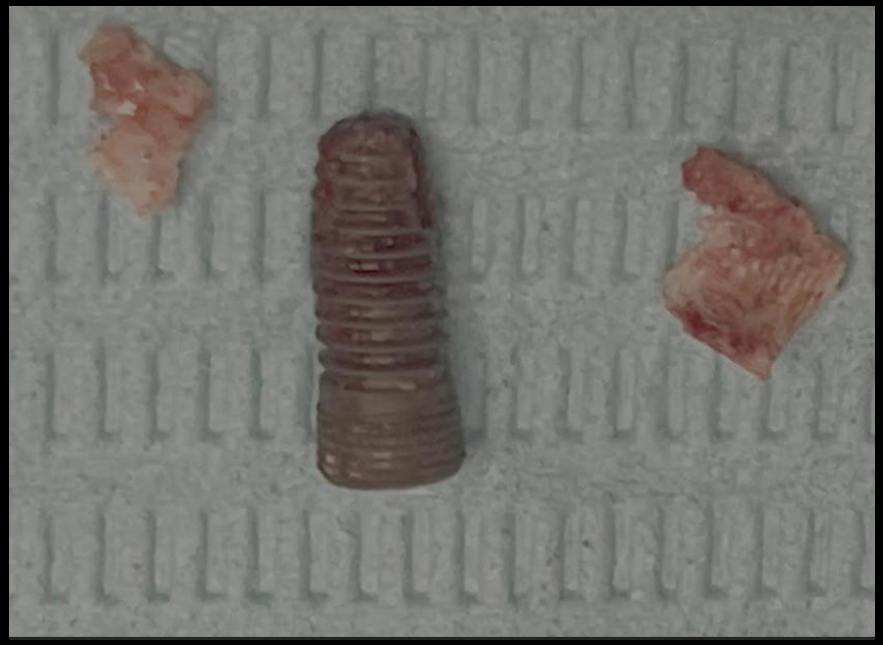
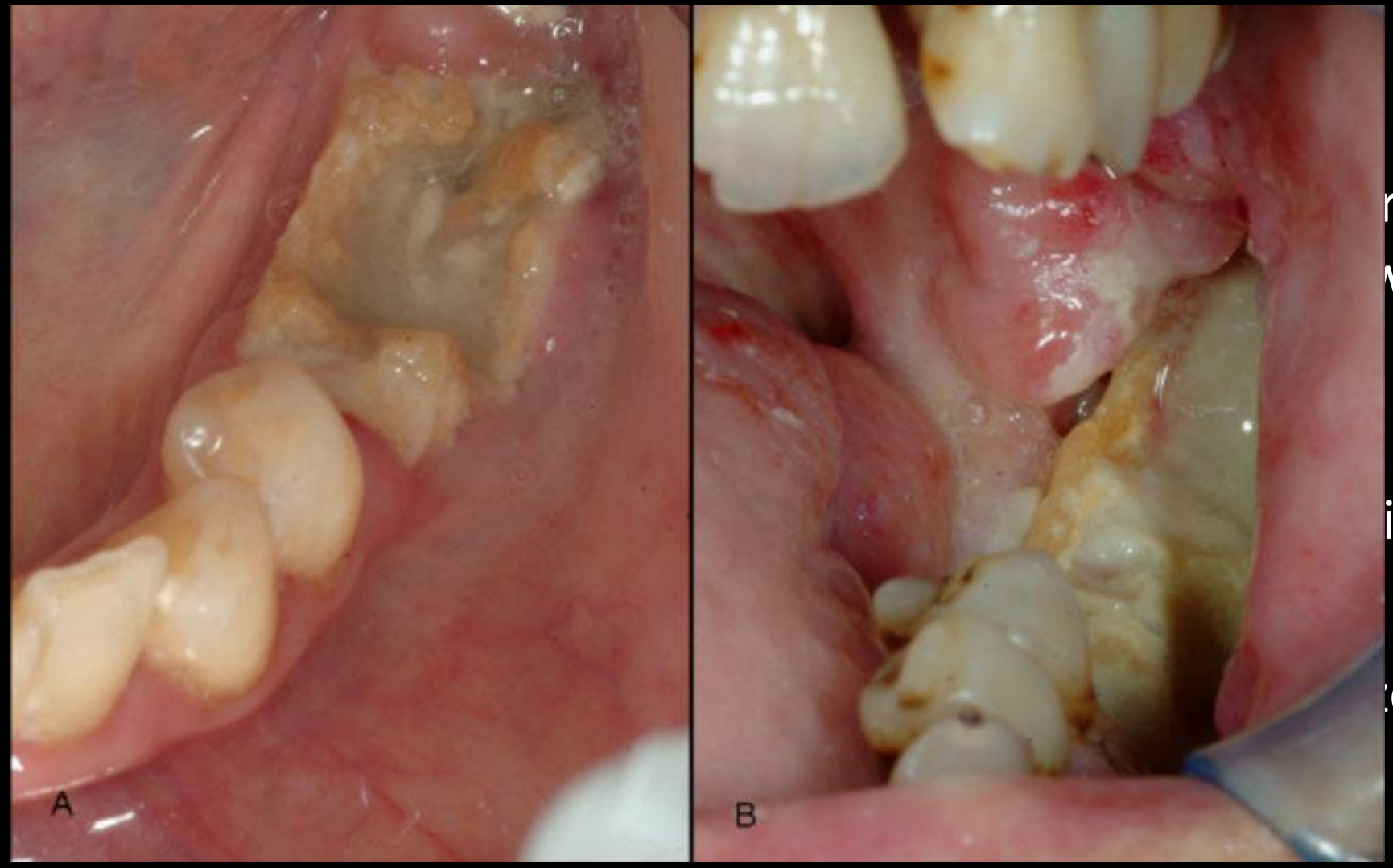


Medical History



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Medical History – Bisphosphonate Clinical Manifestations

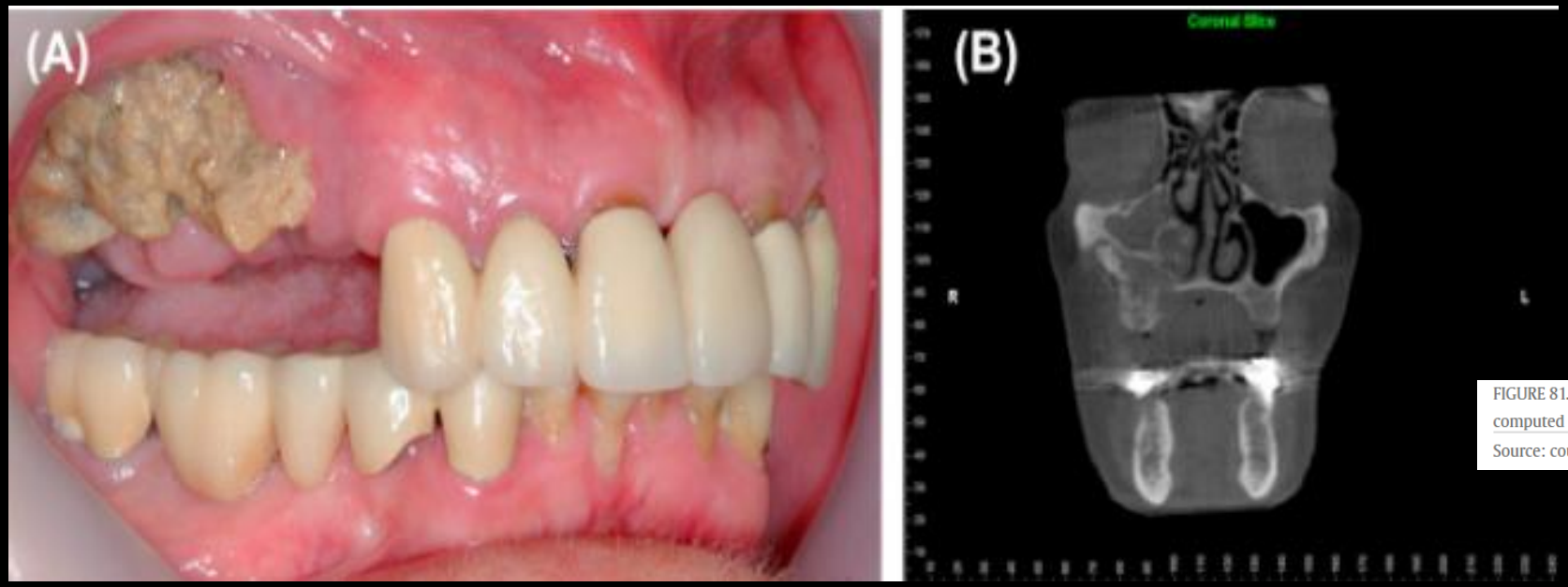


FIGURE 81.1. A, patient with Stage 3 bisphosphonate-associated osteonecrosis of the right maxilla. B, computed tomography scan of the same patient, coronal view.
Source: courtesy of Dr. Salvatore Ruggiero.

- About 68% of cases occur in the mandible, 28% in the maxilla & 4% in both jaws
- Once bone is exposed, it stays exposed permanently
- Exposed bone itself isn't painful due to no nerve supply, but pain arises from inflammation caused by bacterial infection

Medical History Bisphosphonate Therapy

- Oral bisphosphonates MAY increase the risk of osteonecrosis of the jaw (MRONJ) per Bornstein et al.
- Patients receiving IV treatment face higher risk than those on oral therapy
- Radiation therapy can cause irreversible tissue damage and reduced blood flow, raising the chance of exposed, nonhealing bone per Moy et al.

Medical History - Bisphosphonate Therapy)

- In majority of cases if patient has been on bisphosphonate therapy < 3 years & NO systemic risk factors – no alteration or delay for extraction

<u>Less than 3 years, but one or more systemic factor</u>

- Contact MD and suspend treatment for 3-4 months, request CTX test level (Collagen Type-1 C-Telopeptide)

CTX > 150 pg/ml reasonable for surgery OR CTX < 150 pg/ml defer surgery & wait additional 3 months

<u>If more than 3 years of medication</u>

- Contact physician & per MD recommend delaying medication for 3 months
- CTX and value of 150 pg/ml needed prior to the surgery

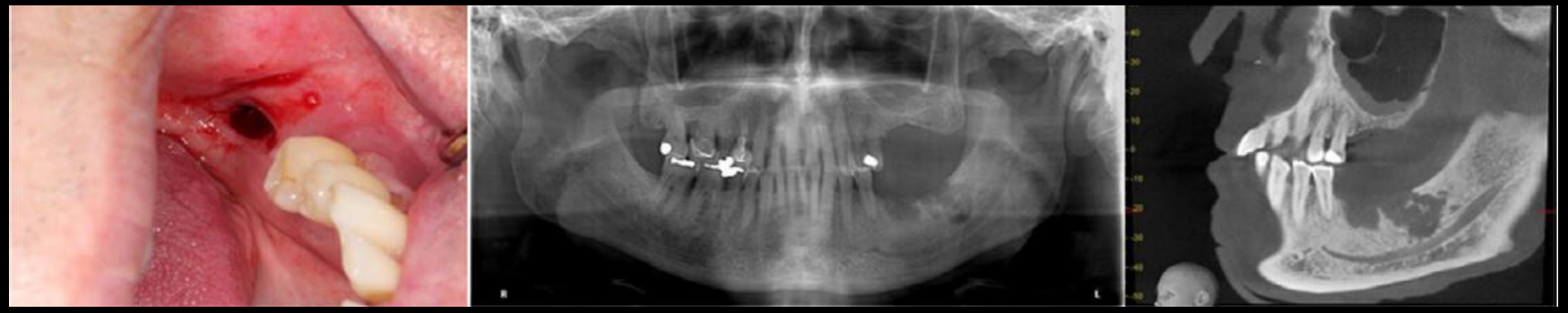
DOCUMENT EVERYTHING!

Medical History - Bisphosphonate Therapy

What if a patient needs extractions and is on oral bisphosphonates?

- Depends on clinical severity such as dental abscesses, draining of purulence & removal of offending teeth
- In certain cases, elimination of the infection source **outweighs** the risk of ONJ

Medical History - Osteoradionecrosis

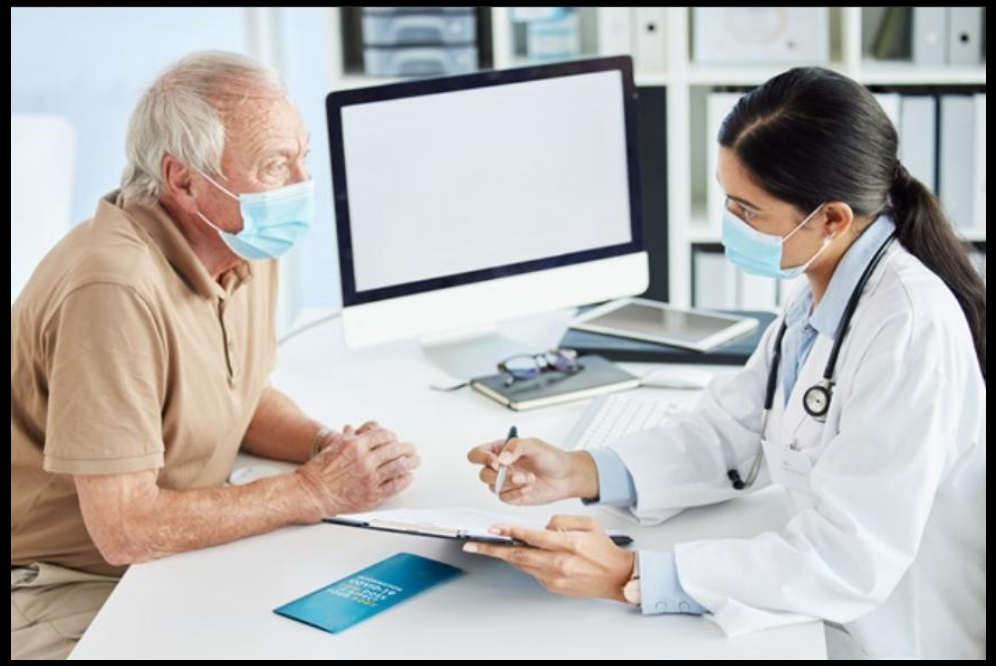


Moy et al. Risk factors in bone augmentations

How to AVOID ONJ?

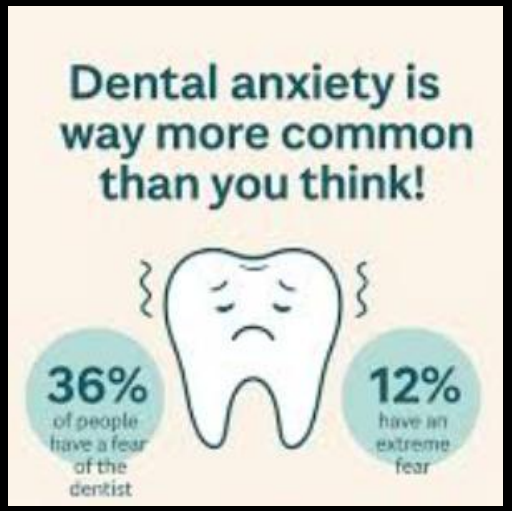
- Communication b/w MD & DDS, extract problematic teeth prior NOT after radiation
- Avoid all trauma to the area & pack the surgical site effectively & suture area
- See patients regularly, even with best care this cannot be avoided
- Spontaneous bone exposure related to oral medication in the lingual plate of molars is ~ 50 % of the cases

Consultation



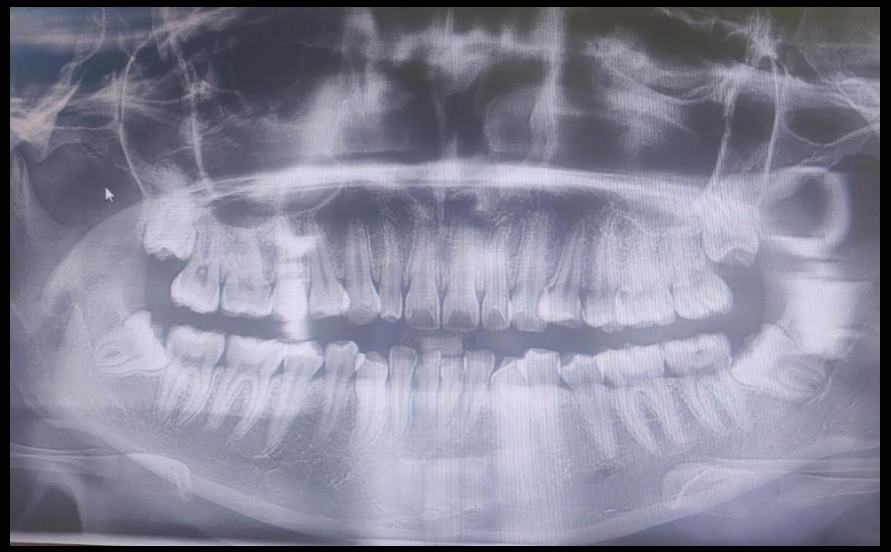
- Pre-operative appointments play a crucial role in minimizing complications observed during post-operative visits
- If instructions are not clearly communicated, an increase in post-operative visits seen
- These appointments address questions such as “Why wasn't this discussed earlier !”

Consultation



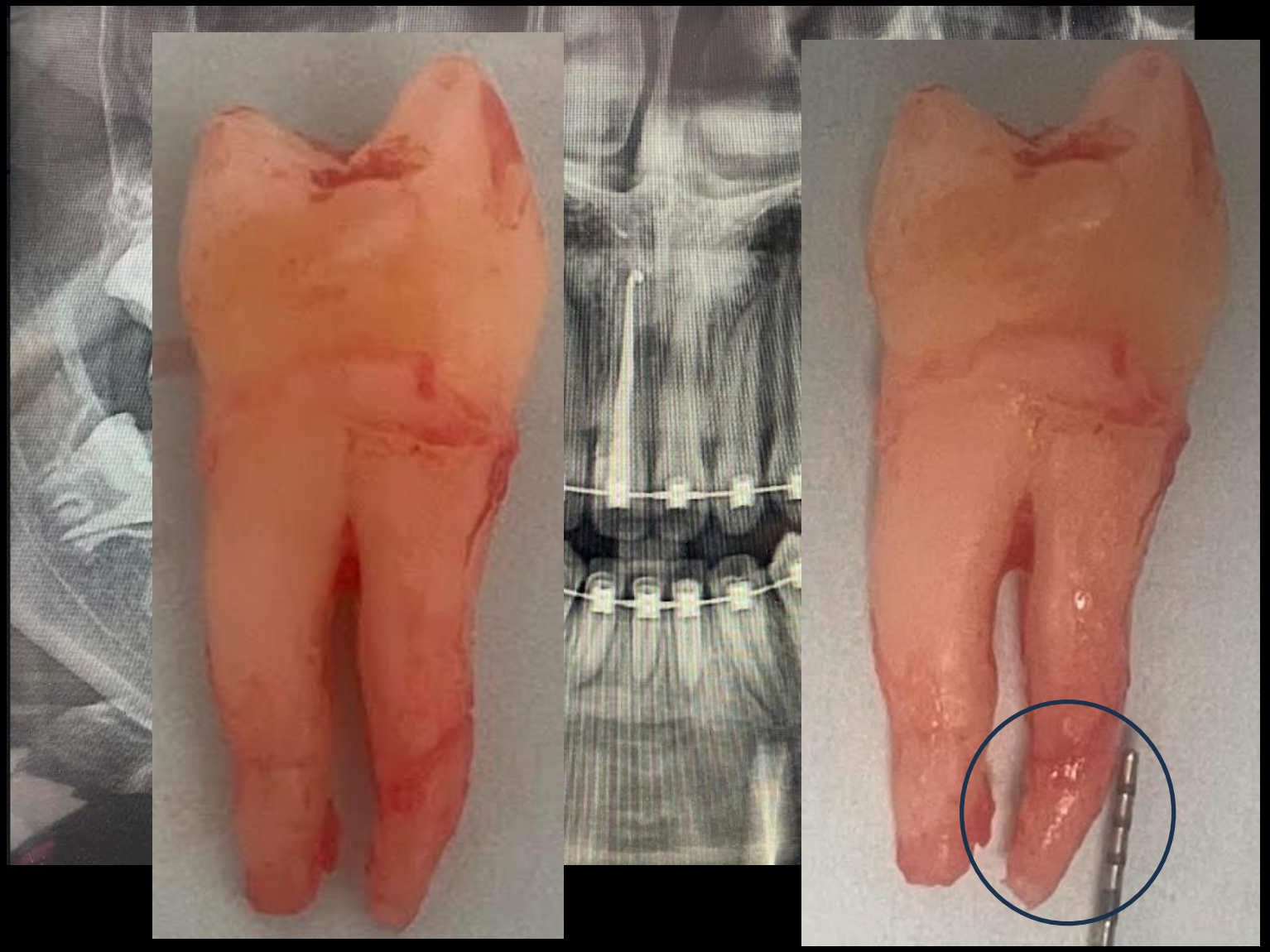
- Surgical assessment
  - What EXACTLY is needed
  - CLEARLY define this for the patient (possible implant site, FPD etc.) GIVE OPTIONS!
- Medical history
  - PMH (past medical hx), PSH (past surgical hx), Social hx, Meds, Allergies
- Informed consent
- Radiographs- Proximity of roots to sinus, IAN etc.
- Anxiety control-Local anesthesia, N_2O, Oral Sedation, IV, General Anesthesia

Surgical Assessment



- Difficulty of the procedure
- Clinic/office or operating room setting
- General practitioner or specialist
- No pressure to proceed
  - YOU are the doctor. If you are NOT comfortable, DON’T do it!

Surgical Assessment



Surgical Assessment

- Despite careful planning and skillful surgery, complications happen
- When extracting a maxillary first premolar with long, thin roots, the buccal root is easier to remove than the palatal root
  - Apply slightly more apical force toward the buccal root
  - If a root breaks, it’s usually the buccal root, which is easier to retrieve

Treatment Planning

- Per the ADA, CDT code for regular extraction is D7140

D7140 - extraction, erupted tooth or exposed root (elevation and/or forceps removal)

Includes routine removal of tooth structure, minor smoothing of socket bone & closure, as necessary

- Per the ADA, CDT codes for surgical extraction is D7210

D7210 - surgical removal of erupted tooth requiring elevation of mucoperiosteal flap and removal of bone and/or section of tooth

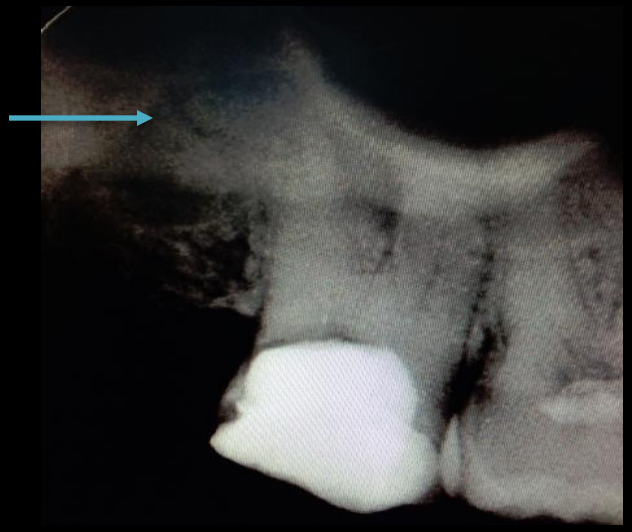
Includes cutting of gingiva & bone, removal of tooth structure, minor smoothing of socket bone & closure

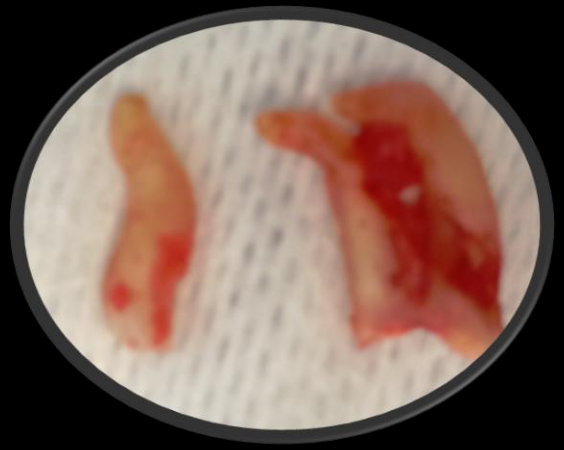
Treatment Planning

ADA CODES

- Code for extraction is **D7140**
- In certain cases, we can predict the ease of the extraction
- Periodontally involved teeth w/extreme mobility & severe bone loss can be “Simple”

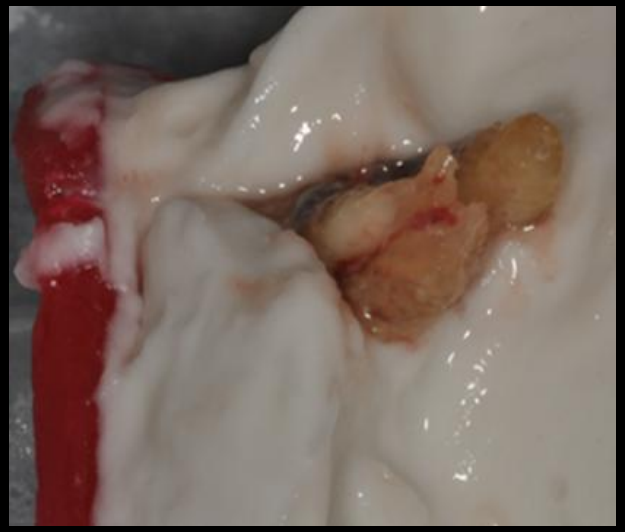
Treatment Planning



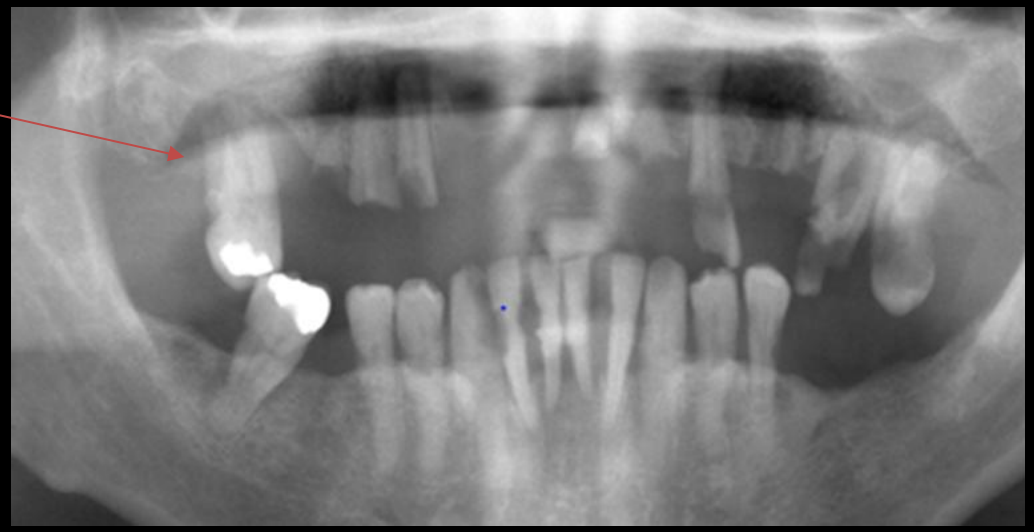


- ADA code for surgical extraction is **D7210**
- #4 deep caries, dilacerated root, apprehensive patient. Is this simple?
- Extraction w/o major complications, #2 treatment planned as simple

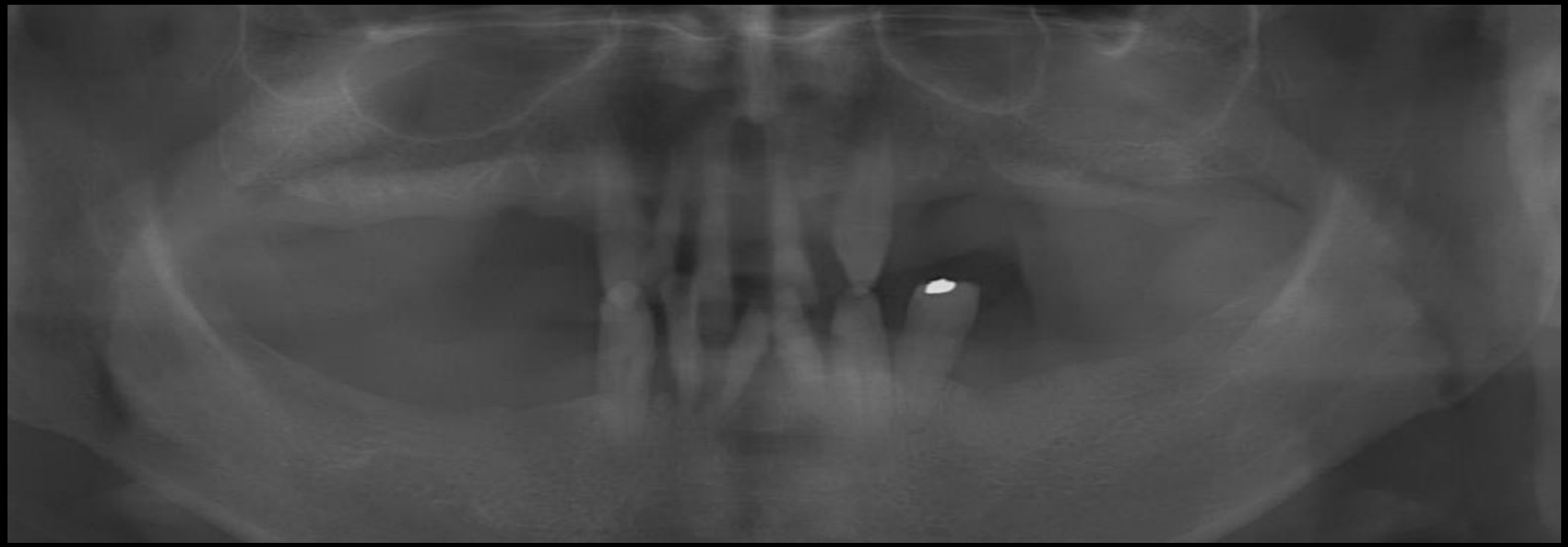
Treatment Planning



#2 complexity ?

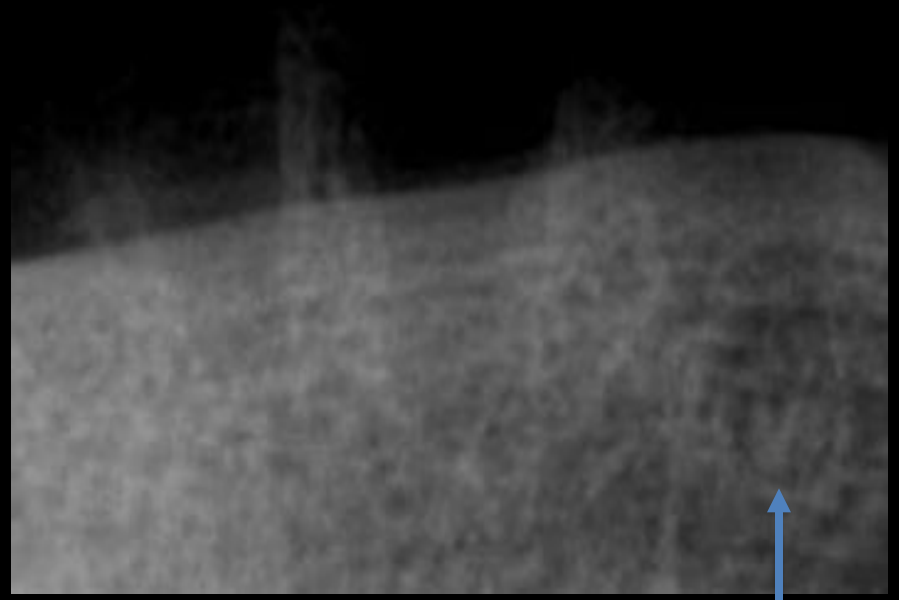


- So simple that it came out during impressions for a stay plate!



- Murphy's Law ***"Anything that can go wrong, will go wrong"***
- Patient presented for full mouth extractions with Class 2-3 mobility, relatively straight forward case

Treatment Planning



Is this tip simple?

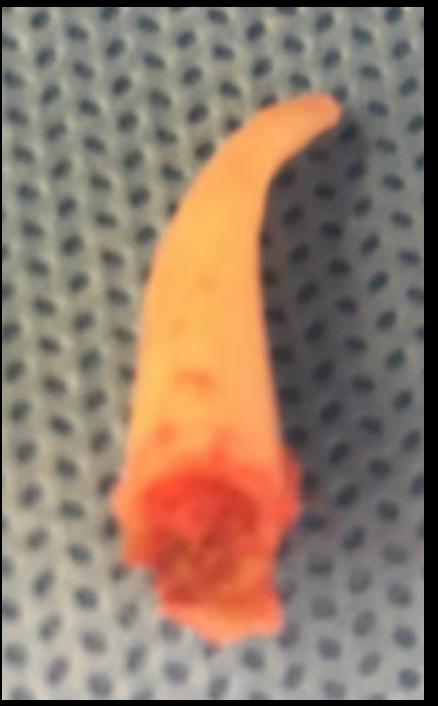
Does a simple extraction really mean its simple, are anterior teeth easier?

Treatment Planning

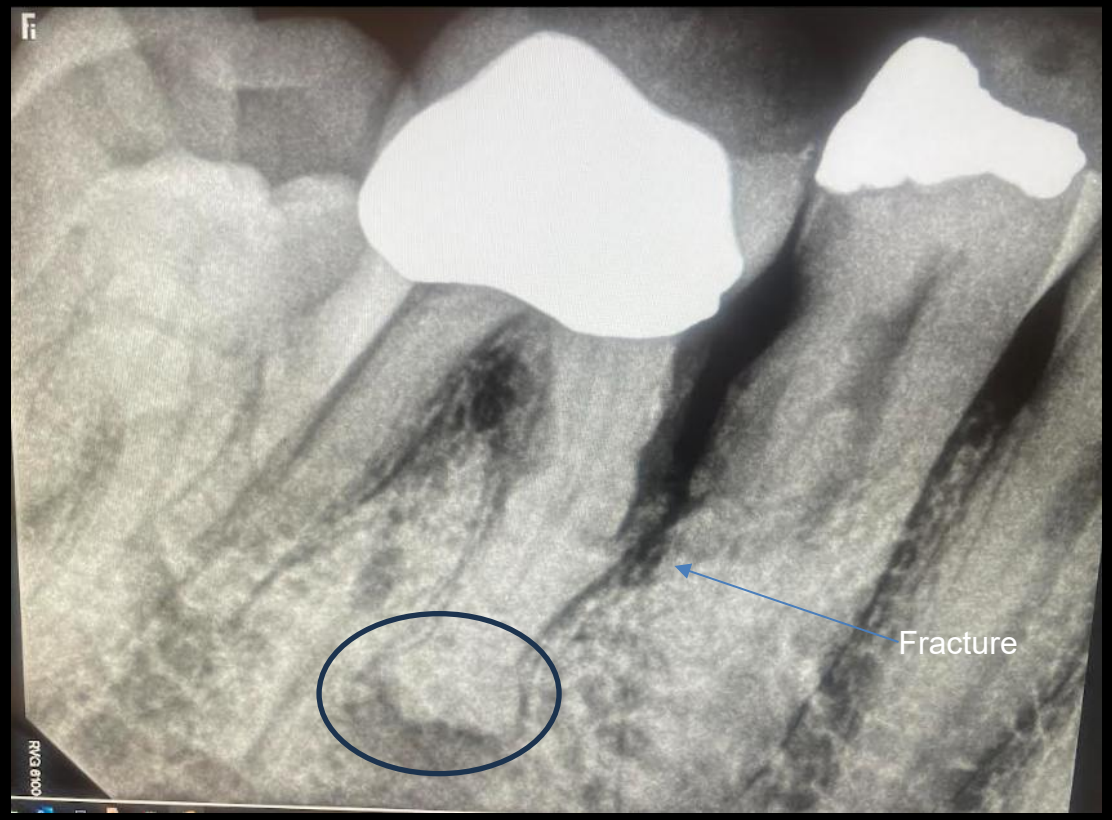
- Anterior teeth can be challenging & complex- dilacerated roots, canine eminences, lack of PDL space etc.

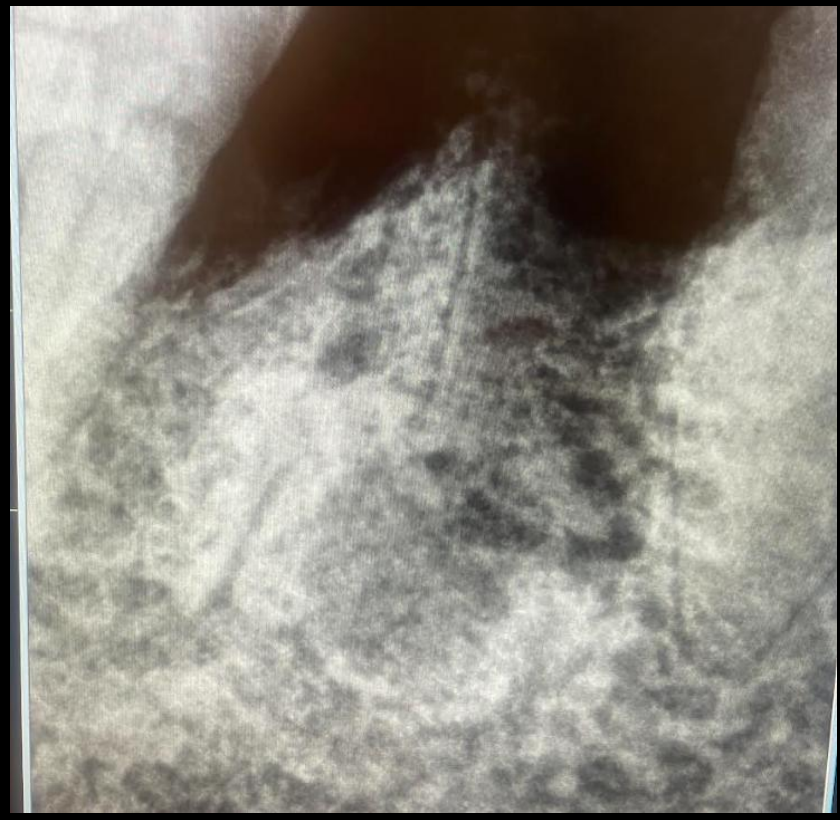
- Never underestimate anterior teeth especially the canine!

"The most common area for the buccal cortical plate to be fractured is the maxillary canine"- Le et al.



Treatment Planning





- Not all periodontally involved teeth are the same, furcation involvement

Treatment Planning - Informed Consent

- “Risks, Benefits, Alternatives (R/B/A) discussed with the patient; he/she has been informed and agrees to proceed”. Pt has had opportunity to ask all questions
- Discuss ALL possible complications
- Description of surgery and “normal” post-op course
- For Non-English-speaking patients TRANSLATION required and document

Treatment Planning

- Lone standing molar, no purchase point & no elevation possible
- Patient referred to me and asked “Why did they try it, if they couldn’t finish it”
- Never sugar coat extraction complexity, refer as needed

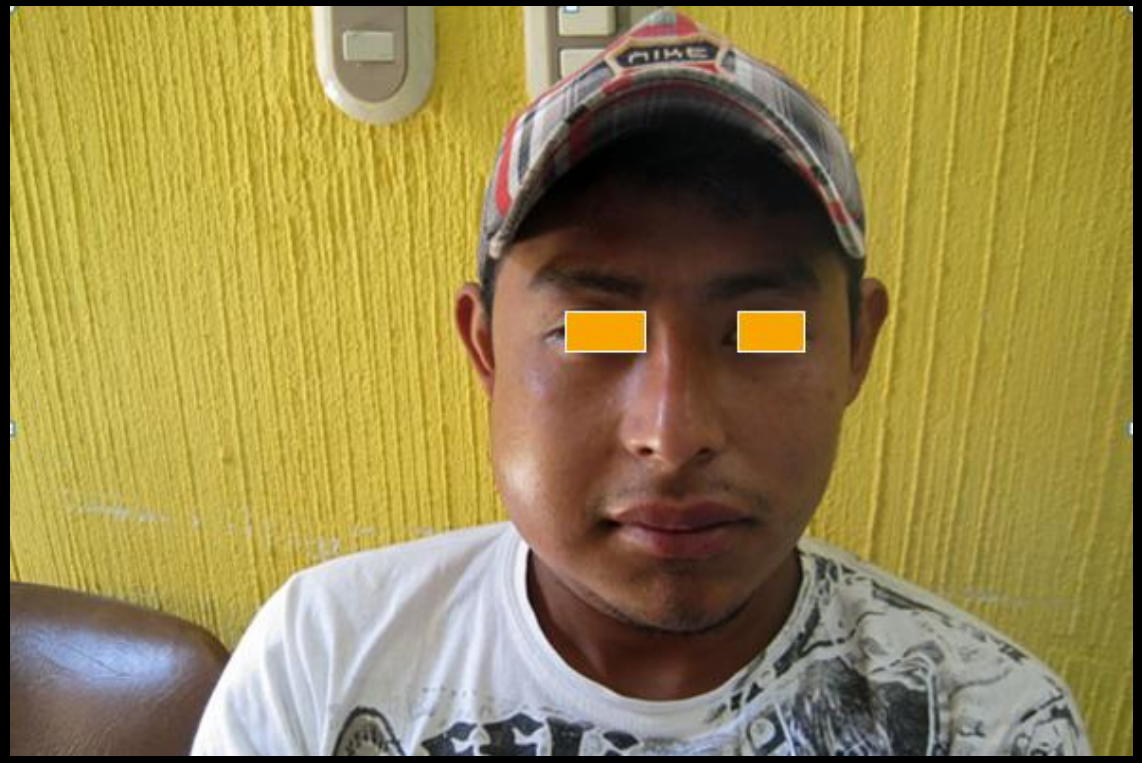
- What patients will tell others you did ! Keep that in mind
- Never use the word simple or easy, complications happen to best of us

Treatment Planning

- Consider what is best for the patient, however finances can dictate treatment plan
- Remember the patient's financial situation; they may not want expensive treatments, but we must provide alternatives
- Even if teeth can be saved, patients might choose not to maintain them

- **Access to Tooth/Mouth Opening:**
  - Trismus secondary to infection
  - Trauma

- **Presence of Infection**:
  - Is there an underlying/systemic infection that needs to be addressed first
  - Dysphagia, dyspnea
  - Antibiotics needed ?
  - Can we obtain adequate local anesthesia, importance of timing



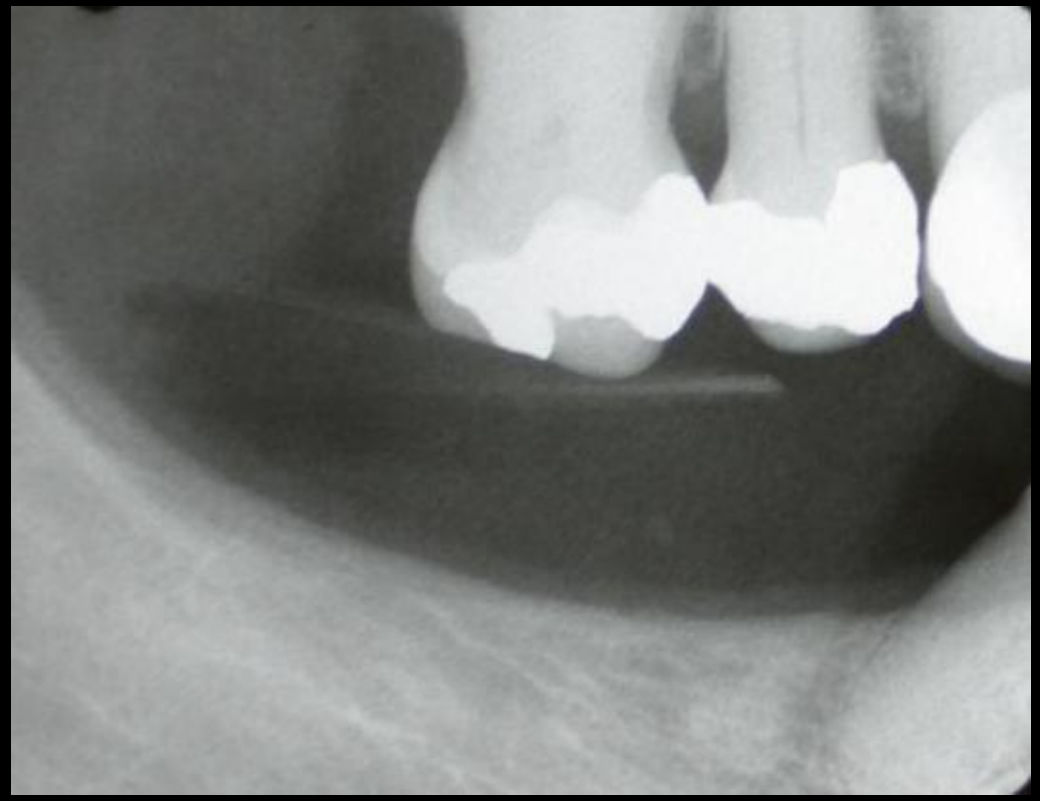
Ask yourself these questions

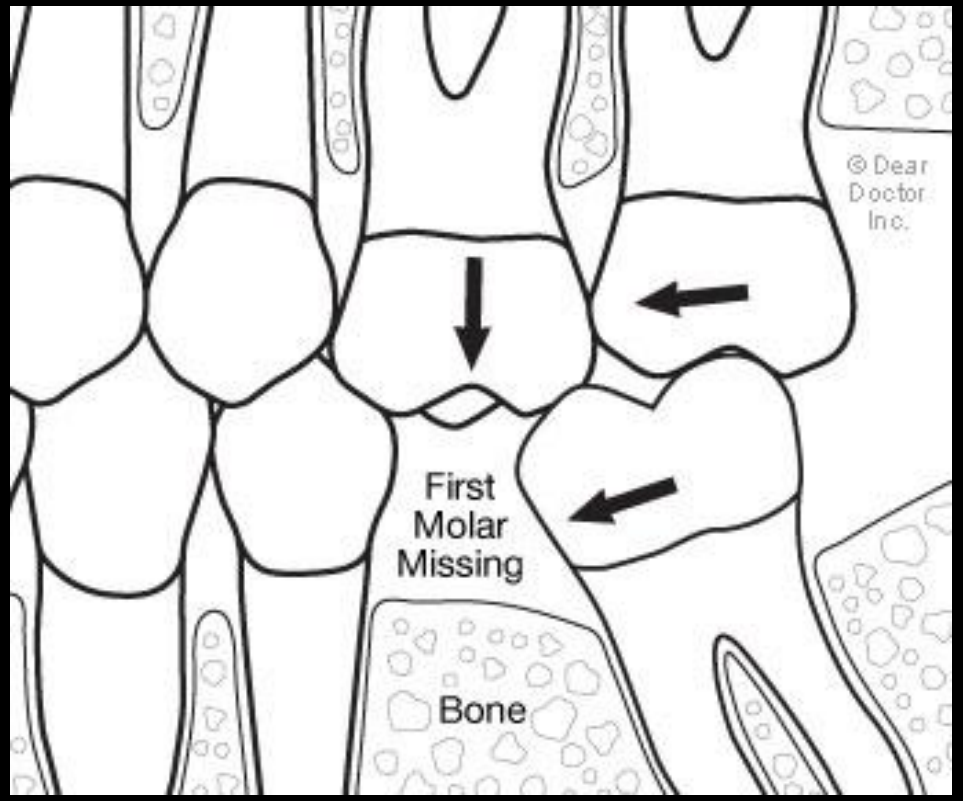
- Can the patient open wide for you to perform treatment?
- Can you put an instrument in a patient with this type of infection?
- Would you try to extract an infected tooth if a patient came like this?

- 23 y.o male presents with pain primarily around # 12,13
- Palpation done to achieve discharge, surgical ext. # 12,13 under local anesthesia
- If patient had cellulitis or trismus appropriate referral to sedate patient would have been done

Malposed Teeth

- Trauma to surrounding structures from these teeth
- Bucco version usually maxillary 3rd molars (cheek biting)
- Hygiene issues with severe crowding plaque accumulation
- Hyper-erupted tooth opposing a planned prosthesis (may need to extract the hyper erupted tooth)





Pre-prosthetic Extractions

- Design interference-lack of VDO
- Second molars supra-erupt, in certain cases first molar occlusion is IDEAL

Assessment of Extraction Complexity

Extraction Complexity

- What is complex for one provider may or may not be complex to another

- **No rewards** to be gained in attempting procedures where you have little knowledge or experience

Extraction Complexity

- No rules or regulations on GP's case selection
- Case selection depends on learning desire, skill level, expertise & training
- Certain radiographic factors can aid in complexity…

Treatment Planning - Radiographic Assessment

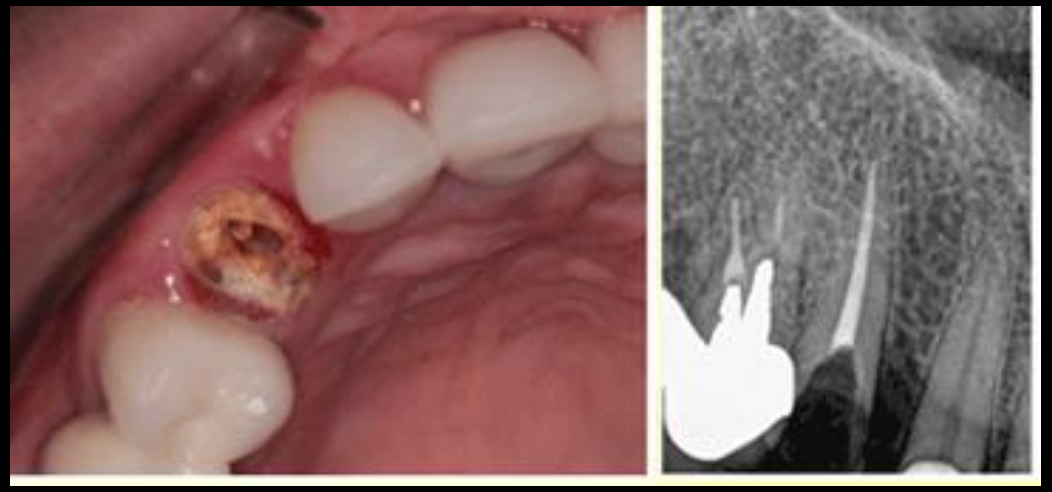
Root Configuration

- Curvature/dilaceration
- Fused/flared
- Bulbous roots

Condition of surrounding bone

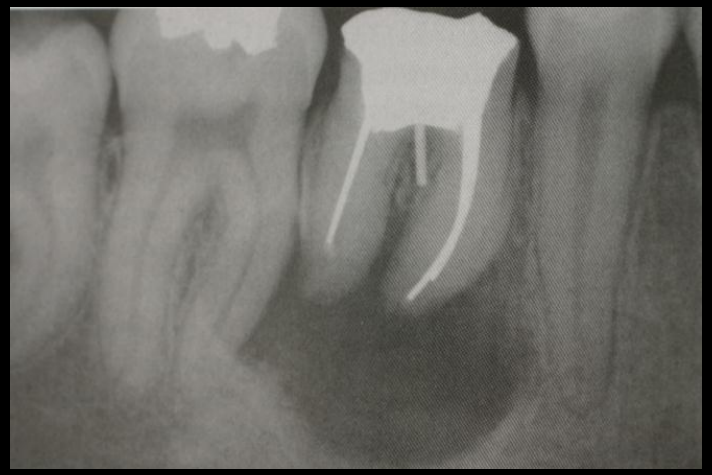
- Densities & opacities
- Maxillary bone is softer than mandibular bone
- Lone-standing teeth
- Certain ethnic populations tend to have denser bone

- Examine the surrounding bone for density and pathology that could be present
- The more radiopaque the bone around the tooth to be extracted, the possible indication of more bone density and complex extraction
- In this case # 6 is fractured at the coronal 1/3 rd., extreme dense bone noted on the M&D with crowns and RCT treated



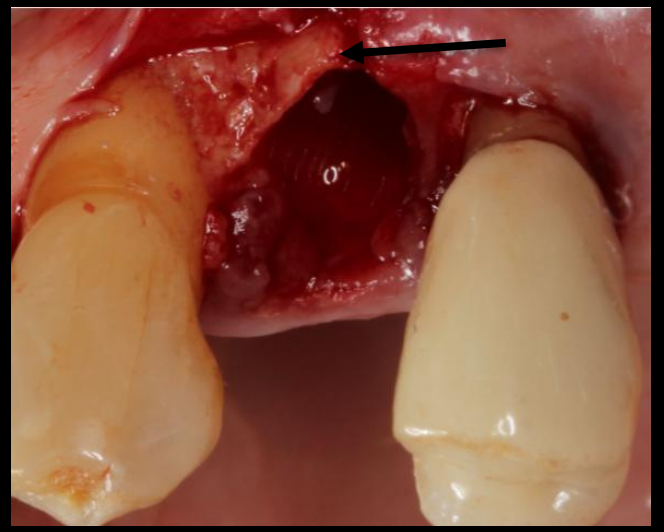
Bach le et al. Oral Surgery for the General Dentist-Atraumatic Extractions

Treatment Planning - Radiographic Assessment



Lack of PDL space

- In my opinion this is determining factor on extraction complexity
- Minimum luxation leading to coronal fracture & NO purchase point
- In certain cases, create a purchase point & extract with surgical technique



- PA reveals NO PDL space. NO purchase point, dense adjacent bone
- Cannot luxate, minimum space between 2 teeth to create purchase point
- Clinical crown has recurrent decay and will fracture upon luxating

Treatment Planning - Radiographic Assessment

Endodontically treated teeth

- Extremely weak and fragile, brittle
- Consider sectioning, troughing with atraumatic measures
- Be aware of critical anatomical structures in this location!!

Treatment Planning - Radiographic Assessment

Poor crown/root ratio

- Greater probability of fracturing at CEJ if no proper planning

- Why is #6 a surgical extraction?
  CEJ caries, Canine eminence presence

Relationship to unerupted teeth

- Divergent roots on primary molars, unerupted tooth buds
- Use a 150 S, 151 S forceps for pedo teeth. Be as atraumatic as possible, don’t damage the tooth buds!!

Treatment Planning - Radiographic Assessment

Crown Condition/Caries Extent

- Decay to furcation & fractured cusps

  Severe decay #3,15 near pulp, low possibility of elevating tooth

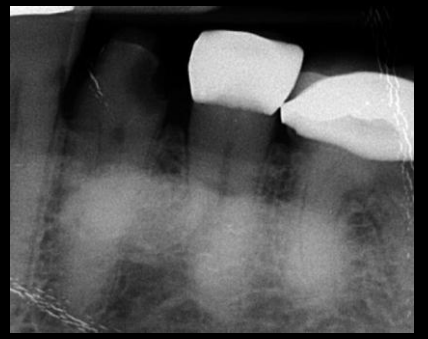
Treatment Planning - Radiographic Assessment

Tooth Mobility

- Periodontal condition
- Ankylosis/hypercementosis

Crown Condition/ Caries Extent

- 72 y.o. pt. presented for #21 ext.
  - NO PDL space, NO PURCHASE POINT!
  - Dense bone, don't spend time elevating



Treatment Planning - Radiographic Assessment

Dense, thick buttressing of bone

- Certain ethnic populations & patients with parafunctional habits have denser bone

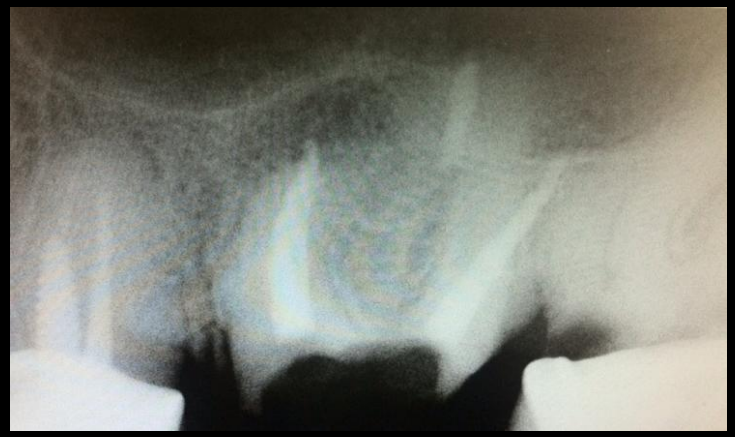
Treatment Planning - Radiographic Assessment

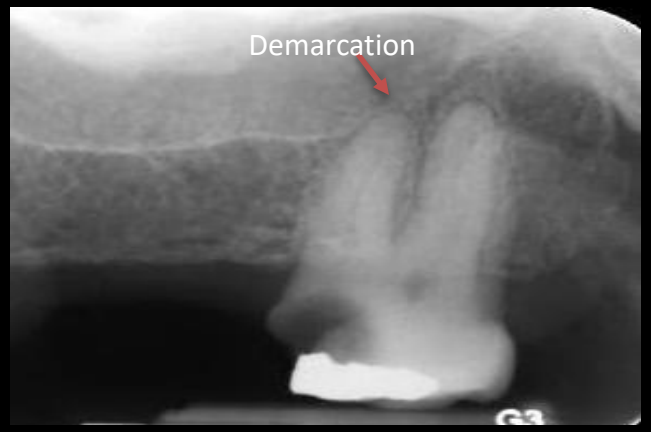



Cracked teeth/ Vertical Root Fracture (VRF)

- Heavy occlusal forces can cause fractures leading to extra segment
- Fractured roots can be challenging

Treatment Planning - Radiographic Assessment

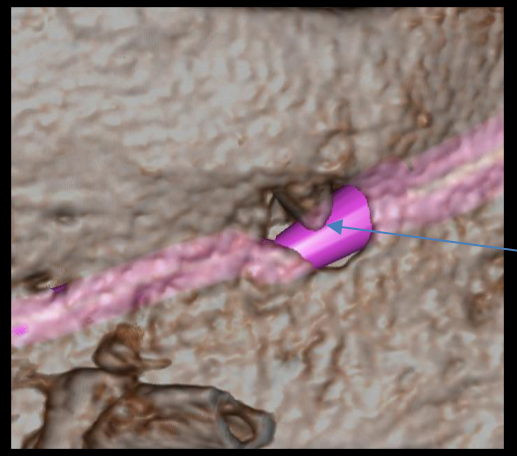




Relationship of Associated Vital Structures

Maxillary sinus (isolated teeth)

- Prepare for complications, document & explain to pt. prior to extraction NOT after!
- Consultation is where we address this, all r/b/a given



Inferior Alveolar Nerve

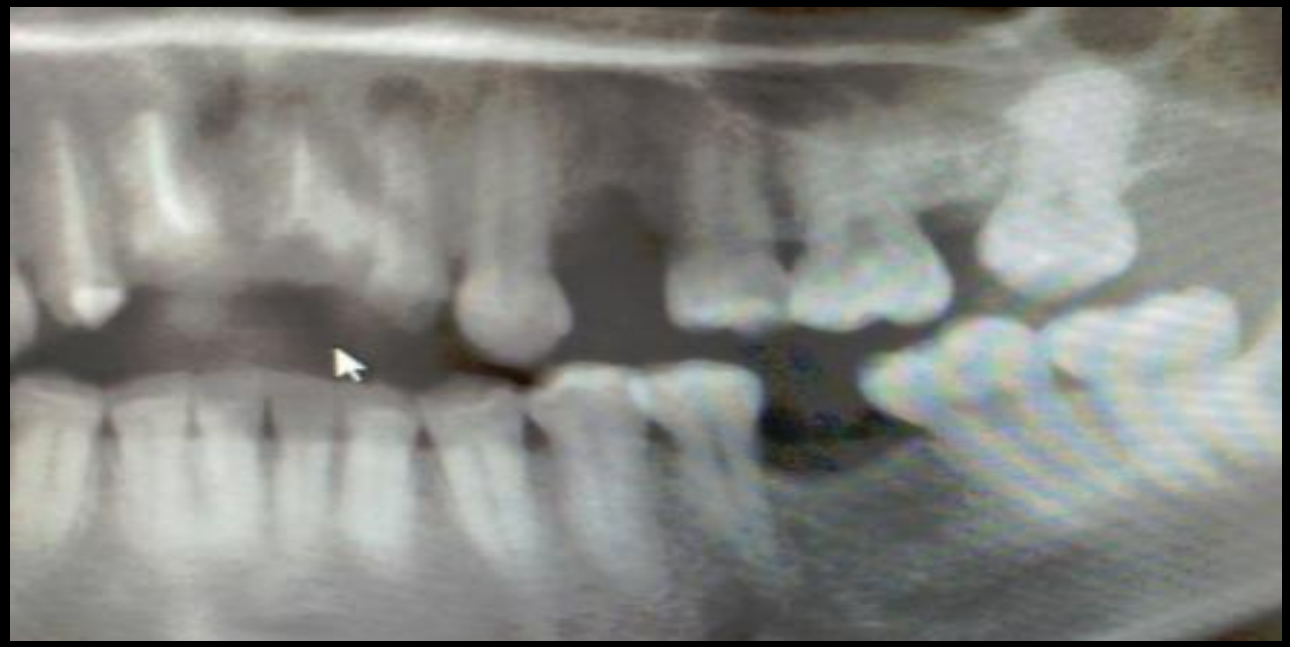
- Long second molar near IAN with possible displacement of canal, paresthesia concerns
- If possible, take a CBCT so patient and you can be on the same page on any post-operative complications

Treatment Planning - Radiographic Assessment

Lone Standing Molar

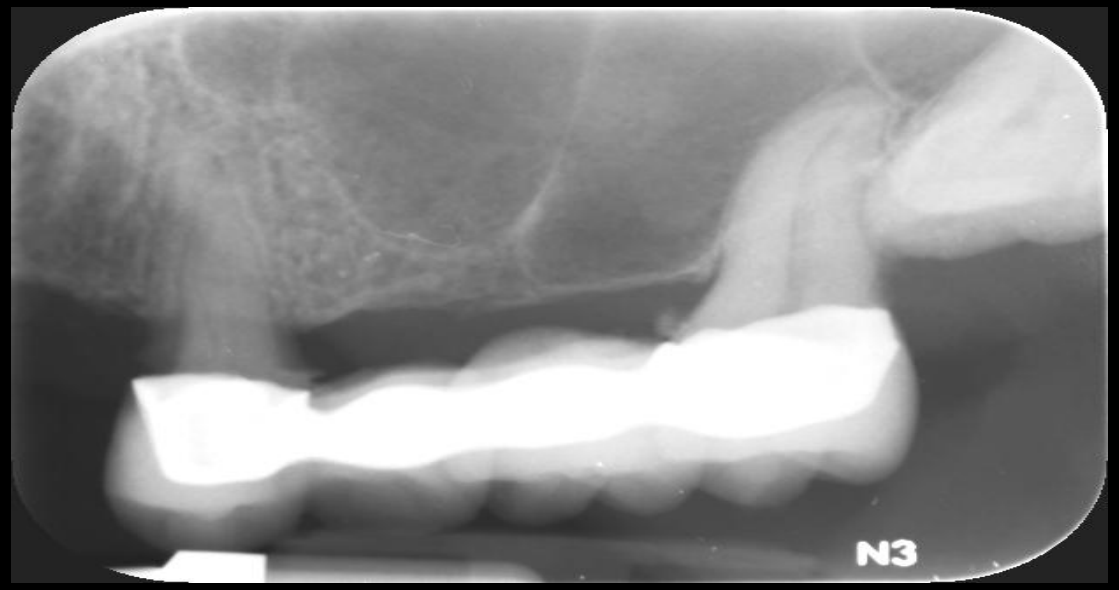
- 'Pneumatized' sinuses can present issues if not properly treatment planned

- #16 is periodontally involved however lone standing, do not assume you can extract with a forcep



Dense bone @ sinus floor

- #16 has bulbous roots with proximity to sinus floor. Extracted with forcep
- Surgically removal of bone required due to lack of a purchase point !



- Pt. had ext. #12-15 FPD, no documentation of sinus perforation or pre-op consultation
- Pt. complained on numerous PO visits that “something feels weird”, but pt. informed this was “normal”
- Saw pt. on urgent care & from signs and symptoms significant oral-antral communication. OS referral
- Due to lack of documentation from previous provider, all future treatment was complementary

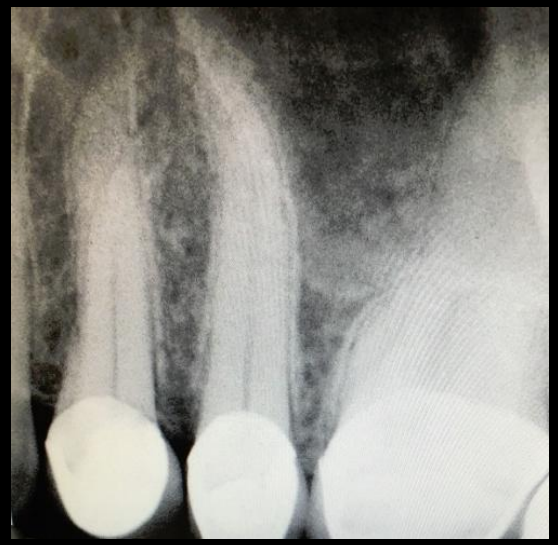
- Use CBCT for cases where you need more diagnostic data

Treatment Planning - Radiographic Assessment

Tooth Alignment/ Maloposed

- PDL space is visible, but lingual positioned
- Where to luxate, where is purchase point? Narrow forceps needed

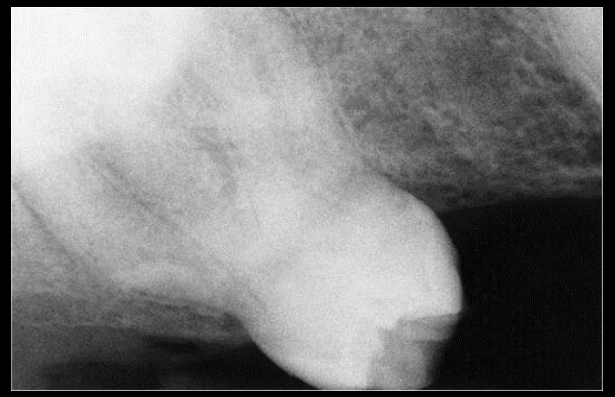
Simple vs. Surgical - Radiographic Assessment



- Critical to have a periapical X-ray (PA) past root apices
- Lack of PDL space USUALLY means a lack of a purchase point
- Purchase point will possibly be need to be created to ensure predictable extractions
- #12 had fracture line at the pupal floor, very challenging extraction, no PDL, minimum space b/w 2 teeth and crown present on #13, avoid elevator!

Simple vs. Surgical - Radiographic Assessment



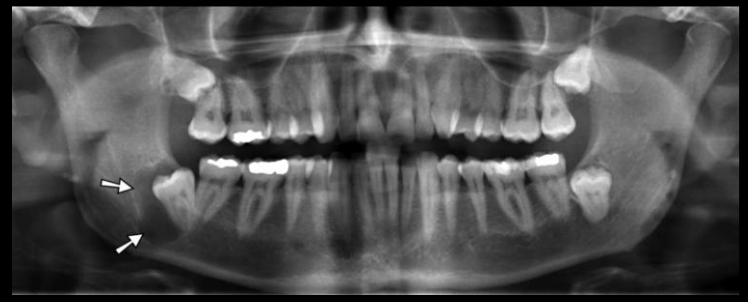



- By now we can understand complexity of extractions
- #1 extraction (Good Luck!)

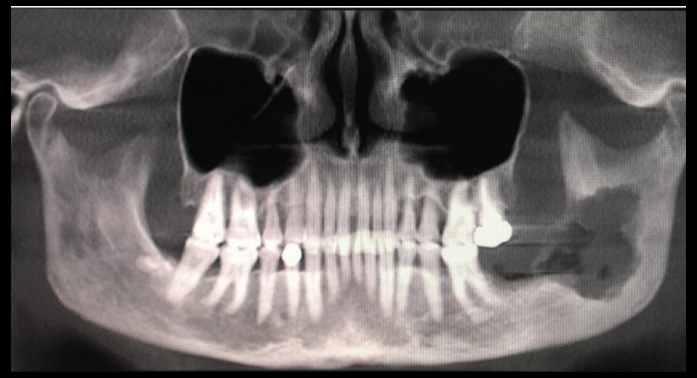
Third Molar Radiolucencies

Pano is needed & Refer to OMFS

1. Dentigerous cyst

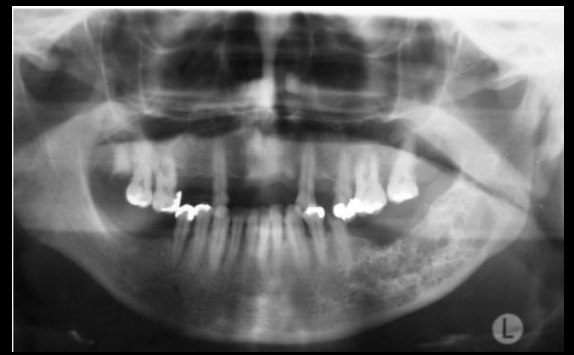


2. OKC



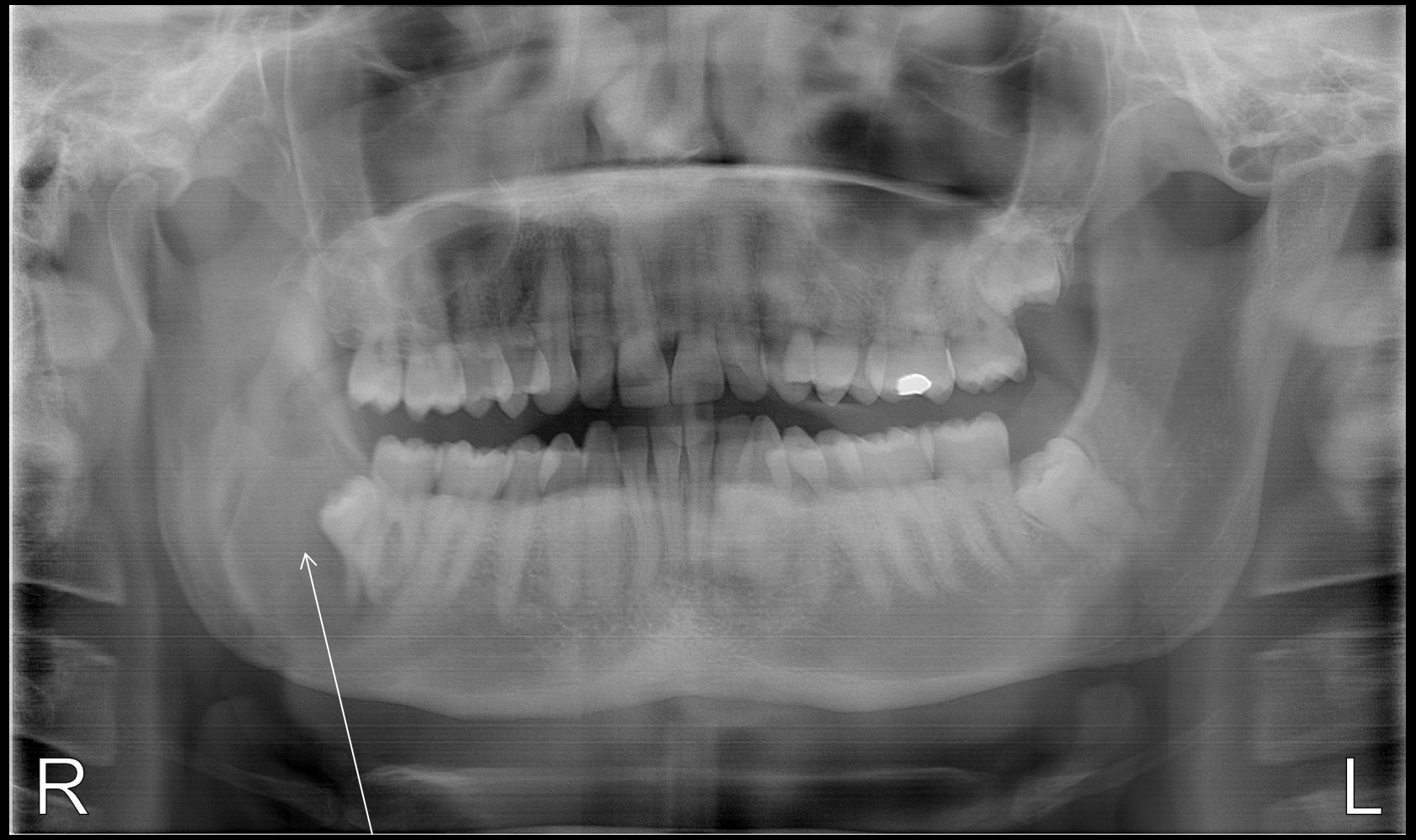
3. Squamous cell carcinoma

4. Dental Follicle



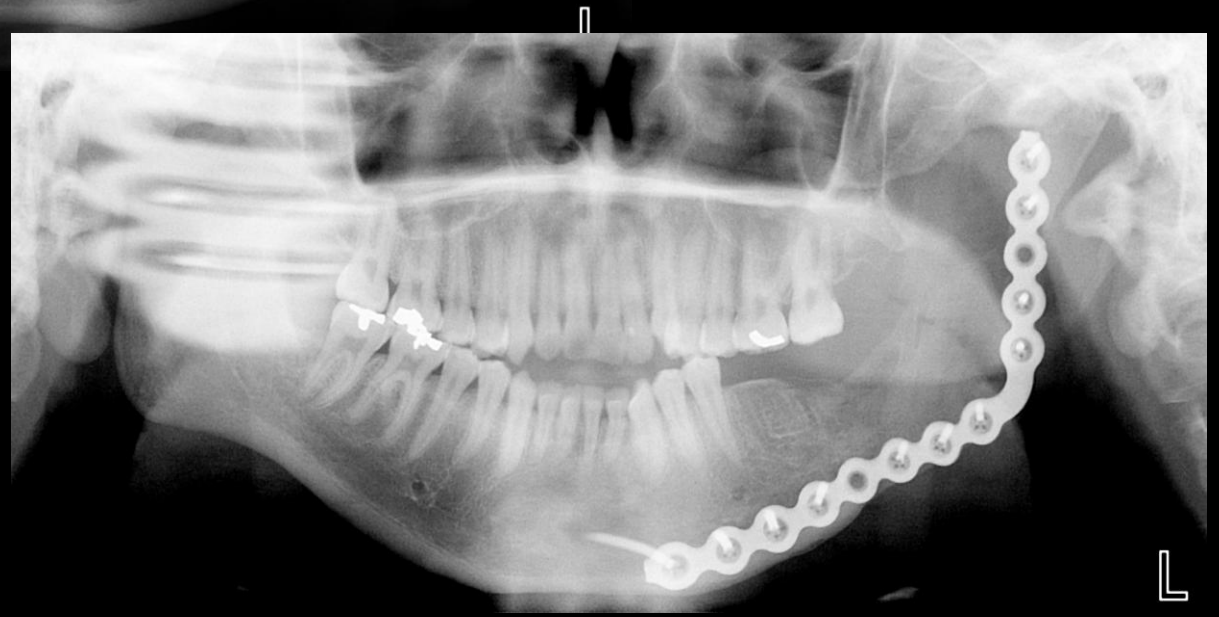
5. Ameloblastoma

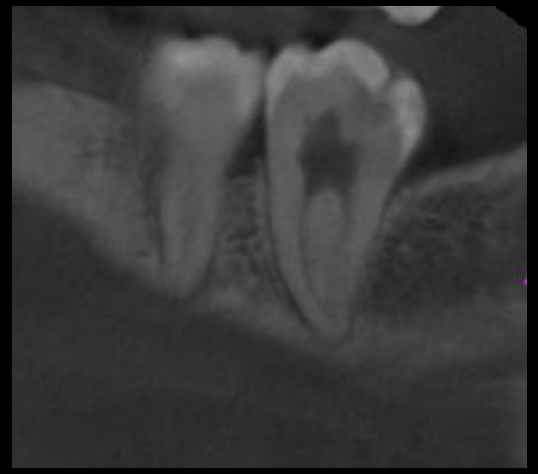
Impacted Teeth With Associated Lesions

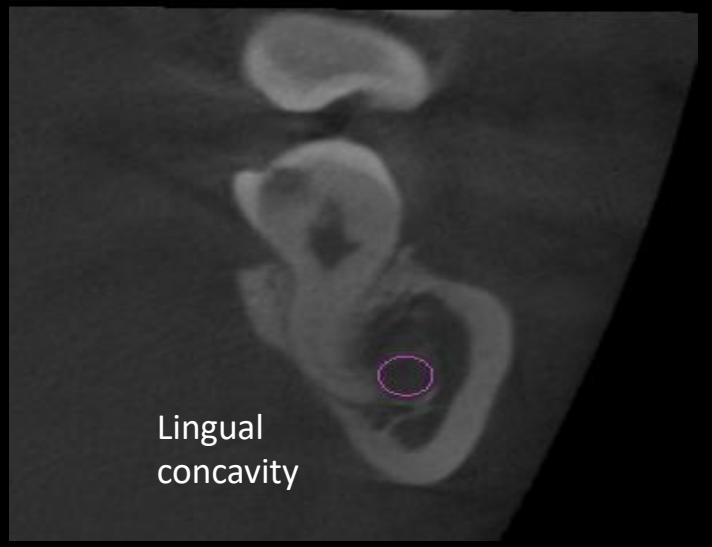


Ameloblastoma Associated With #17

Refer to OMFS !







#32 is close to lingual plate, be careful of lingual nerve!

- PA can be misleading, #17 looks straight forward but CBCT shows otherwise!
- Minimum x-ray for third molar diagnosis should be PANO and not rely on a PA

Simple vs. Surgical

- After examining radiographs, modify technique to prevent complications
- Consider surgical & atraumatic approaches for complex exodontia
- Need to understand both techniques for extractions

Surgical Technique - Terminology

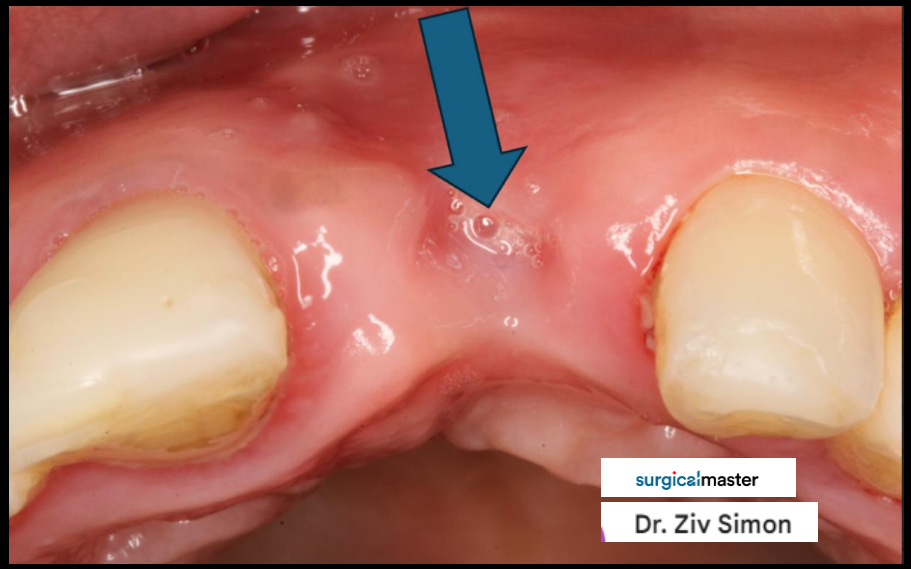
- Sectioning - cutting roots into predictable sections & removing individual sections with possible flap
- Troughing - creating space by selective bone removal to aid in extraction
- Purchase point - Point of contact created when sufficient force can be delivered to aid in the extraction process

What is meant by a surgical extraction?

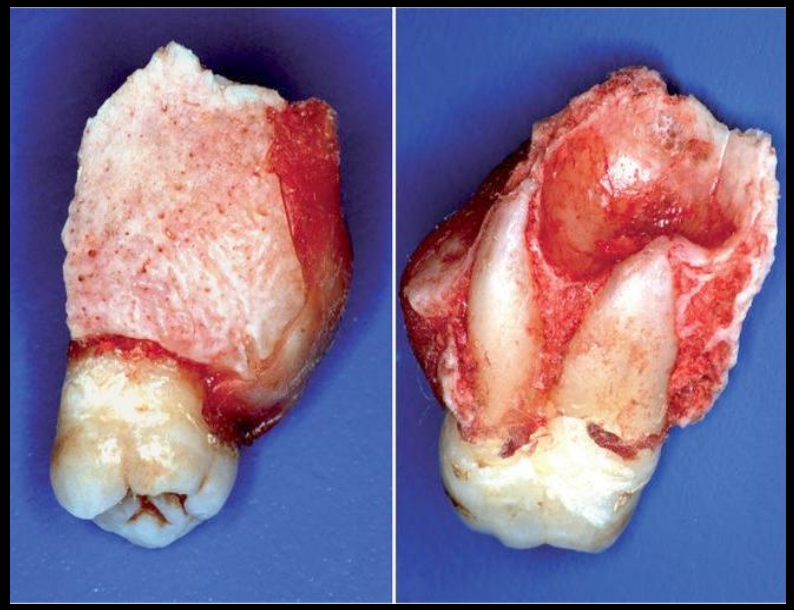
- Selective bone removal to create a purchase point assisting in elevation
- Precise bone removal with roots sectioning being prioritized before additional ostectomy
- Knowing all steps from beginning to end are essential prior to all surgical extractions, let's get the basics down first……

Atraumatic Methods

Atraumatic Extractions



- When treatment planning extractions we need to consider atraumatic techniques
- Maximum preservation of all hard & soft tissues will give a predictable outcome
- “An equilibrium is reached approximately 3-4 months post-extraction, resulting in a bone and soft tissue level that is lower than that of the neighboring teeth as complete regeneration of the socket site never occurs” per Amler

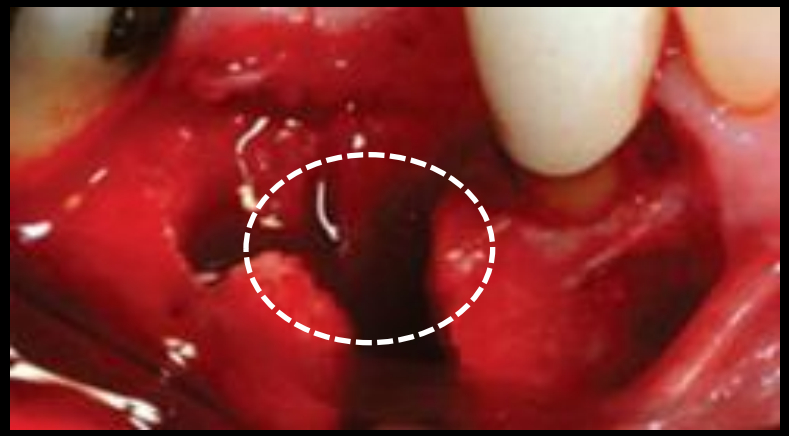


- Forceps extraction resulted in removal of bone & tooth instead of tooth
- Tuberosity removed with maxillary second molar, eliminates important prosthetic retention area & exposes maxillary sinus

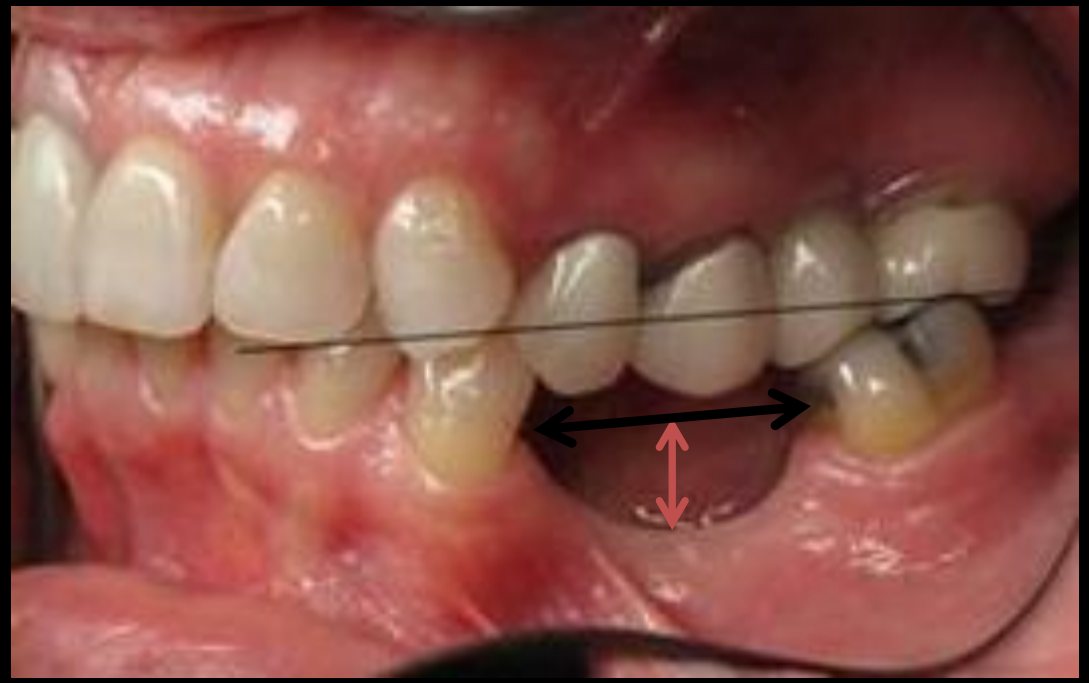
Atraumatic Extractions

Why is Buccal Plate Important

- Excessive buccal plate fractures leads to complications during implant & prosthetic placement
- Soft tissue defects lead to poor esthetic outcomes
- By applying too much force or trauma during an extraction you can damage the buccal plate



Courtesy of Dr Elo DDS,MS.



- Proper management of extraction sites can reduce vertical & horizontal deficiencies
- Poor extraction sites lead to esthetic & functional prosthetic complications
- Vertical and horizontal loss seen leading to clinical dilemmas

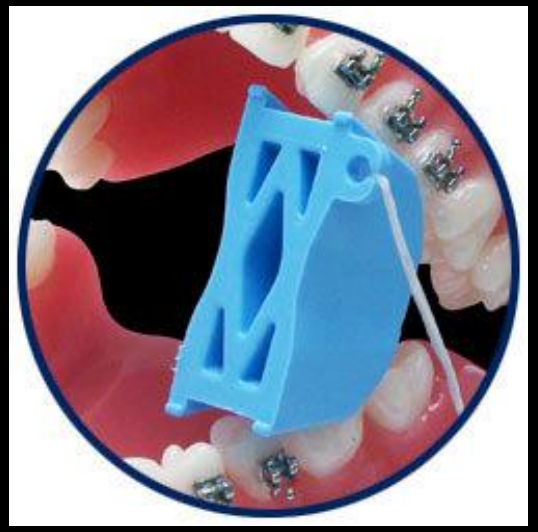
Atraumatic Extractions

- The most time efficient & cost-effective augmentation techniques starts at extraction appointment
- If we can maintain what we have, we can achieve optimal success
- “The first step in the transition from a failing tooth to an implant – supported prosthesis is the extraction of the tooth and management of the extraction socket” per Elian et al.

Before Starting Any Extractions

- Proper patient positioning & Maintain proper posture
  - Don’t bend over backwards just to treat your patient!
    - You need to be comfortable for the next 25-30 years…
    - The patient can lie supine for the next 25-30 minutes
  - Make sure the height and position of the patient is correct
- Have good lighting, good suction equipment & a good assistant for exodontia
- Use a bite block & make sure you use a 4 x 4 gauze throat pack!

Holding The Mouth Open

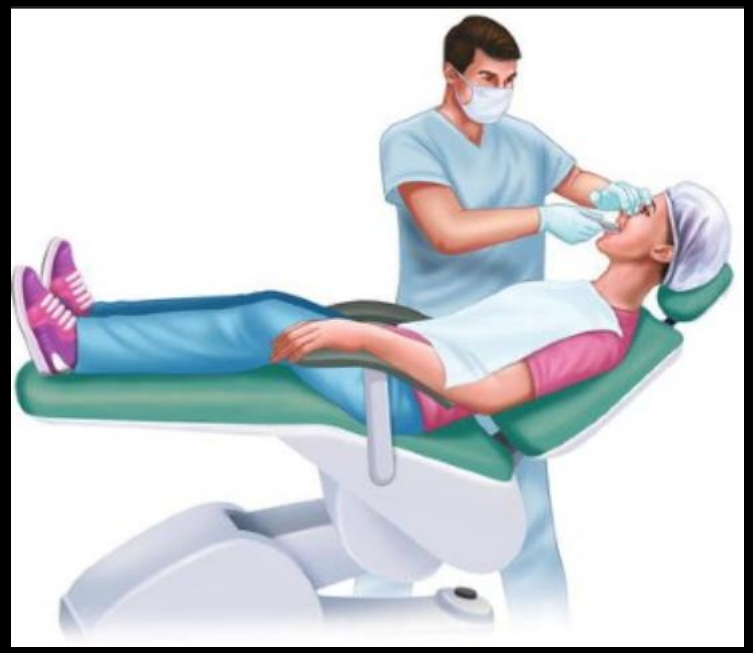


- When performing extractions recommend bite block to prevent stress on the TMJ
- Supporting the patient's jaw on a bite block will protect the joints
- The sides of the bite block are corrugated to provide a surface for the teeth to engage

Patient Positioning And Lighting

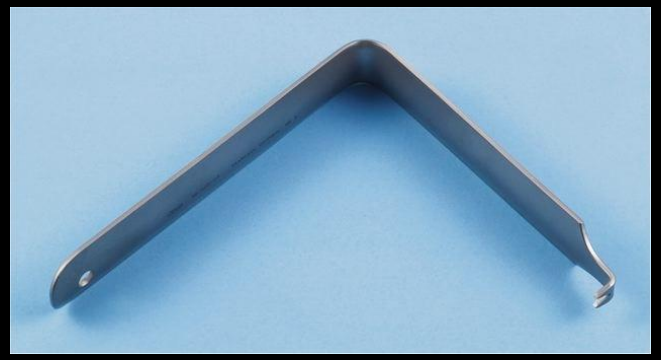
- Recommend a supine pt with elevation of head 20-30˚
- Always have good lighting

Proper Patient Positioning



- Patient position for **maxillary** extractions tilt back so that maxillary occlusal plane is at about 60 ° angle to the floor, SLIGHT SUPINE
- Chair height should put the patient's mouth slightly below surgeon's elbow

Retracting Soft Tissue



- Good access & vision are essential to performing excellent surgery
- Good retraction with good lighting & minimum bleeding - **critical for success**
- The two most popular cheek retractors are:

  Right-angle Austin retractor & broad, offset Minnesota retractor

Atraumatic Extraction Kit

Atraumatic Extraction kit containing 8pcs instruments - Atraumatic Extraction Luxating Elevator, Periotomes, Apical Retention Forceps, Serrated Curettes for atraumatic luxation with clean socket during dental extraction.

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7: S1112S	Serrated Surgical Curette 3.2mm
8: S1110S	Serrated Surgical Curette 2.4mm
9: S1152	Crile-Wood Needle Holder T/C (Tungsten Carbide) 15CM
10: S1180	Dental Surgical Minnesota Retractors
11: F1006	Lower Molar Modifed Cow Horn Beak
12: S1124	Surgical Bone Files-Miller BF1X

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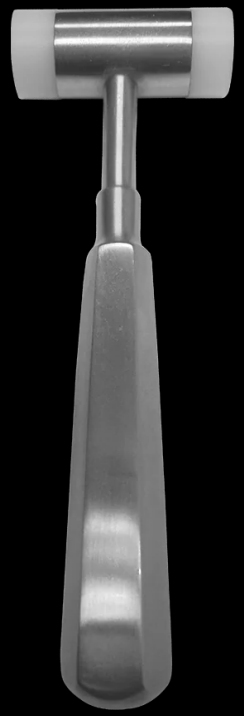
PERIOTOMES

- Types of periotomes available:

1) Manual periotomes 2) Autotome

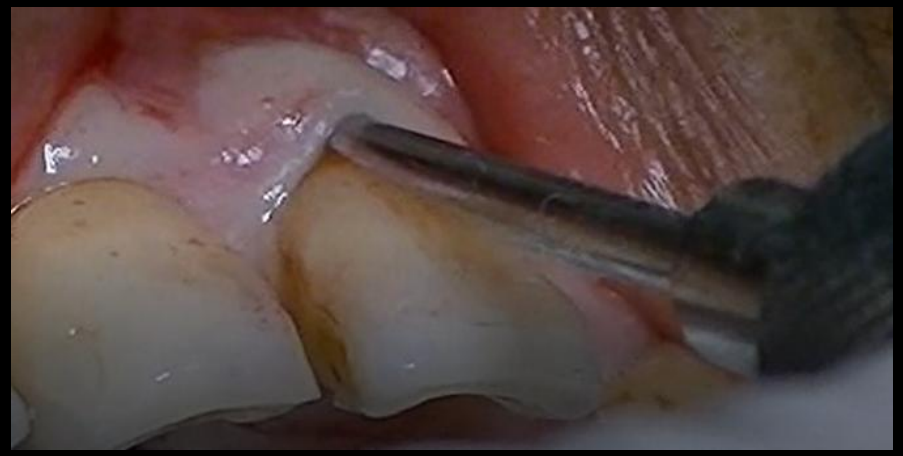
- Periotomes are used to preserve buccal plate by severing the periodontal ligament (PDL) by encircling the tooth 360^{o} & tapping with a mallet



- Especially important to preserve buccal plate in implant regions

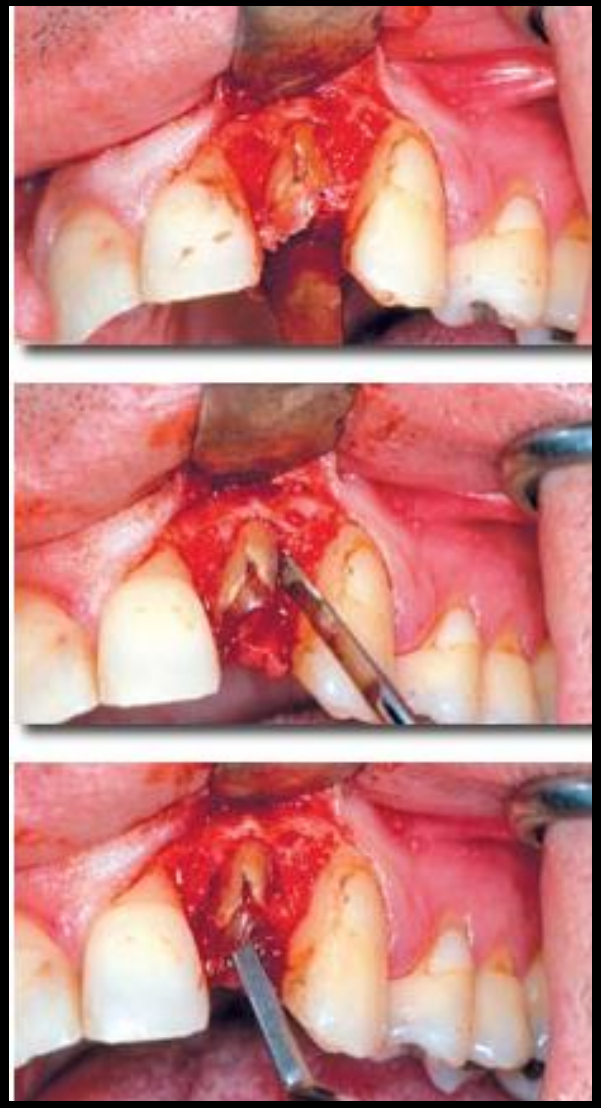
- Manual periotomes are available to use without the mallet portion for GP

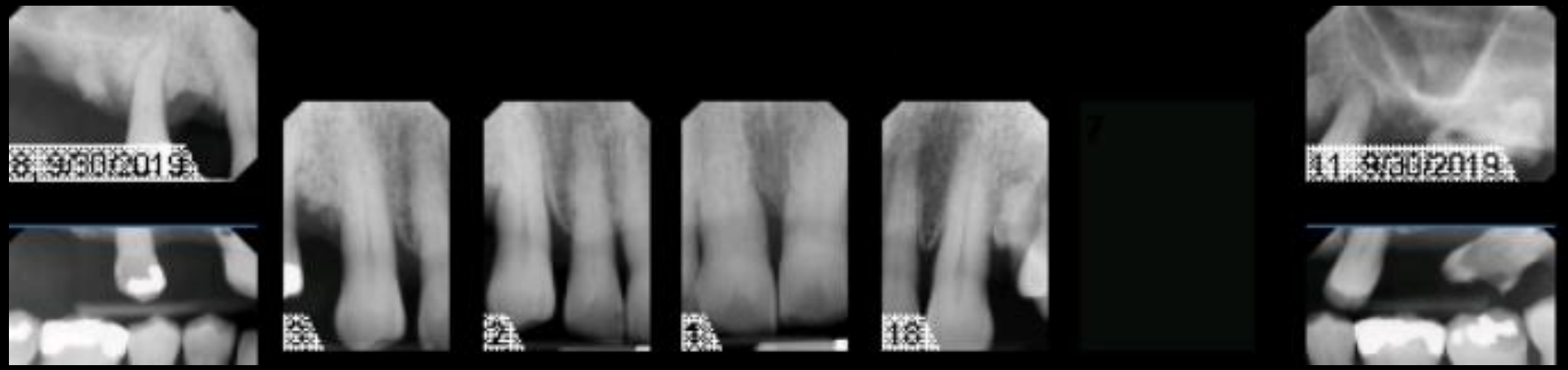
Surgical Armamentarium - Periotomes

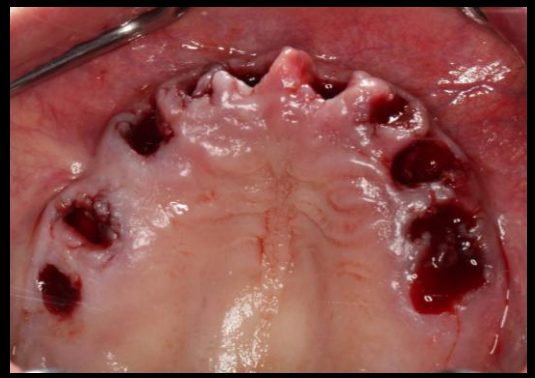


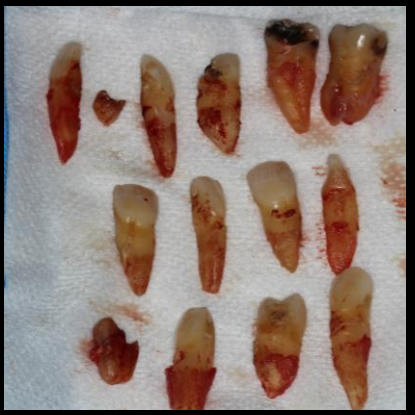
- When using a manual periotome, pay attention on the lingual aspect & encircle 360°
- Consider periotome kit for your extractions, different sizes & tips help in various sites

- Periotomes are invaluable in cases of retained root tips that are extremely fractured and delicate
- Encircle the tooth 360° to get ideal usage
- Make sure periotome is angled to the long axis of the tooth, double check to ensure it does not slip and lacerate soft tissue during mallet
- Critical in **ANTERIOR AREAS** to preserve buccal plate





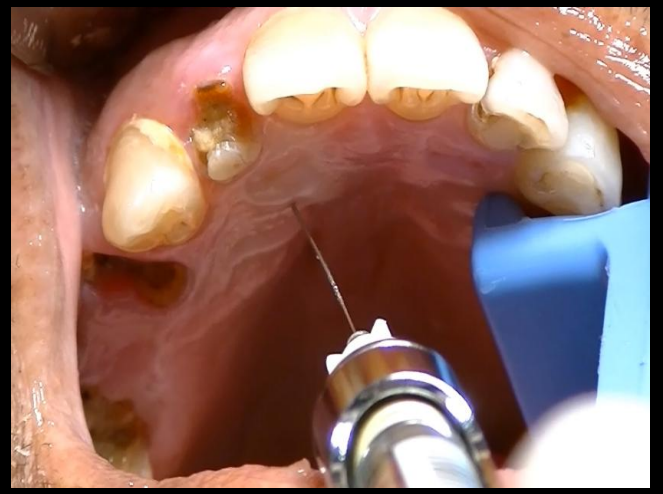




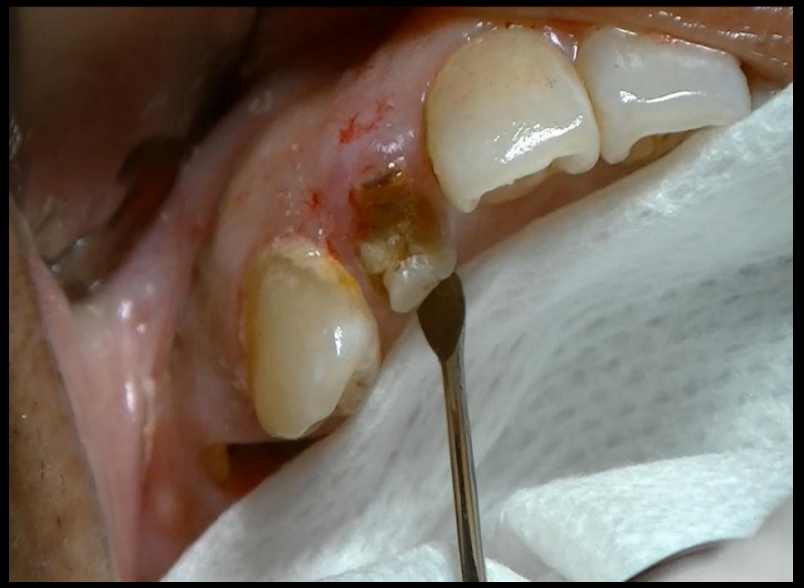
Conventional Power/Autotomes

- Essentially, an electronic periotome with multiple tips that eliminates the mallet portion of the conventional periotome
- Benefit: setting up RPM per providers preference
- Limitations: may take longer time than the conventional technique, possible provider fatigue
- Piezo surgical units have also been suggested for extractions of teeth, disadvantages in its use are increased heat generation & increased surgical time along with high cost of its armamentarium – Jain et al.

Anterior Teeth Extraction Technique (Maxillary)



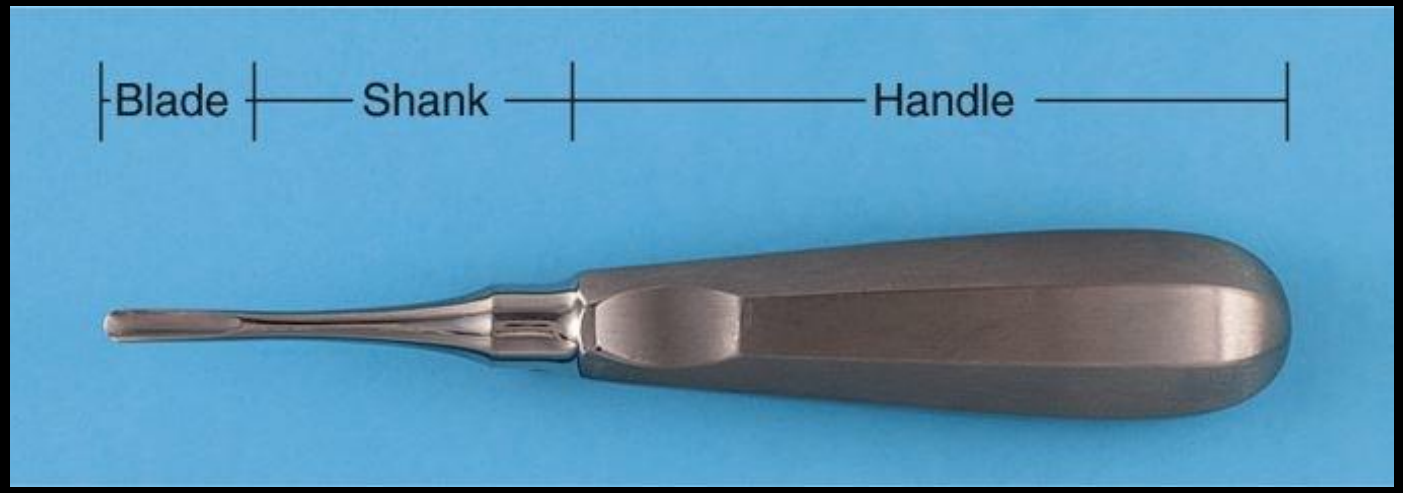
- Administer Profound Anesthesia: Maxillary & Palatal infiltration
- Recommend 30-gauge extra short needle as my initial injection
- Use a Bite Block when possible



- Use a periosteal elevator to reflect gingival tissue, gives an idea on the anesthesia in site
- Use a Minnesota retractor to protect soft tissues & to achieve better visualization
- After periosteal elevation, start periotome usage

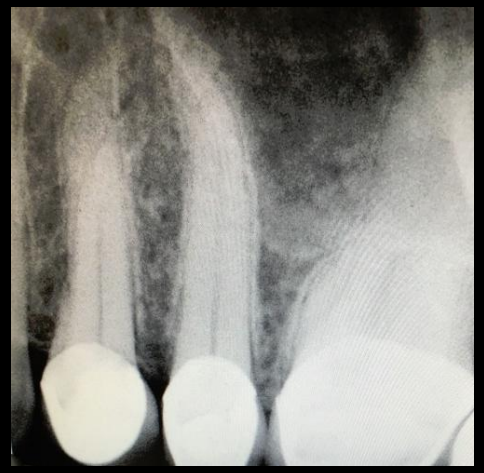
- Periotomes should be used 360° around the tooth
- Gentle tapping on the mallet as you encircle the tooth
- Periotome should be placed on hard and **NOT** soft tissue
- Tooth should start to exhibit some mobility

Dental Elevators



- Always luxate teeth (loosen them) from the surrounding bone prior to dental forceps
- The three major components of the elevator are the: Handle, Shank, Blade
- The blade of the elevator is the working tip of the elevator and is used to transmit the force to the tooth, bone, or both

Dental Elevators

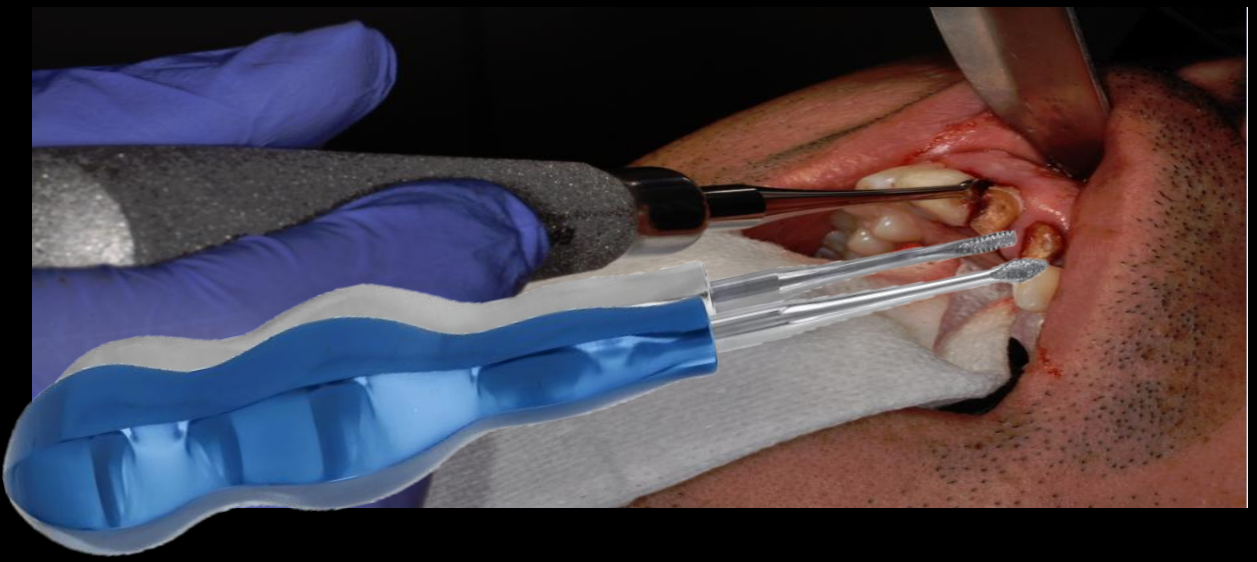


- The handle of the elevator can be held comfortably in the hand to apply substantial but controlled force
- **Helpful luxation tips**

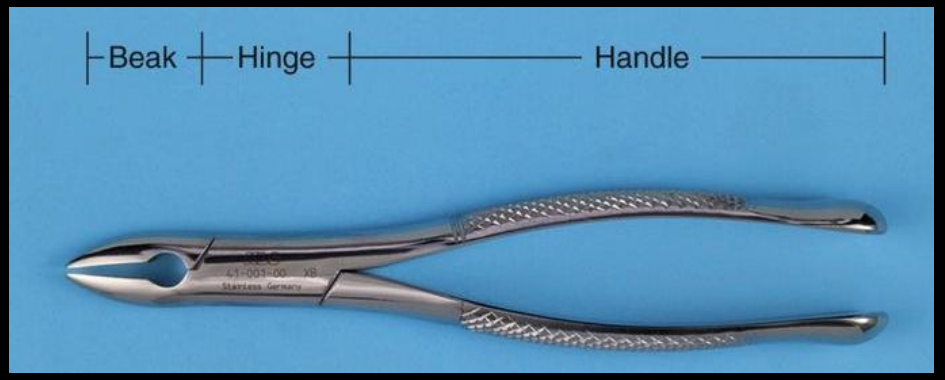
  UR/ LL teeth luxate elevator clockwise

  UL/ LR teeth luxate elevate counter-clockwise

Keep in mind large fillings or crowns on adjacent teeth



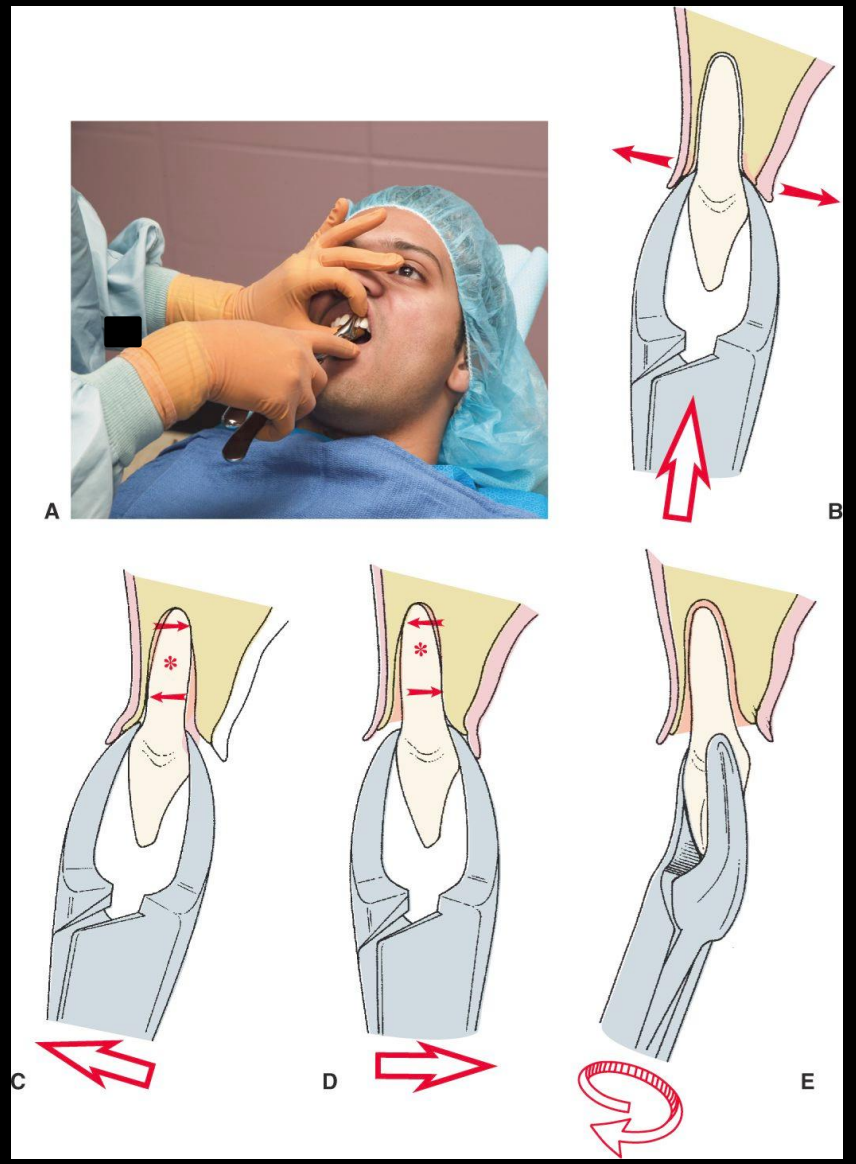
- Start luxating tooth with a Bayonet (spade) , 77R and luxate into the tooth
- Make sure adjacent tooth does NOT have any large restorations that could be dislodged by improper luxation
- Concave side ALWAYS MUST face the tooth! Luxate into and not away



Extraction Forceps

- The extraction forceps are instruments used for removing the tooth from the alveolar bone
- These forceps are designed in many styles and configurations to adapt to the variety of teeth for which they are used
- Basic components of forceps are - Handle, Hinge & Beaks

- Maintain good body posture with your back as straight as you can
- With your opposite hand, either retract the lips using your Minnesota retractor, or stabilize the alveolus of the arch in which you are working.
- This will help prevent the “rocking back and forth” of the patient’s head
- For anterior teeth extractions, your forceps will move in either a figure 8 motion or an “unscrewing” motion to deliver the tooth



- Extraction will be attained after adequate & luxation apical movement is achieved
- Always keep throat pack in, if possible, to avoid any unforeseen situation
- Make sure to not place forcep on gingival tissues, don’t remove keratinized tissue (KT)

- Apply forcep apically & start to rotate tooth in a circular fashion
- Always avoid buccal & palatal movement, figure 8
- Keep in mind the buccal plate ! Be mindful

Removing Bone & Soft Tissue - Bone File and Curettes

- Final smoothing of bone if needed with a small bone file, effective only in pull stroke
- When doing alveoloplasty for multiple extractions use your file to smooth bone
- The curette is used to remove soft tissue from bony defects, always check sites for granulomas

Inadequate curettage

To Suture Or Not To Suture ?

- Suturing is recommended to help the patient:
  - Minimizes post-operative bleeding & chance of socket food impaction
  - Significantly decreases risk of dry socket
  - Patients may swell a bit more when sockets are sutured

- 3-0 chromic gut suture is my preferred suture of choice
  - Lasts 5-9 days and is resorbable

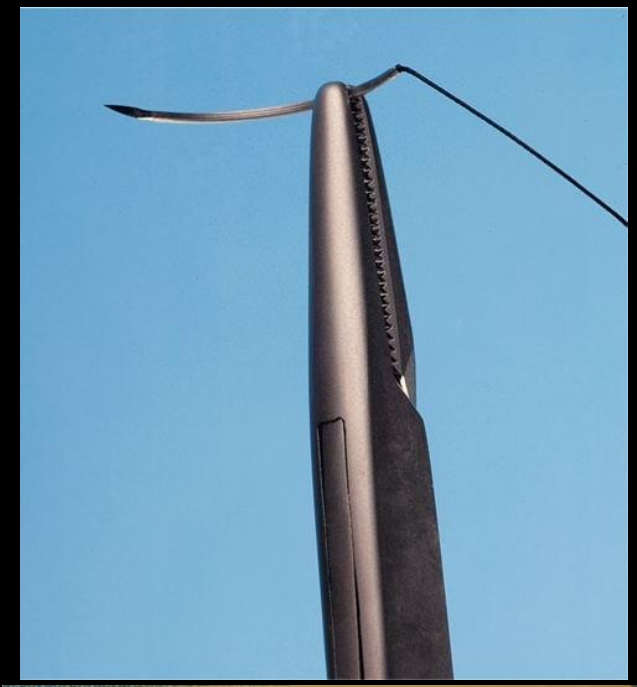
  A 3-0 silk suture is also okay to use, but will require removal at 1-week post-op however silk can cause a large amount of wicking

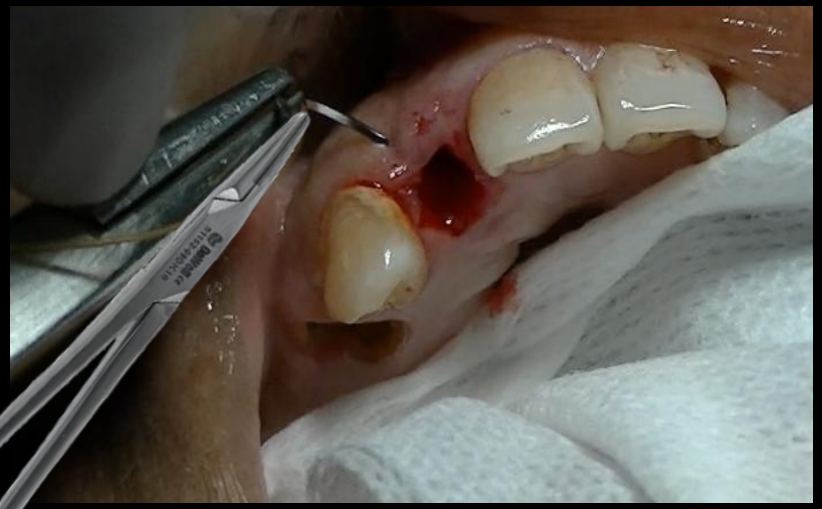
Suture Material

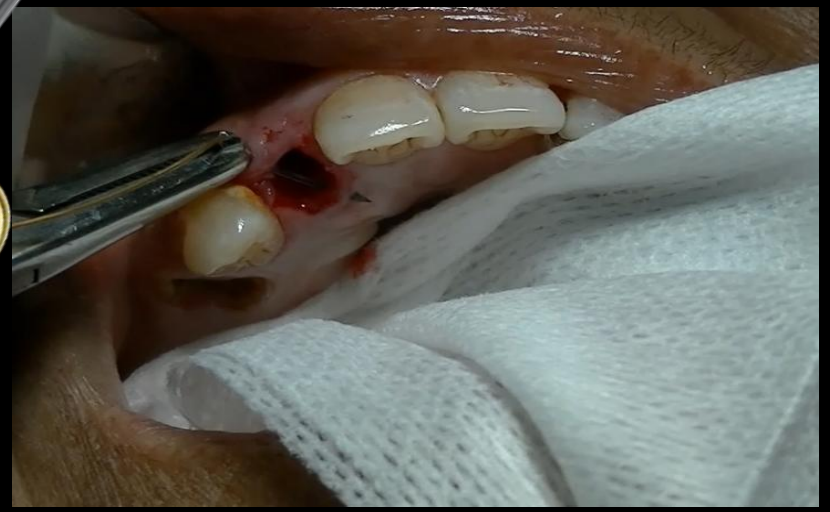
- Suture materials classified by diameter, restorability and whether they are monofilament or polyfilament

- Nonresorbable suture materials include types such as silk, PTFE, nylon, cytoplast , stainless steel

- 3-0 silk suture can be used, but will require removal at 1-week post-op however silk causes wicking

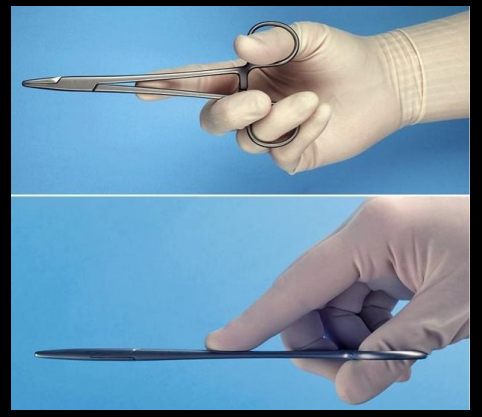






- Gently curette the socket followed by saline debris to remove any debris
- Place a simple suture to ensure the tissue heals adequately
- Start your suture buccal and then got to the palatal aspect

Needle Holder



- Needle holder is held by using thumb and ring finger in rings and first and second finger to control instrument
- Use “finesse” and not a pushing motion, glide your wrist

- Tie the 2 ends together & make sure to cut the suture ~ 1mm above your knot
- Clean the area & remove gauze

If root breaks, use the Root Extractor (S1301).

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12: S1124	Surgical Bone Files-Miller BF1X

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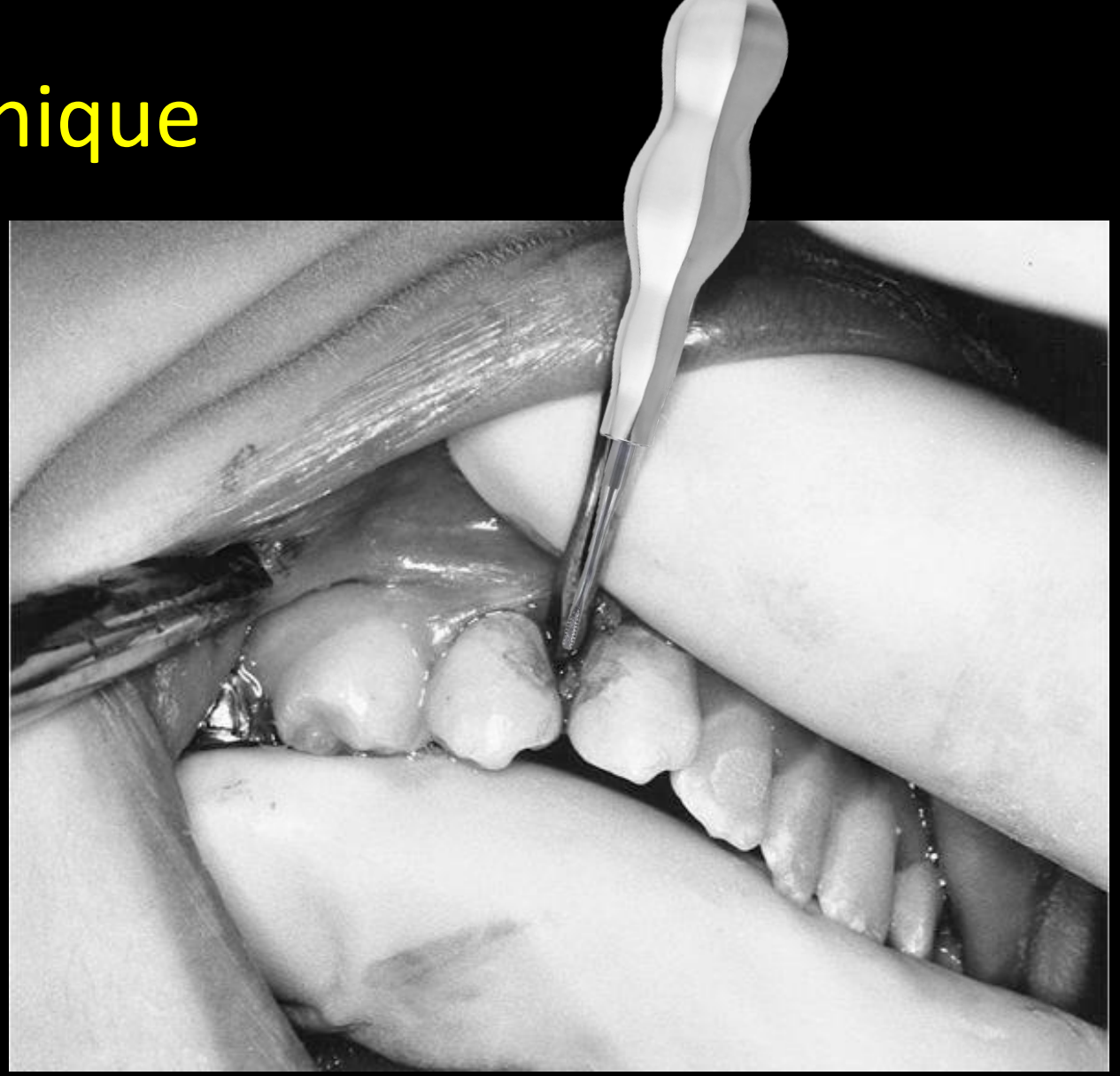
Posterior Teeth Extraction Technique (Maxillary)

- After profound local anesthesia, release the gingival cuff around the tooth to be extracted
- Recommend Buser elevator which is slightly smaller than a regular periosteal elevator, followed by periotome

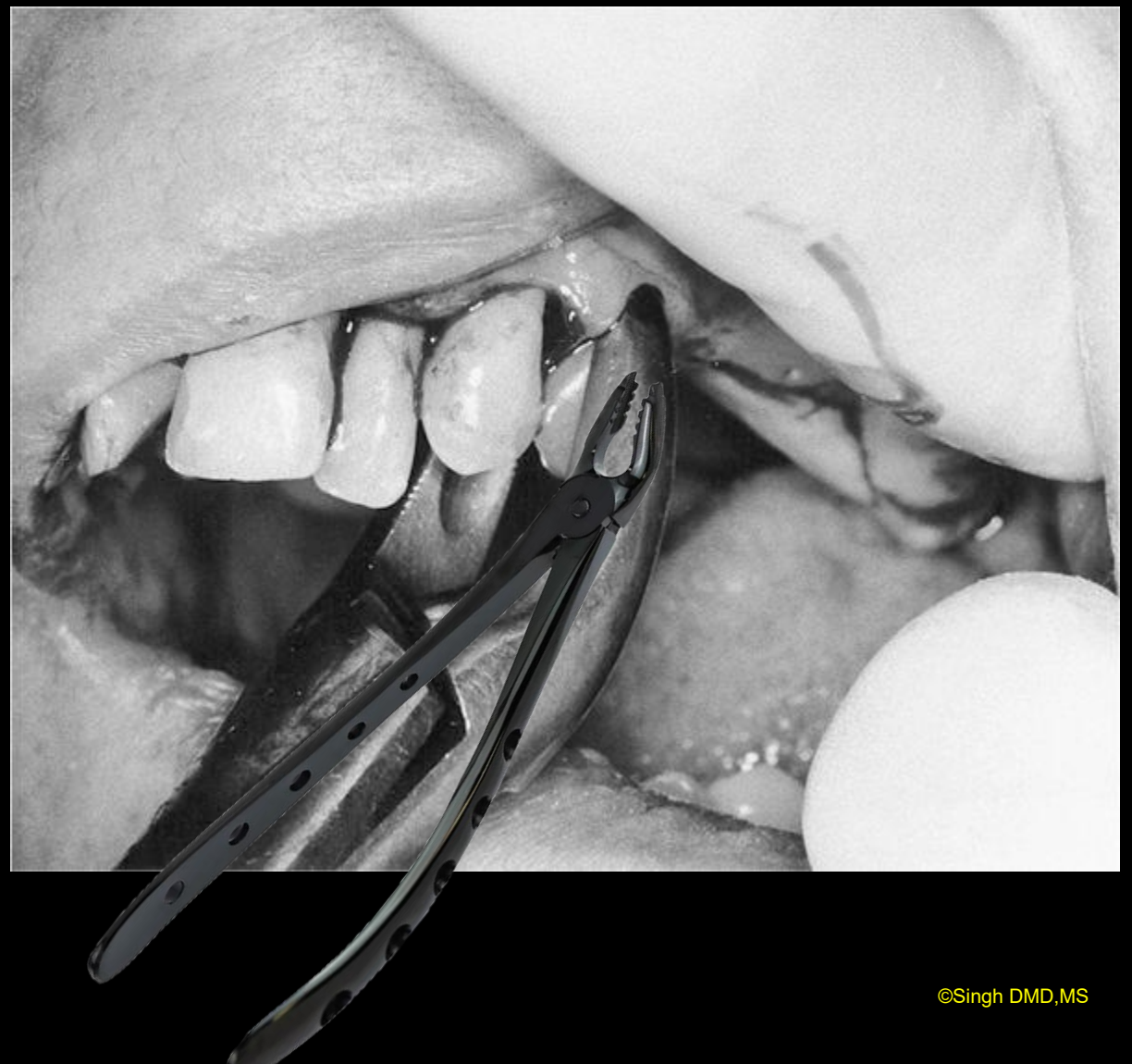
Technique

- Either use your Bayonet or 77R elevator and gently luxate the tooth
- The motion is turning INTO the tooth with the elevator
- The more gently you luxate the tooth, the more comfortable the patient will be



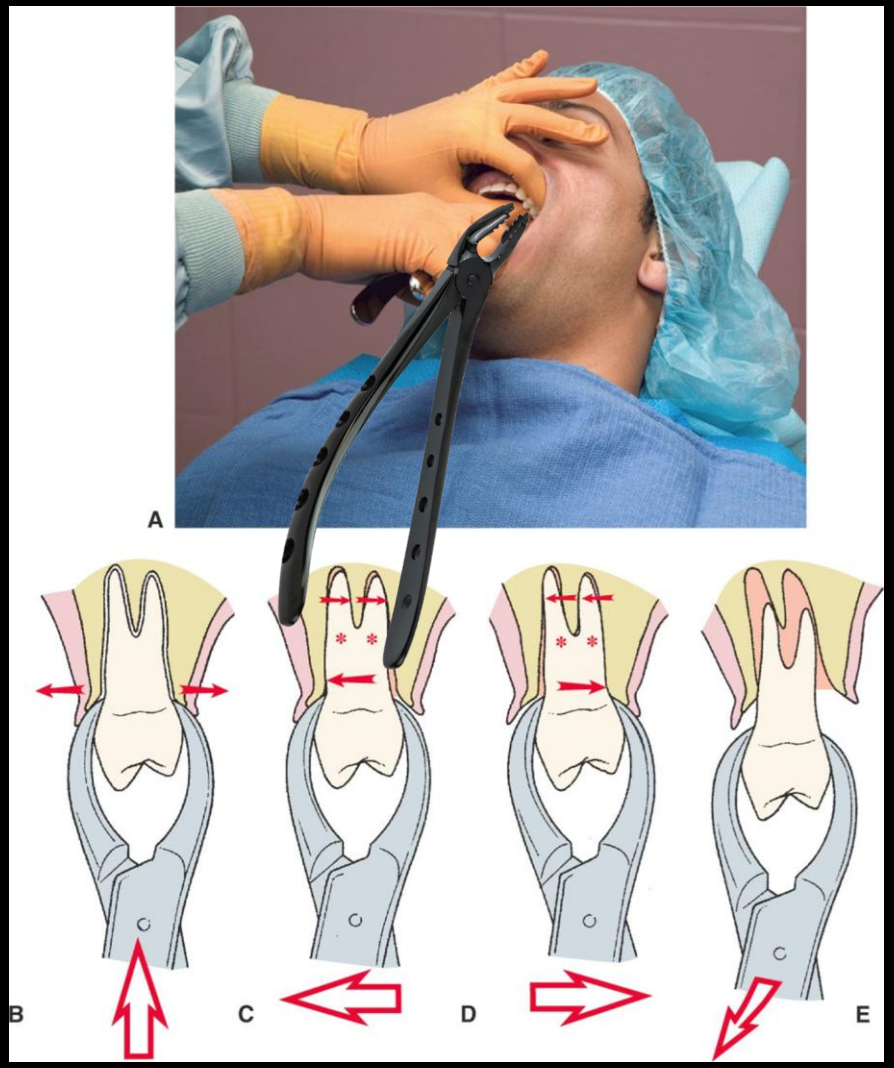
Technique

- Upon mobility with dental elevators, you seat seated apical retention forceps
- Motion with forceps is NOT B/L
- Use a figure 8 to widen the socket and loosen the tooth - “taking the tooth out for a dance”



Technique

- Maxillary molars and premolars can pose unique challenges in their, sometimes, stubborness with elevation
- Always use the “figure 8” movement
- Apically seat your forceps for the most control of the tooth
- Grabbing the tooth by just the crown can lead to more tooth fractures, and more frustration



Mandibular Extractions - Proper patient positioning

- For mandibular extractions, patient is more upright so that the mandibular occlusal plane of opened mouth is parallel to the floor

- Height of the chair is also lower to allow operator's arm to be straighter

Posterior Teeth Extraction Technique (Mandibular)

- Release the gingival cuff around the tooth to be extracted with a Buser
- Pointed side of periosteal for papilla release, rounded side for gingival margin
- Rarely periotome with mallet is used, concern of soft tissue laceration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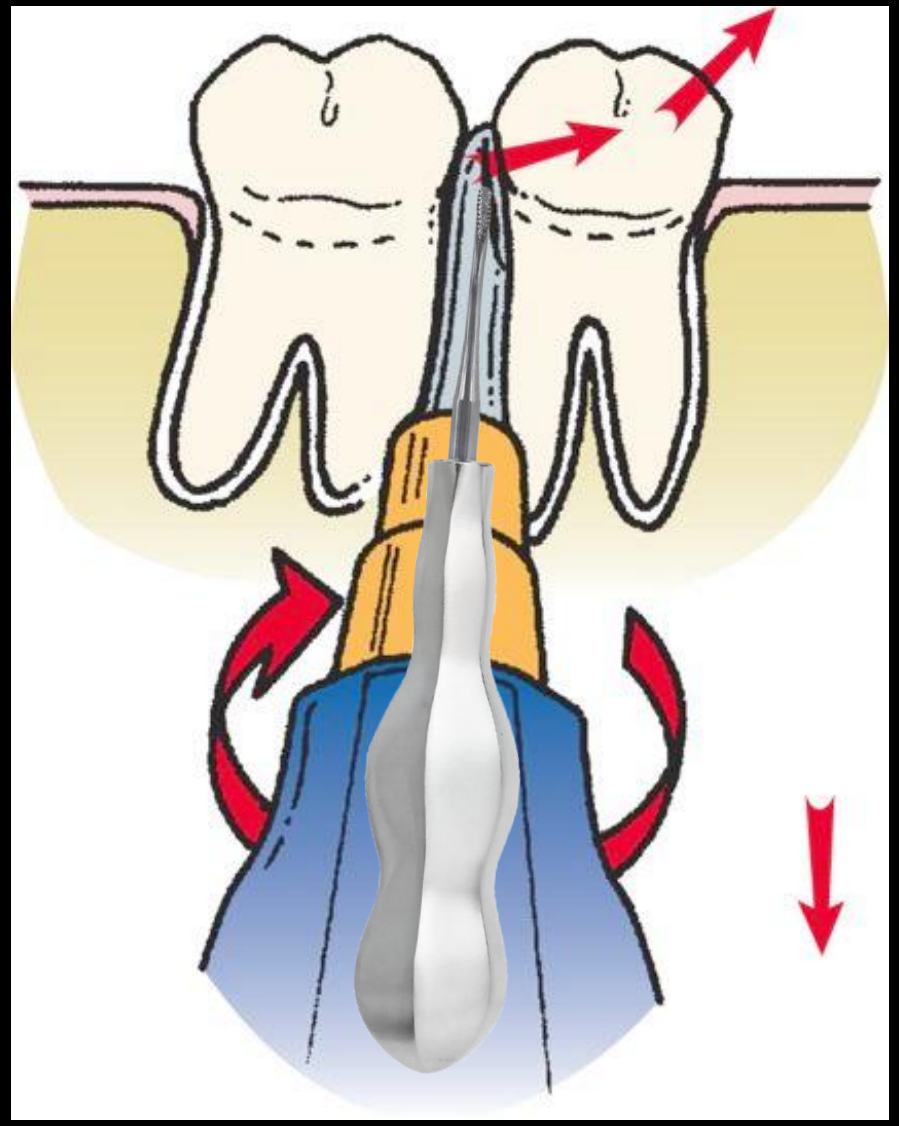
Technique

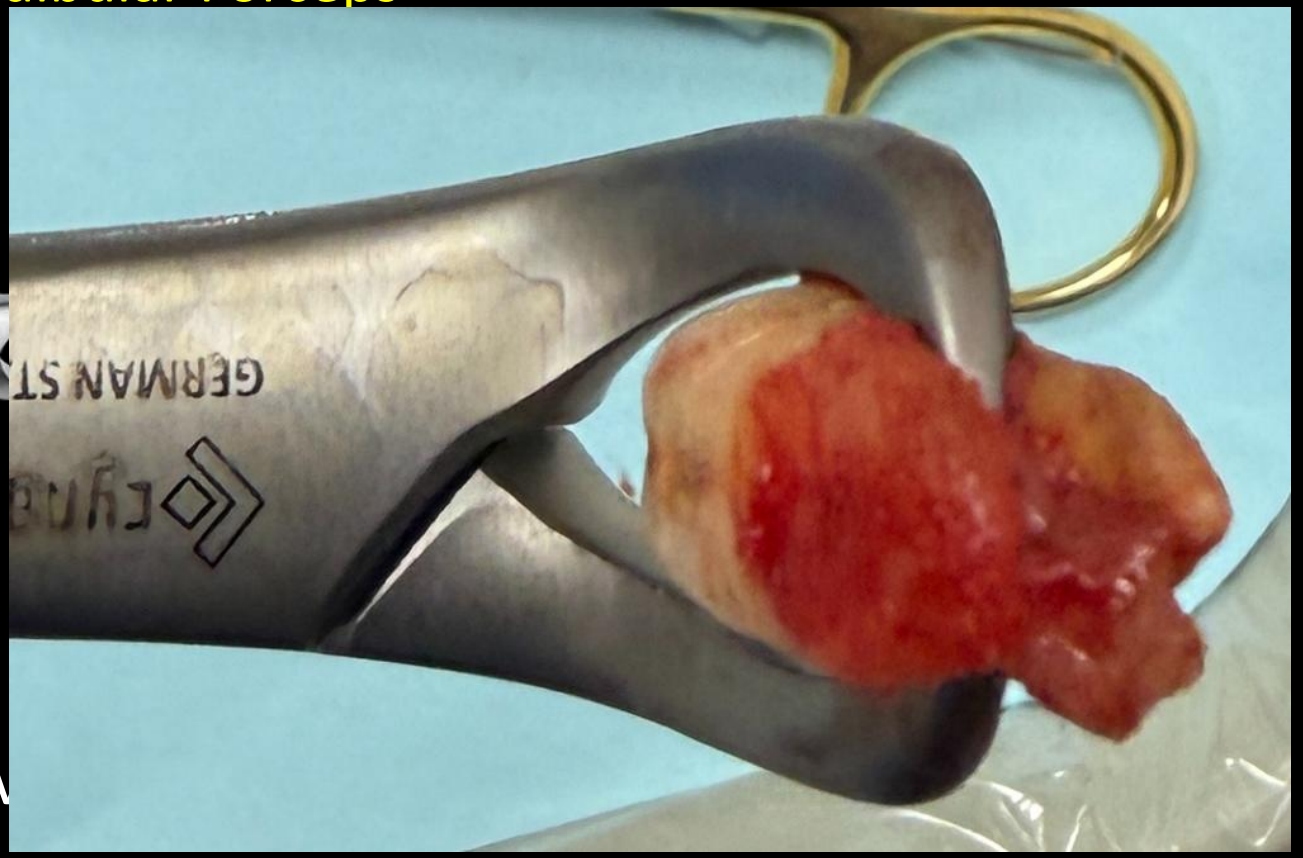
- The luxation motion is to turn INTO the tooth to be removed
- If there is NO adjacent tooth do NOT luxate
- Be mindful of making sure you always have a good fulcrum
- Vascular FOM is in proximity ! Caution



Mandibular Forceps

- Convention #23 forceps called “ Cow Horn”, designed with two-pointed, heavy beaks entering bifurcation of lower molars
- After the forceps are seated into the correct position, usually while pumping the handles up and down, tooth is elevated by squeezing the forcep handles
- As beaks are squeezed into the bifurcation, they use the buccal and lingual cortical plates as fulcrums & tooth literally squeezed out of the socket
- Concern has been that excessive pressure fractures buccal and lingual plate

Mandibular Forceps



- A major design variation for conv
  COW horn forceps”
- Beaks are modified to prevent fracture of buccal plate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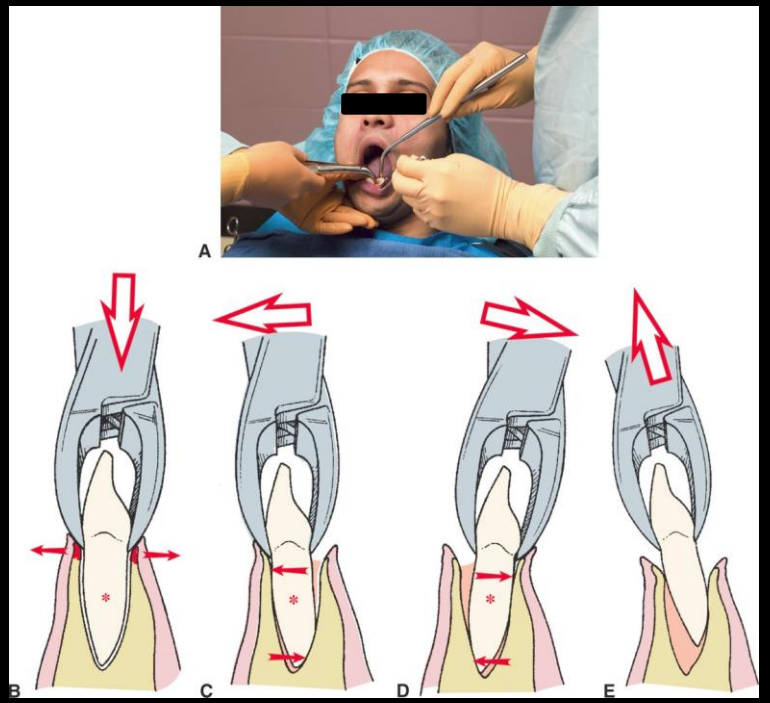
Mandibular Forceps

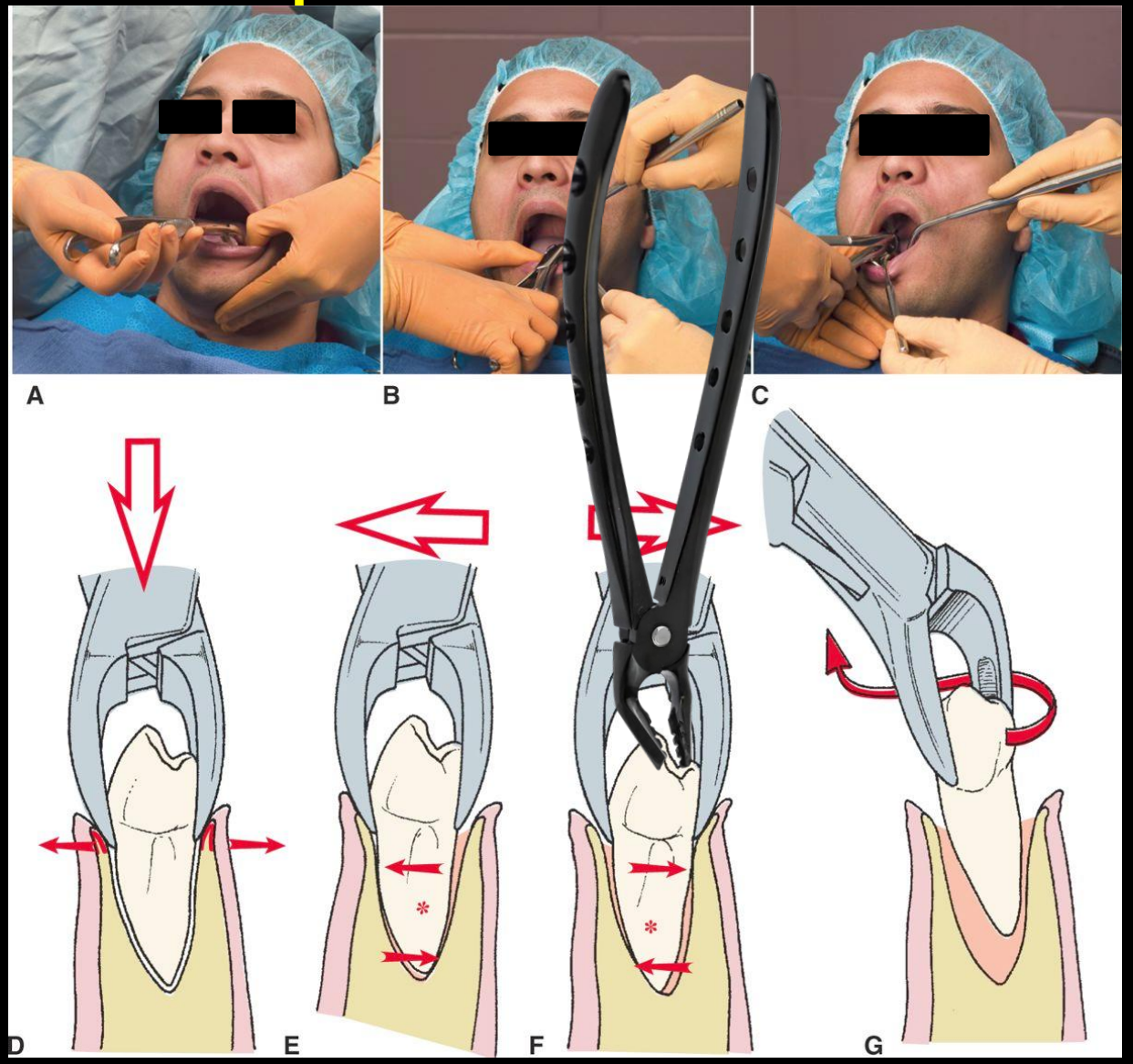
- For single-rooted teeth use the lower universal forceps (No. 151)
- Recommend new design that are titanium serrated forcep for apical retention

- For mandibular incisors, either a #150 forceps (upper forceps usually) or a #151 forceps (lower forceps) can be used
- In addition, some like to use the Ash forceps (bird-beak forceps)
- Apply apical pressure to seat the forceps with a circular motion



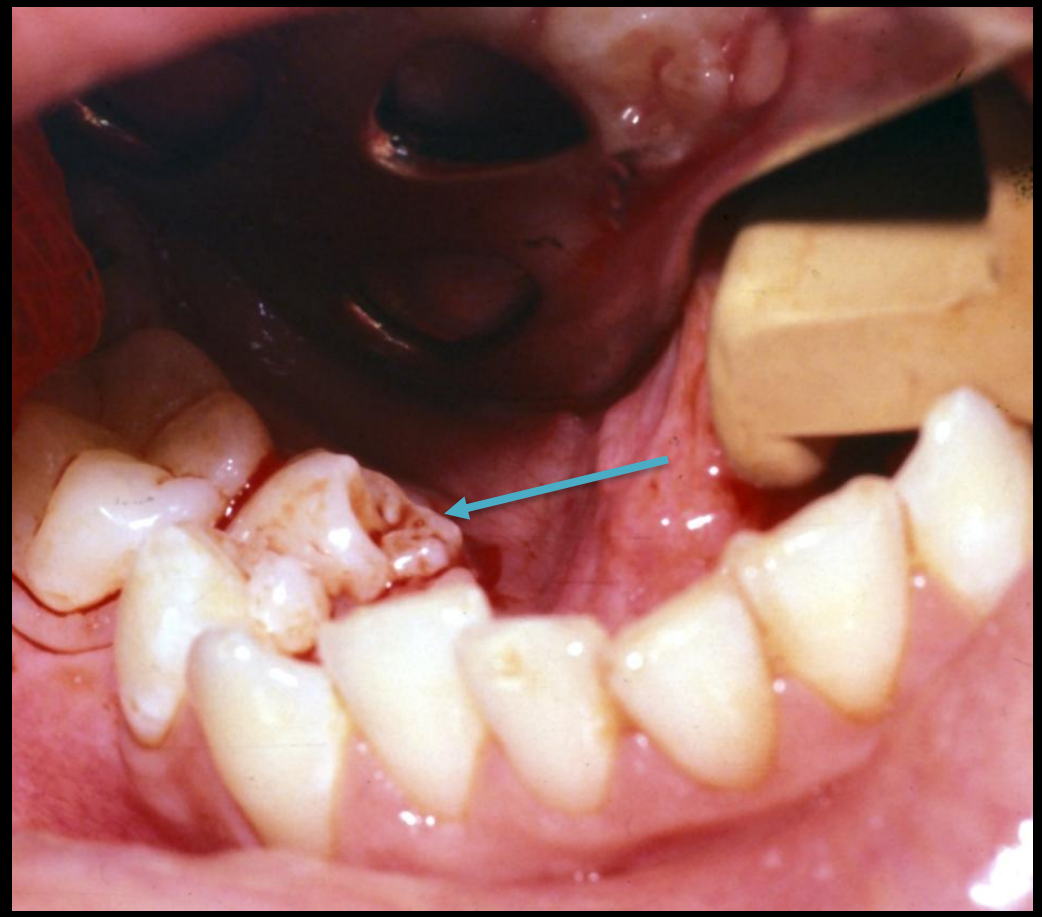
Technique

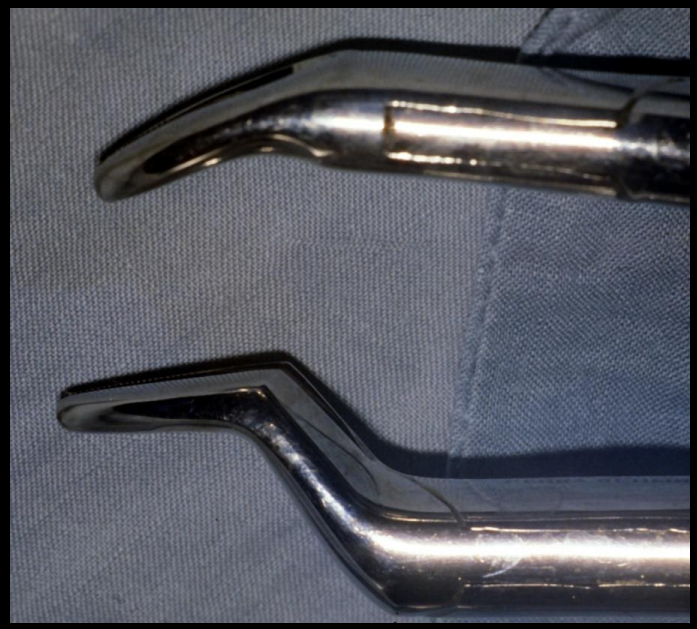
- For lower premolars, either a #150 or #151 forceps can be used
- Apply apical pressure to seat the forceps
- A more circular motion is helpful to deliver one rooted PMs



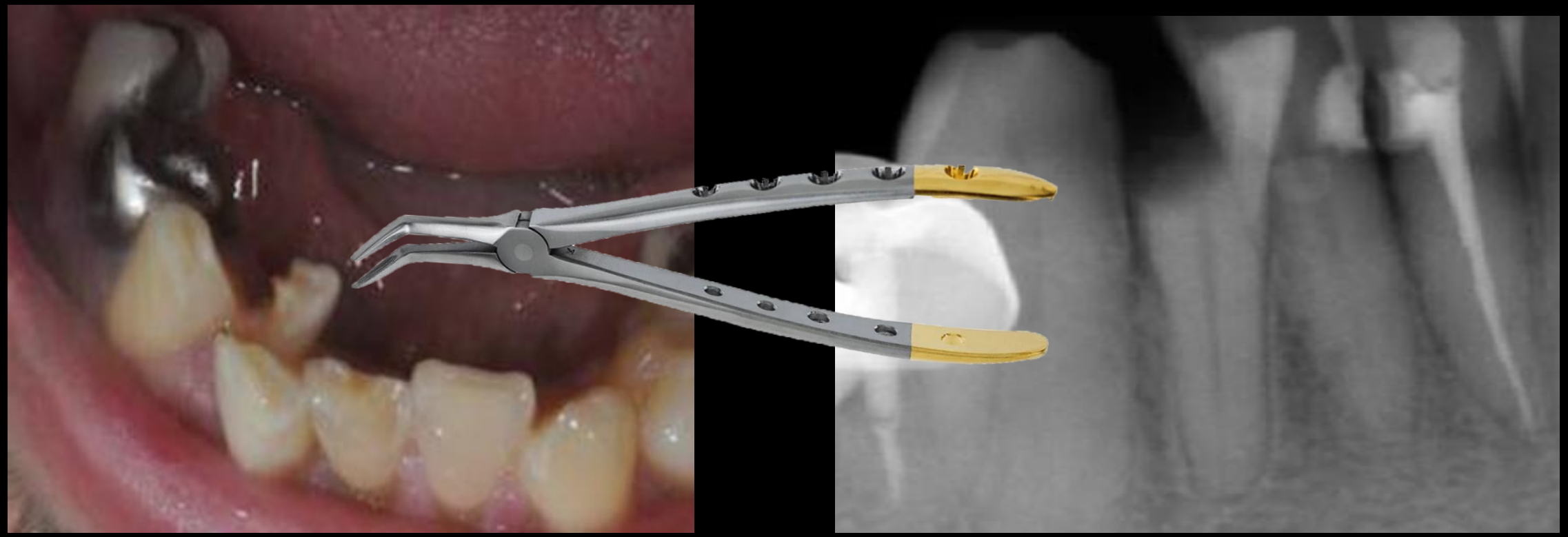
Root Tip Forceps

- Root tip forceps are used primarily to remove broken maxillary or mandibular molar roots, but can be used for removal of narrow premolars and for lower incisors
- My favorite for long thin roots fractured due to its longer beak giving greater access sub gingivally





- Having the proper instruments can save precious time, need longer beaks to engage narrow space



- Maintaining good body posture is very important to prevent operator fatigue
- If your body is not comfortable, or if your shoulders are too high, it is easy to get fatigued, and that is followed by frustration
- Maintain a firm grasp of the forceps, but not so firm as to make your hand spasm!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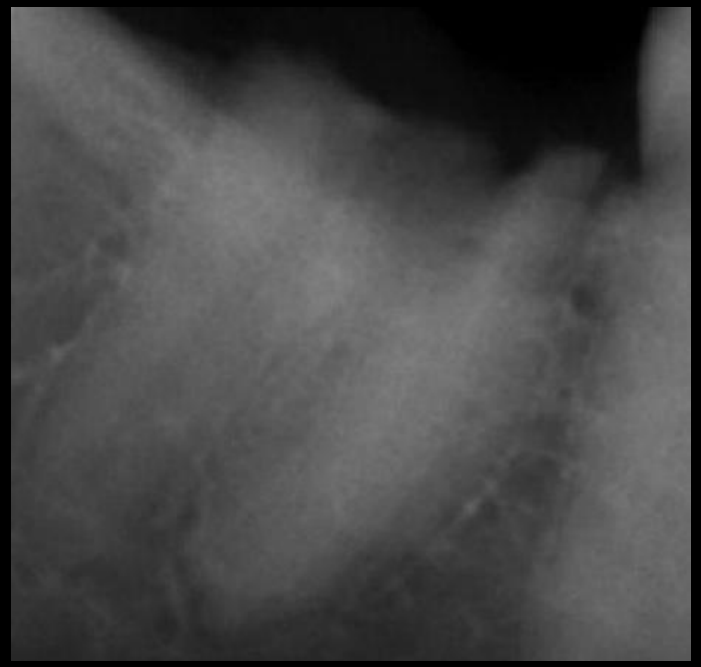
Session gallery
Gallery

Surgical Extraction Steps

What Do You Do When…..



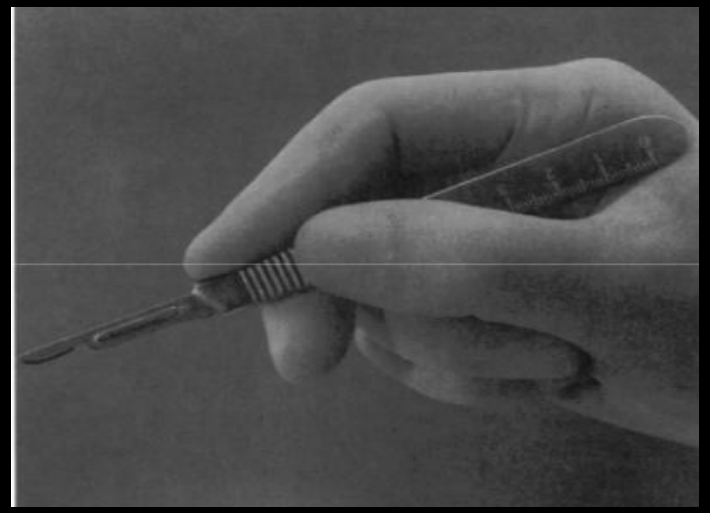
- Crown fractures, root tips need to be retrieved. Roots need to be sectioned
- If unable to retrieve root tips, ask for help ASAP. Longer pt. in chair, more anxious pt.
- IF radiographic assessment tools provided were understood, better prepared

Surgical Technique - Goal of Flaps & Surgery

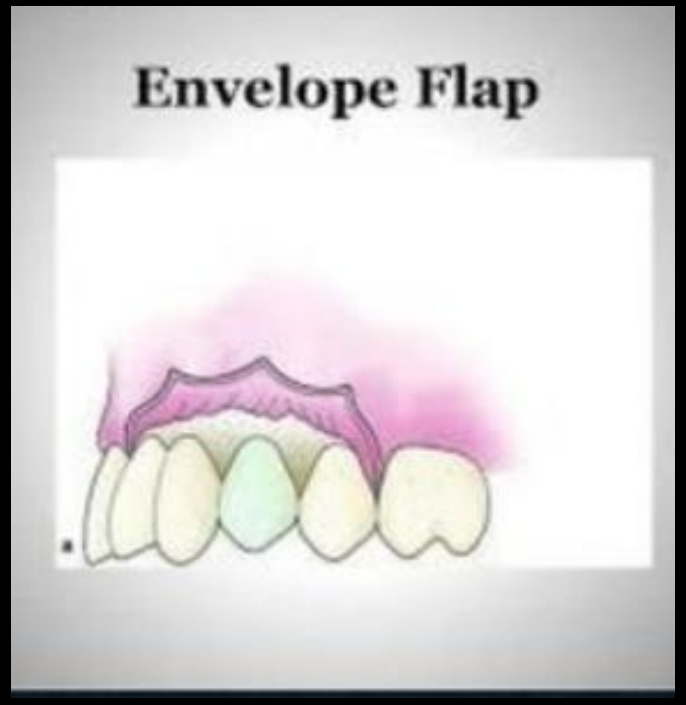
- Full thickness mucoperiosteal flap if needed
  - includes the surface mucosa, sub-mucosa, and periosteum
  - allows improved access and visualization to tooth to aid in removal
  - allows you to remove or reshape the bone, as needed
  - all overlying tissue must be reflected from the bone
  - must reflect the periosteum and do no damage to it
  - periosteum is the primary tissue responsible for bone healing

- Less bleeding
  - Staying sub-periosteal minimizes the amount of bleeding

Surgical Technique

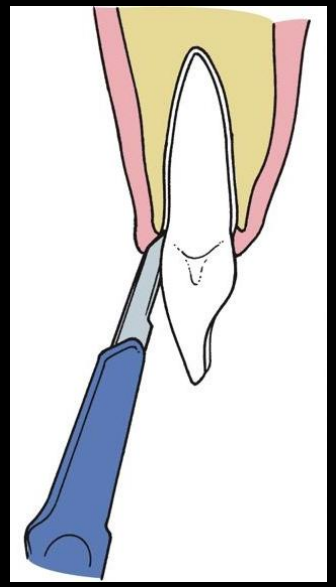


- If roots are sectioned, crown fractures & roots cannot luxate next step is laying a flap
- Flaps aid in access to visualize working field
- If planning on doing surgical extractions a basic understanding of flaps is needed
- Good flap allows better access for selective bone removal and for sectioning
- Do you know your anatomical structures?



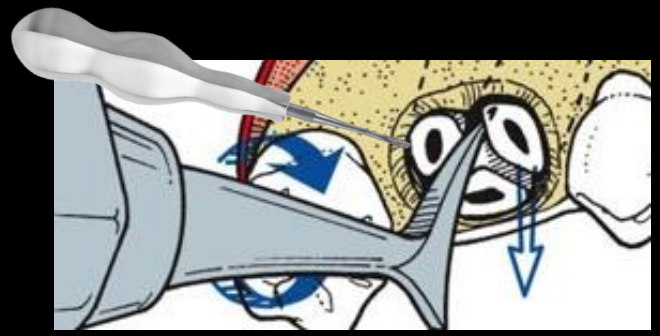
- For basic flap design, envelope/sulcular flaps are sufficient in maxillary extractions
- These flaps are done along the cervical margins of the teeth
- This flap design helps maintain the gingival blood supply
- Recommended at least 1 tooth mesial & distal to the extracted tooth

Surgical Technique - Incision

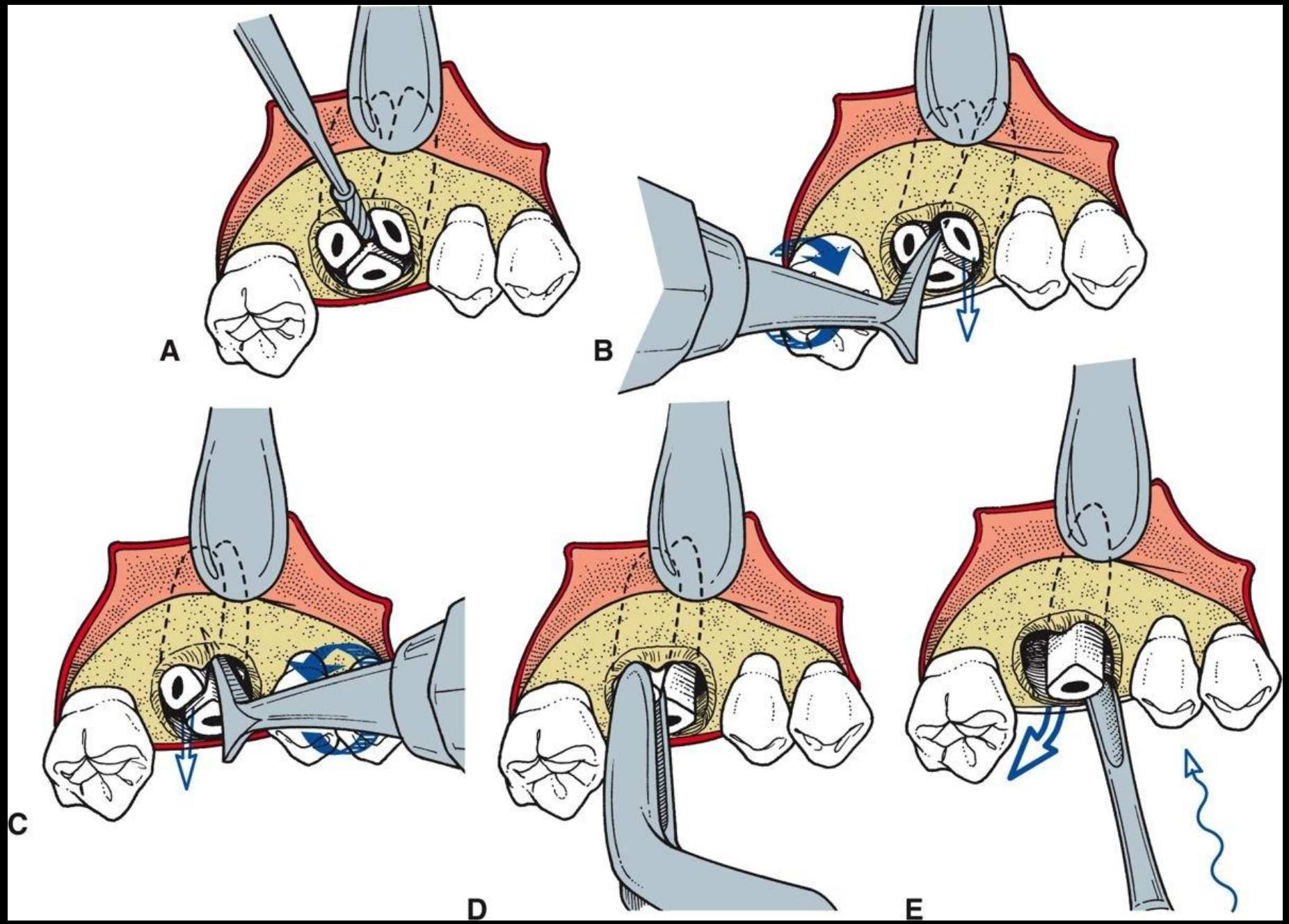


- Knife is angled slightly away from the tooth & incise all soft tissue, including periosteum
- Incision is started posteriorly and is carried anteriorly, with care taken to incise completely through the interdental papilla

Surgical Technique - Sectioning



- Upper first and second molars pattern:
  - Section the crown w/ a Y-shape—with the surgical bur passing b/w the two buccal roots & branches passing to the MP & DP—around the palatal root
  - Periotome each root @ line angles ONLY ! Luxate roots with a 77R
- Lower molars pattern:
  - Section the crown bucco-lingually between the M & D roots
- Upper bicuspids pattern:
  - M-D & deep to enter the furcation near the apex, if possible

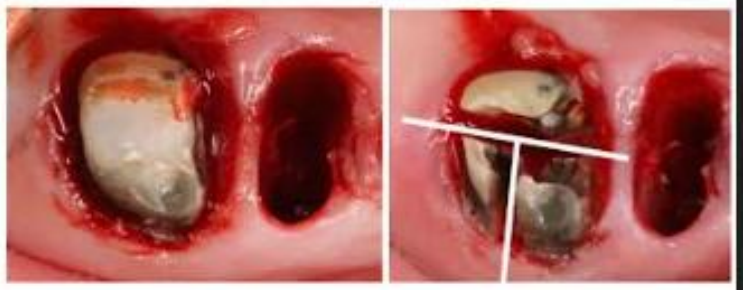


The Y split starts by splitting between the MB and the DB root.

After splitting the buccal roots, the split continues diagonally to separate the palatal root.

Why diagonally? So that we bypass the adjacent teeth.

If there are no adjacent teeth, use the **T-split.**

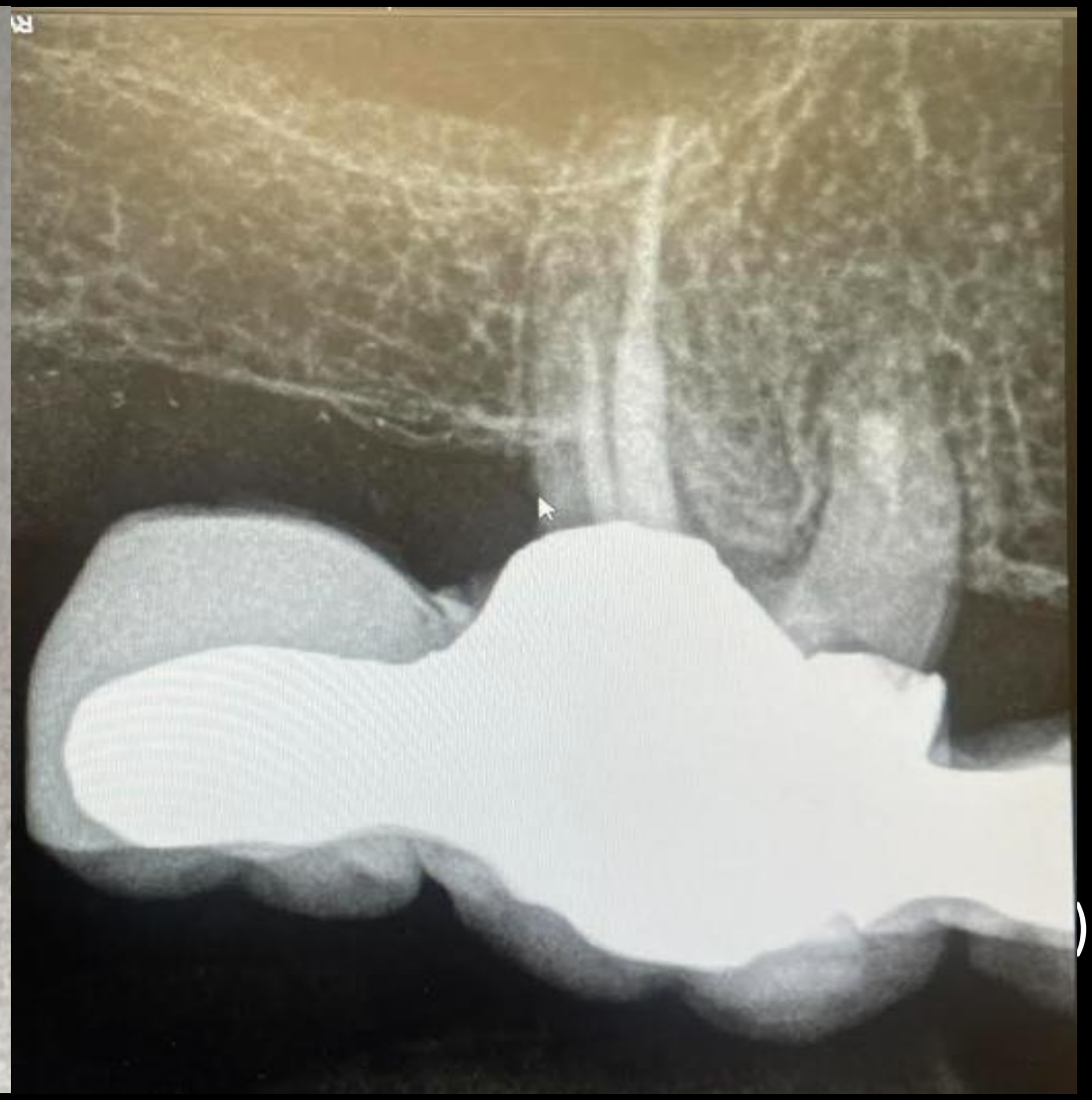


Start by splitting between the MB and DB roots. At the trifurcation, continue the split in a perpendicular to the split between the buccal roots. This creates the "T" and completes the separation between the roots.

surgicalmaster

Dr. Ziv Simon

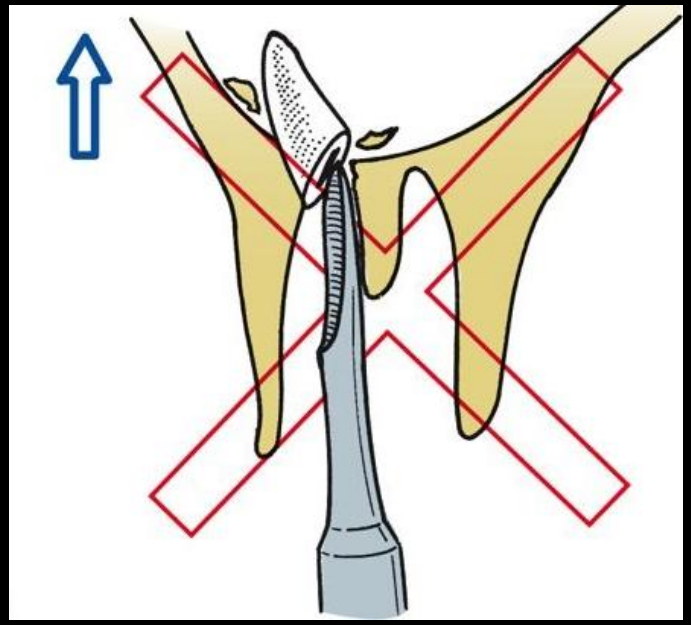
Surgical Technique - Sectioning



Surgical Technique - Caution

- Laying a flap, removing bone, suturing is complex. Take a PA if you lose orientation
- Practicing on a patient without knowledge can lead to irreversible mistakes
- Patient came for #14 extraction, but operator lost angulation & gouged #15

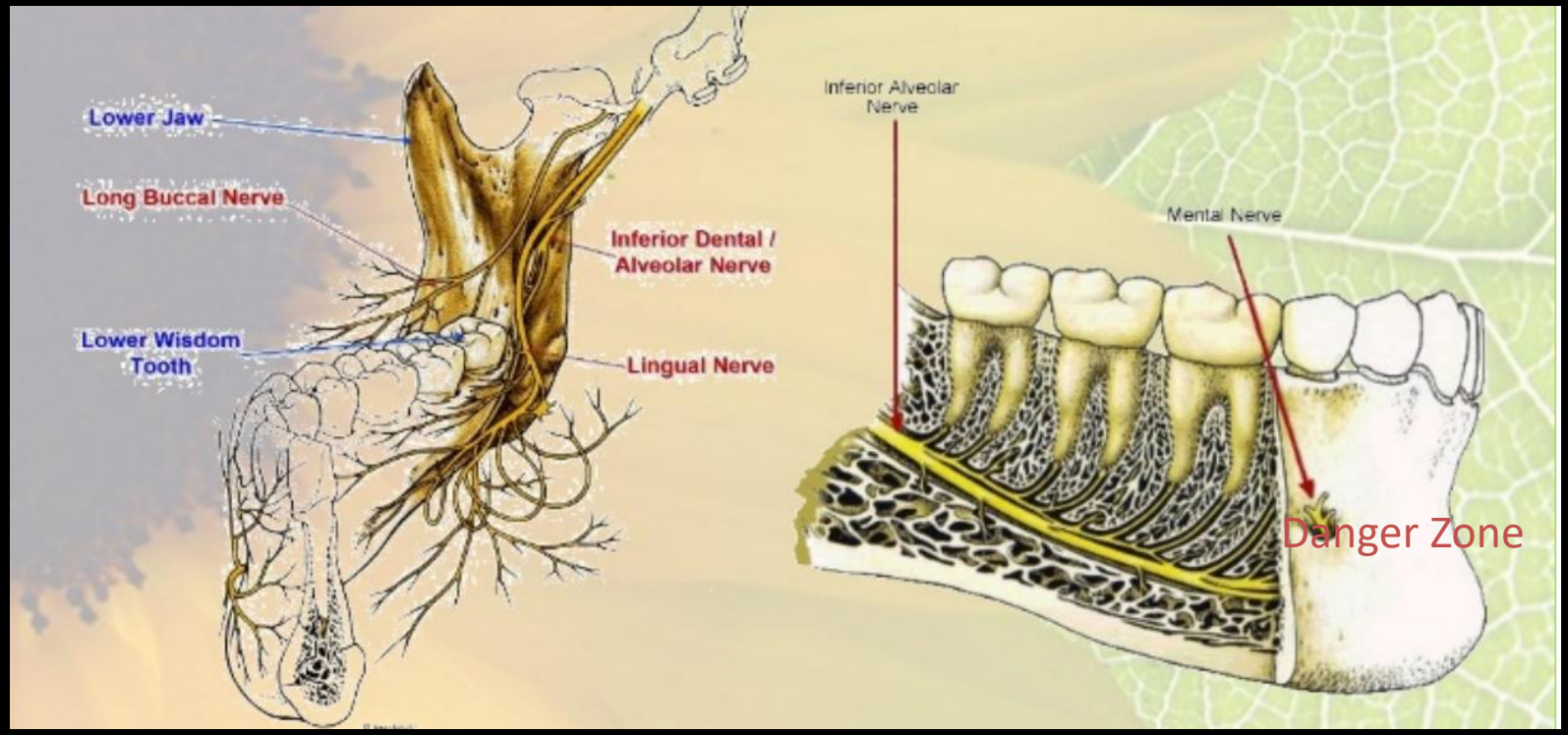
Surgical Technique - Caution



- Be careful with elevation of maxillary molar roots !
- Excessive pressure in an apical direction results in displacement of tooth root into undesirable places, such as the maxillary sinus
- PERIOTOME ROOTS INDIVIDUALLY at LINE ANGLES

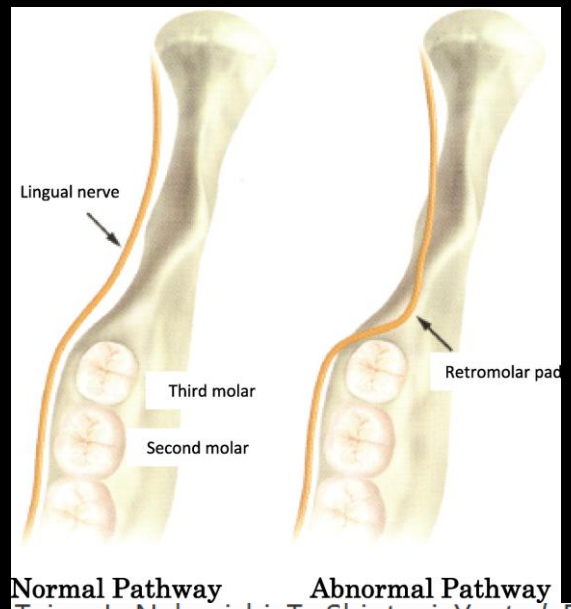
- Roots are sectioned, but we can’t retrieve root tips, what are next steps?
- Surgical technique needs to be followed, but we need to know basic anatomy

Surgical Technique - Anatomy



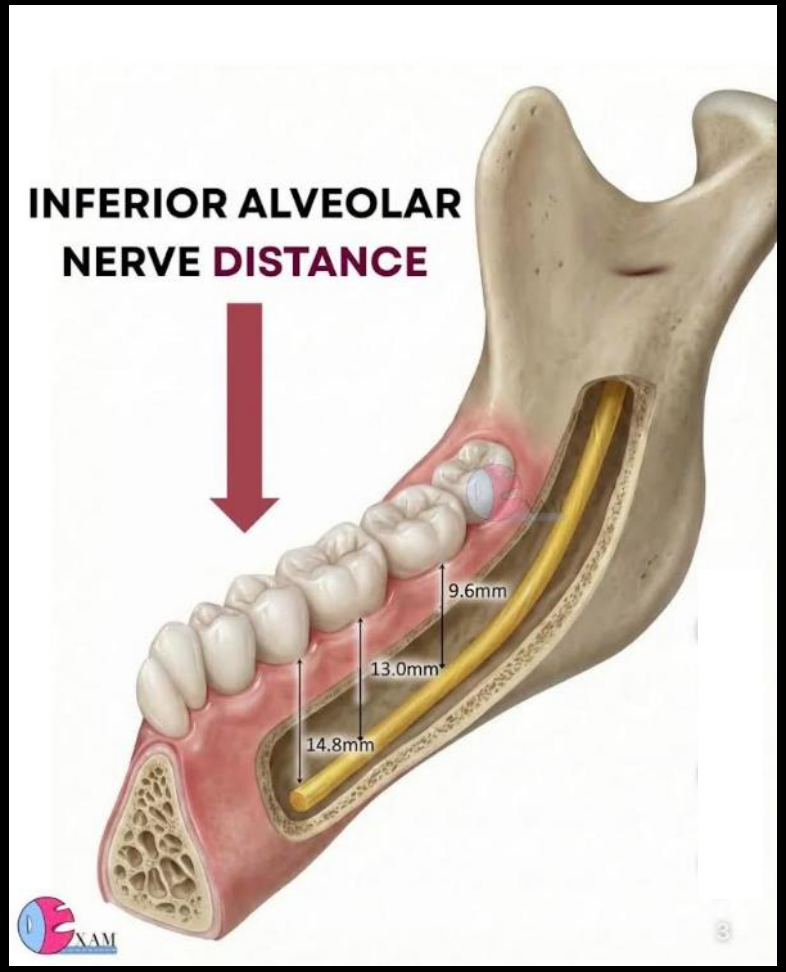
- Surgery around the mental nerve & foramen must be performed with great care
- If the mental nerve is injured, the patient will have a paresthesia of lip & chin
- Avoid making a vertical-releasing incision between the canine & second premolar

Surgical Technique - Anatomy



Tojyo, I., Nakanishi, T., Shintani, Y. *et al.* Risk of lingual nerve injuries in removal of mandibular third molars: a retrospective case-control study. *Maxillofac Plast Reconstr Surg* **41**, 40 (2019). https://doi.org/10.1186/s40902-019-0222-4

- The lingual nerve is usually anatomically located directly against the lingual aspect of the mandible in the retromolar pad region
- Occasionally, the path of the lingual nerve takes it into the retromolar pad area itself
- Never remove bone or luxate an elevator on the lingual aspect

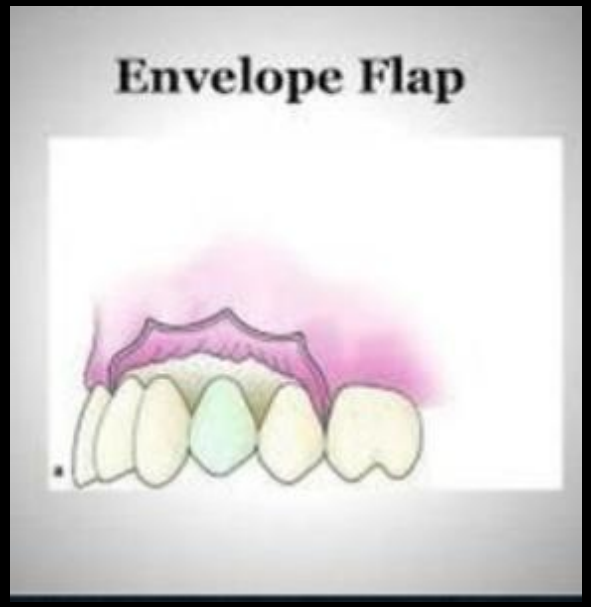


- IAN usually runs along the lingual side of the mandible in molar region & shifts toward
- Never elevate from the lingual aspect, stay buccal

Surgical Technique

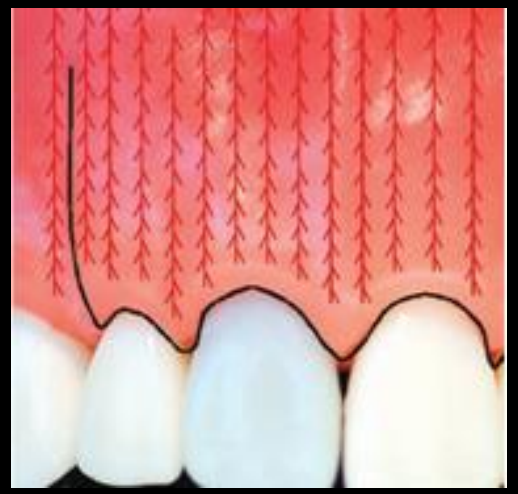
- When incising tissue hold scalpel in the pen grasp for maximum blade control
- Scalpels available as disposable with fixed blade such as 15 or 15 C

Surgical Technique - Principles of Flap Design



- For basic flap design, envelope/sulcular flaps are sufficient
- Done at cervical margins of the teeth & helps maintain the gingival blood supply
- Recommended at least one tooth mesial & distal to the extracted tooth
- For mandibular 3rd molars distal buccal "hockey stick" incision & envelope incision for mandibular premolars

Surgical Technique - Principles of Flap Design

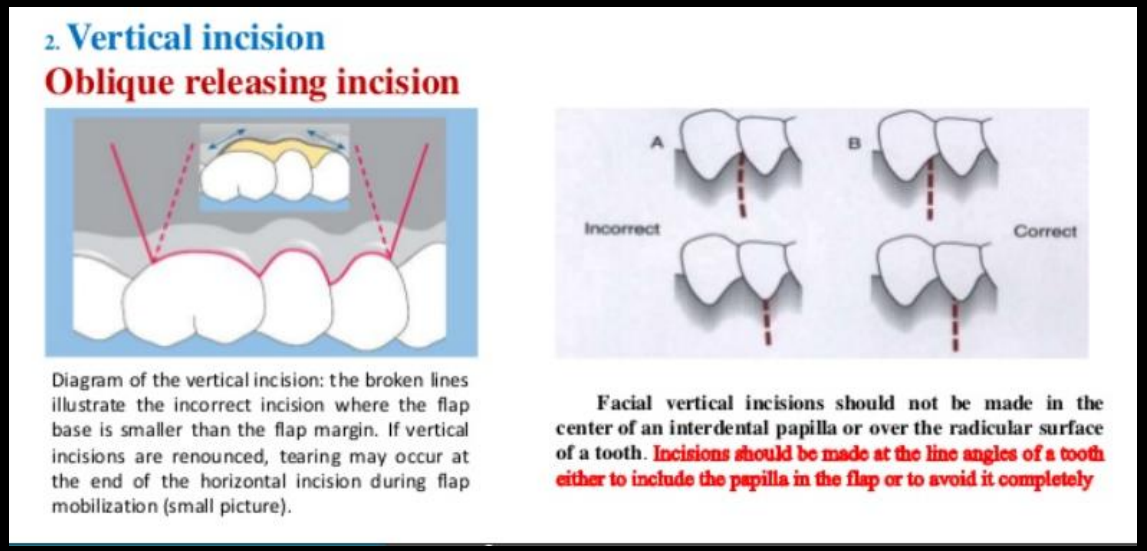


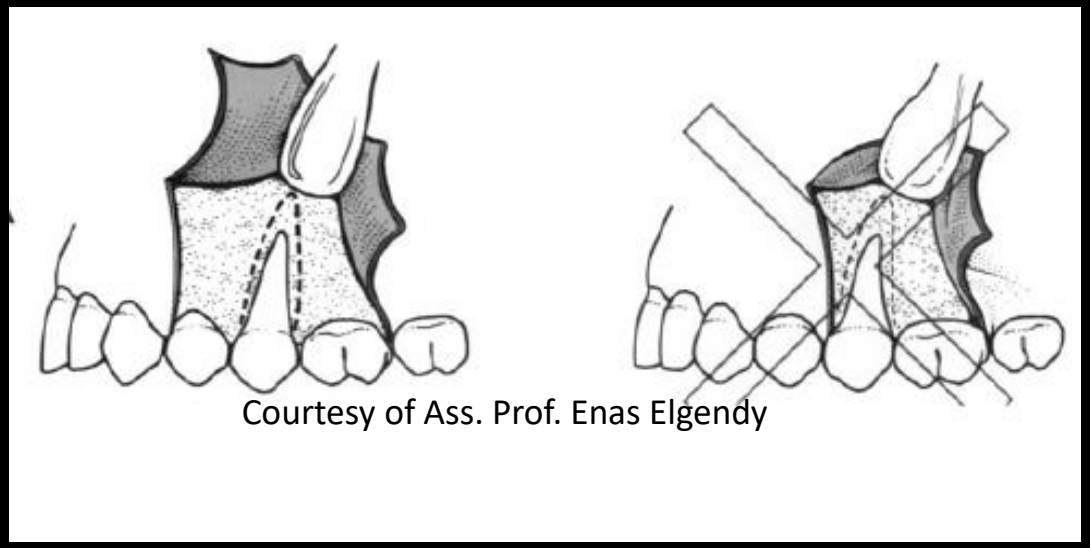
- The base or apical end of the flap should be WIDER than the coronal end
- The incision should be made in keratinized mucosa as it heals more quickly
- Vertical releasing incisions should be placed at least one tooth anterior or posterior
- Vertical releasing incisions no less than parallel to the local vasculature

Surgical Technique - Principles of Flap Design

- Vertical releasing incision should cross the free gingival margin at the tooth **line angle**
  - not at the (mid)facial aspect because
    - A mid-facial vertical releasing incision can heal with a soft/hard tissue defect in the attached gingiva with vertical clefting (recession) of the facial tissue
    - Facial bone is thin
  - Incision made directly in the papilla
    - Lead to periodontal problems & papilla necrosis

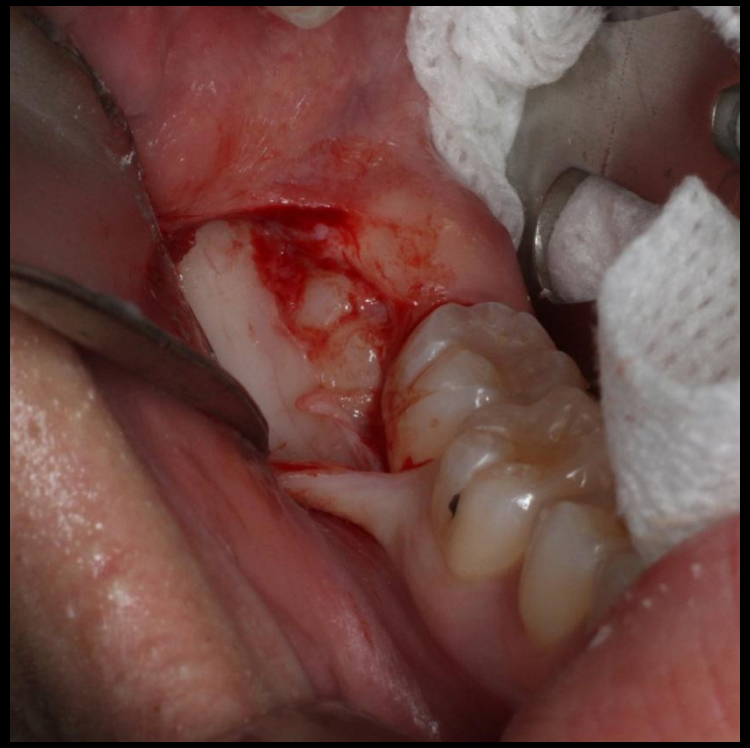
Surgical Technique - Principles of Flap Design




Courtesy of Ass. Prof. Enas Elgendy

- Vertical incision not recommended in anterior sites due to scarring
- Verticals not recommended in canine/pm sites on because of the mental foramen

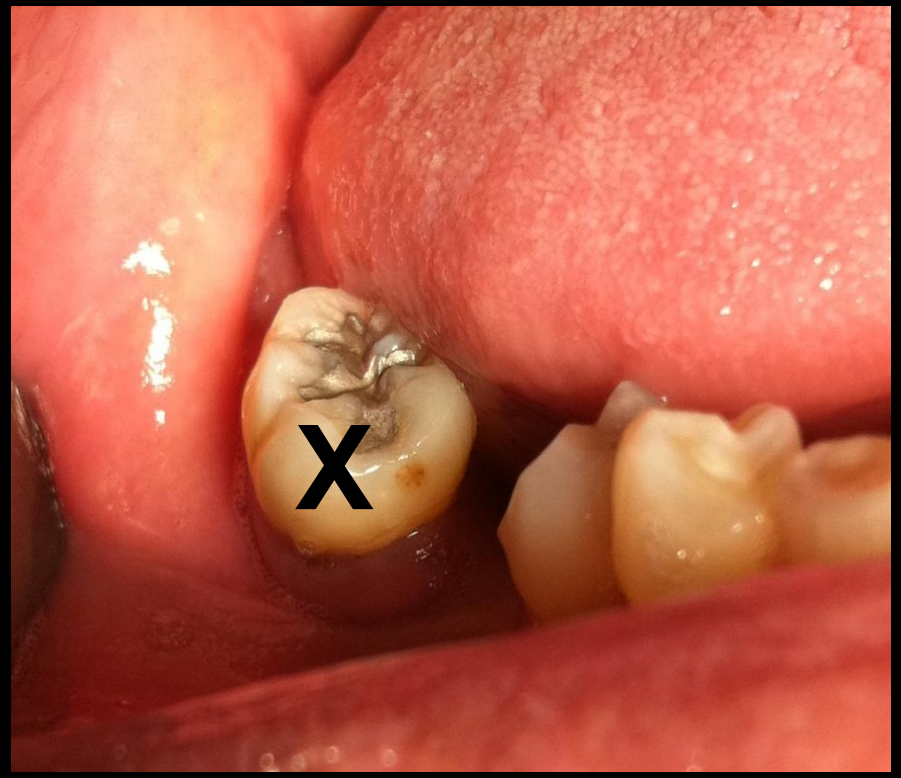
Surgical Technique - Elevating Mucoperiosteum

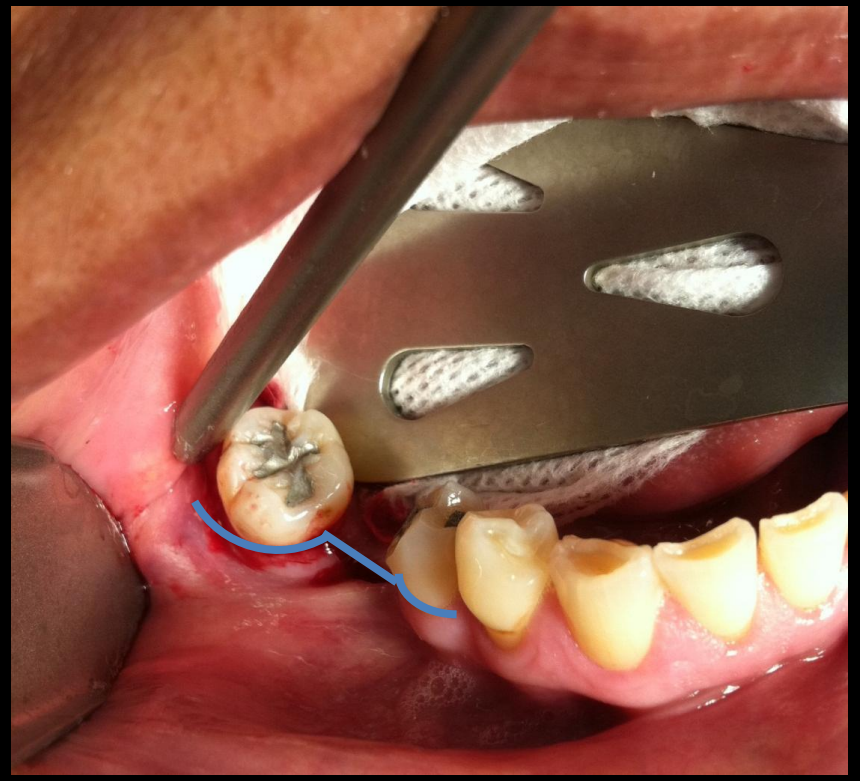


- Periosteum should be reflected from the underlying cortical bone in a single layer with a periosteal elevator
- For exodontia, leaving periosteum leads to excessive bleeding
- Use a periosteal to reflect additional fibers

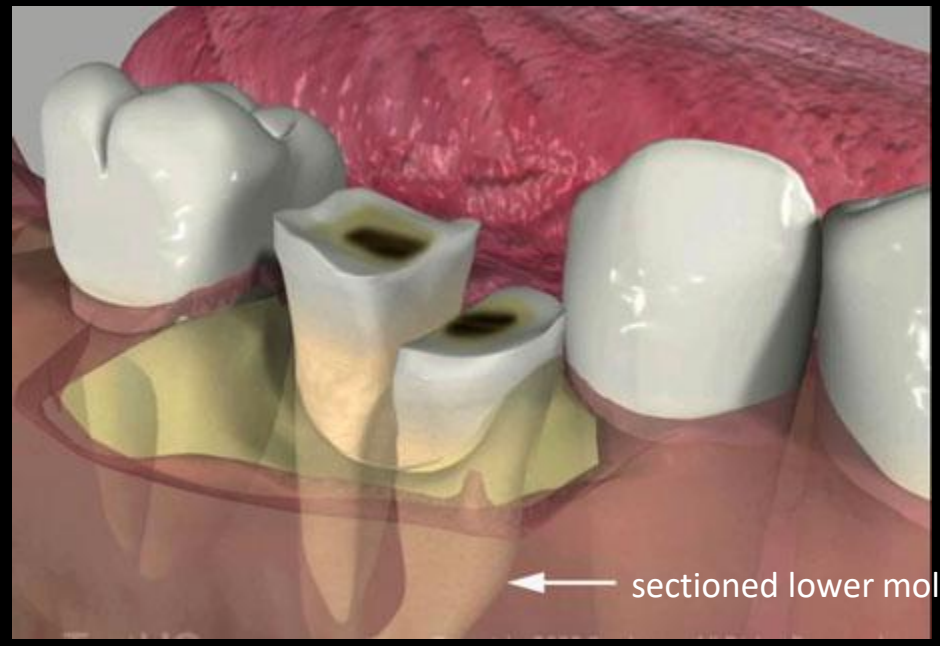
Surgical Technique - Incision/Flap Design

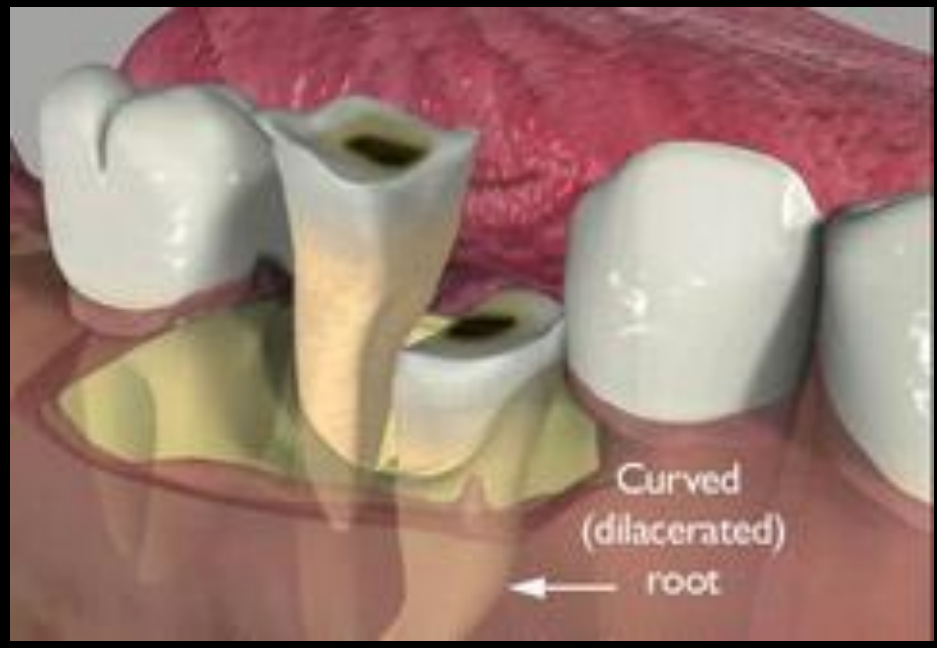
- Incise the mucoperiosteum using a sulcular incision, extending at least one tooth anterior & posterior to the tooth to be extracted





Completing the section





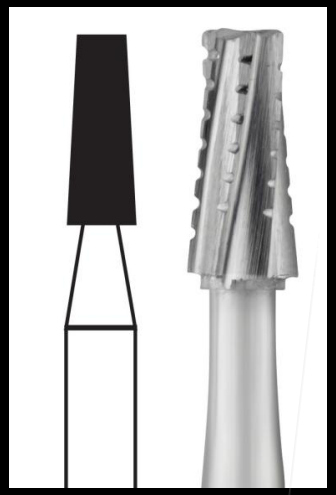
- Complete the sectioning with elevator inserted into the slot created

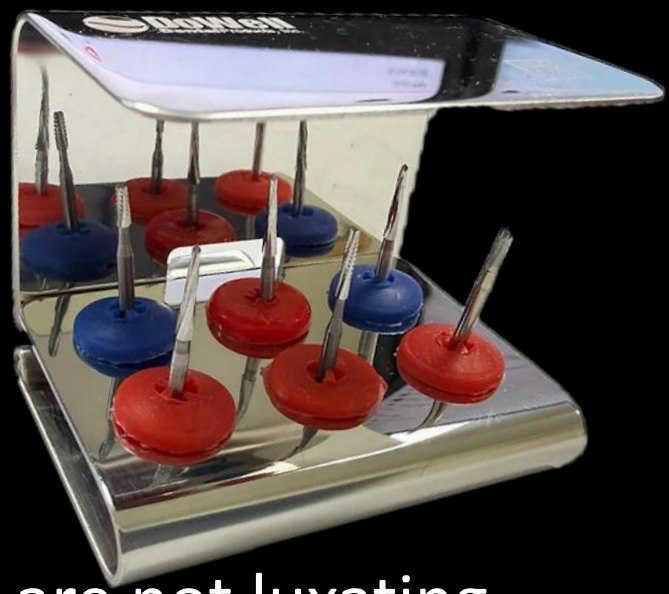
Surgical Technique - Incision/Flap Design

77R elevator

- Stop short of completely sectioning through the tooth, avoid perforating the lingual plate due to possible lingual nerve housing
- You will crack the last 1-2 mm with an elevator (77R my preference)
- Sectioning the tooth 1st without needing to create a bony trough around the tooth
- If roots cannot be luxated, selective bone removal needed

Surgical Technique - Bur & Handpiece



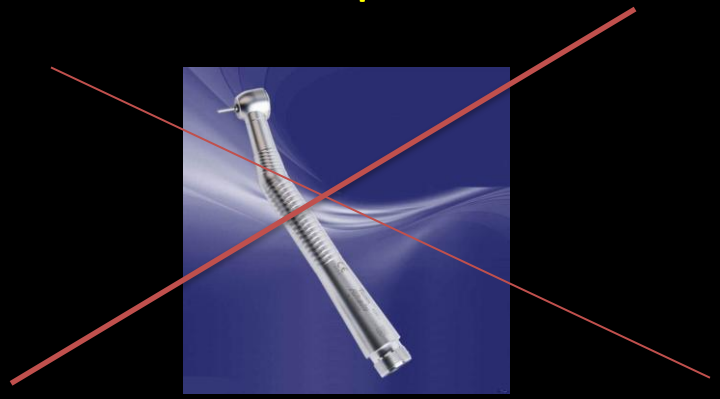


- Bone removal needed in all impacted thirds & roots that are not luxating
- High-speed, high-torque handpieces with sharp carbide burs
- Burs such as a No. 702, 703 fissure bur used, 702 L preferably
- ALWAYS AVOID BUCCAL PLATE !

Bone Removal

- Rongeurs primarily used in alveoloplasty during full mouth extractions
- Rongeurs are expensive, be careful how you use them. Don’t use them to extract teeth!

Removing Bone - Bur and Handpiece



- Handpiece should have high speed & torque, allowing bone removal to be done rapidly and allows efficient sectioning of teeth especially for third molar cases
- The handpiece must not exhaust air into the operative field
- Avoid typical high-speed turbine drills used normally for routine restorative dentistry

Irrigation

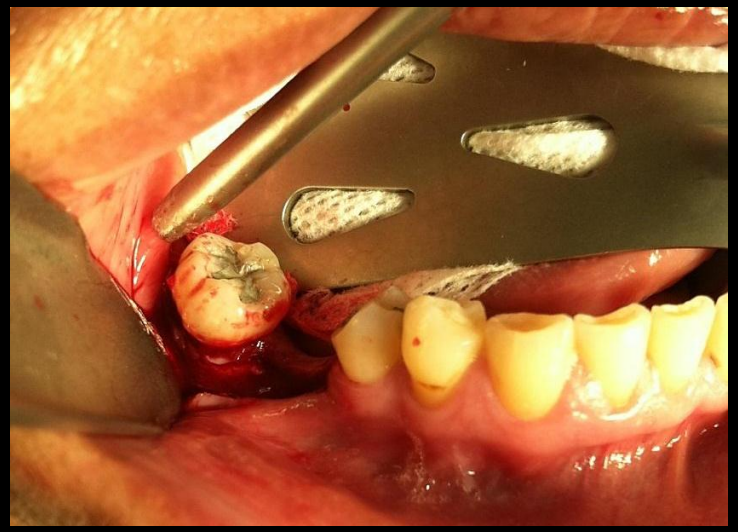
- When using a handpiece to remove bone, always irrigate surgical site
- Irrigation cools burs & prevents bone-damaging from heat buildup
- Irrigation also increases bur efficiency by washing away bone chips from the bur flutes

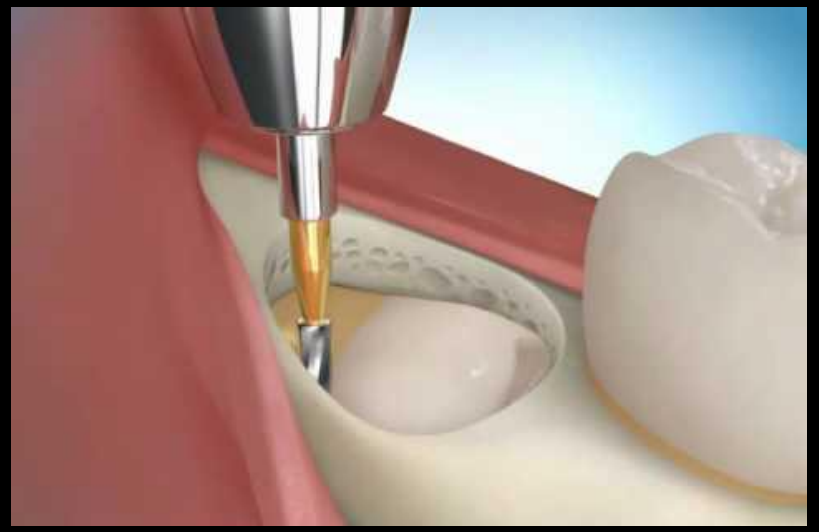
Removing Bone - Bur and Handpiece

Why can't I use a restorative handpiece?

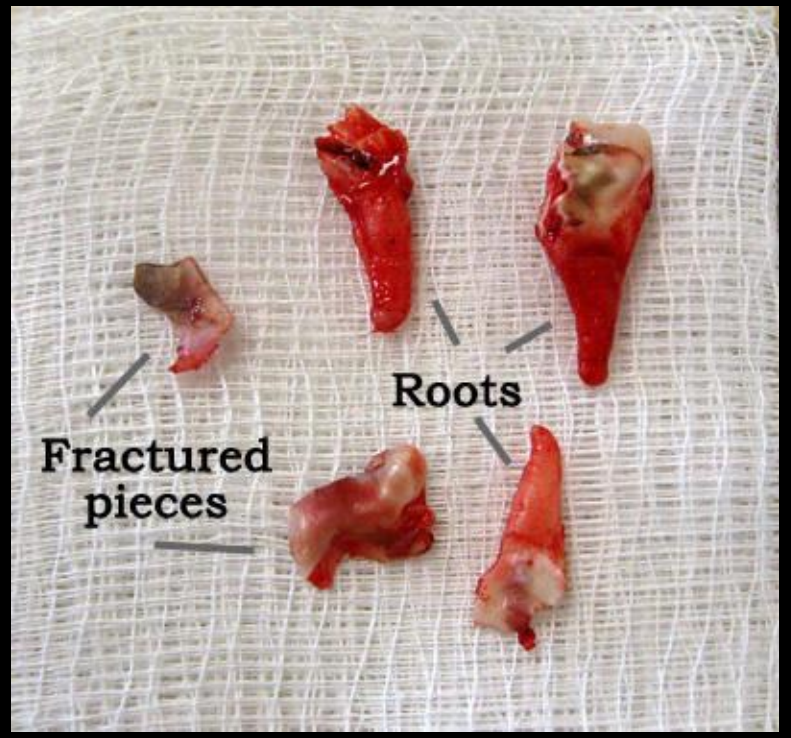
- Air exhausted into the wound may be forced into deeper tissue planes and produce **tissue emphysema**, a dangerous occurrence
- Be kind to your patient, get a surgical handpiece

Surgical Technique - Bone Removal

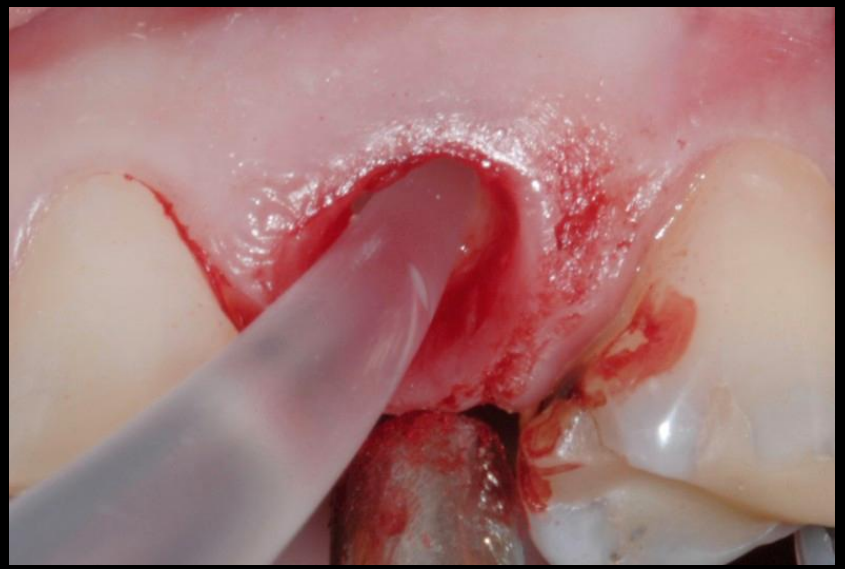




- The purpose of this step is to allow elevator access to PDL space
- Remove bone **conservatively** around the tooth, start with interseptal bone
- Create a trough with a bur around the crestal margin of the tooth, avoiding the periodontal ligament or tooth structure of the adjacent teeth



- Examine the root pieces for complete extraction

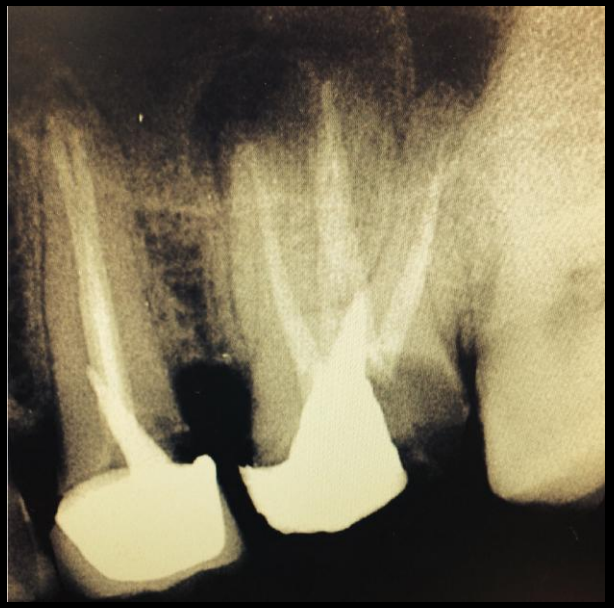


- Inspect the socket for remaining pieces of tooth or exposure of the sinus, inferior alveolar nerve, or perforations of the cortical plates
- Irrigate both the socket as well as under the mucoperiosteal flap copiously

- Inspect root tips and carefully curette sockets, be gentle around the sinus cavity
- Do Not use a serrated curette in this site

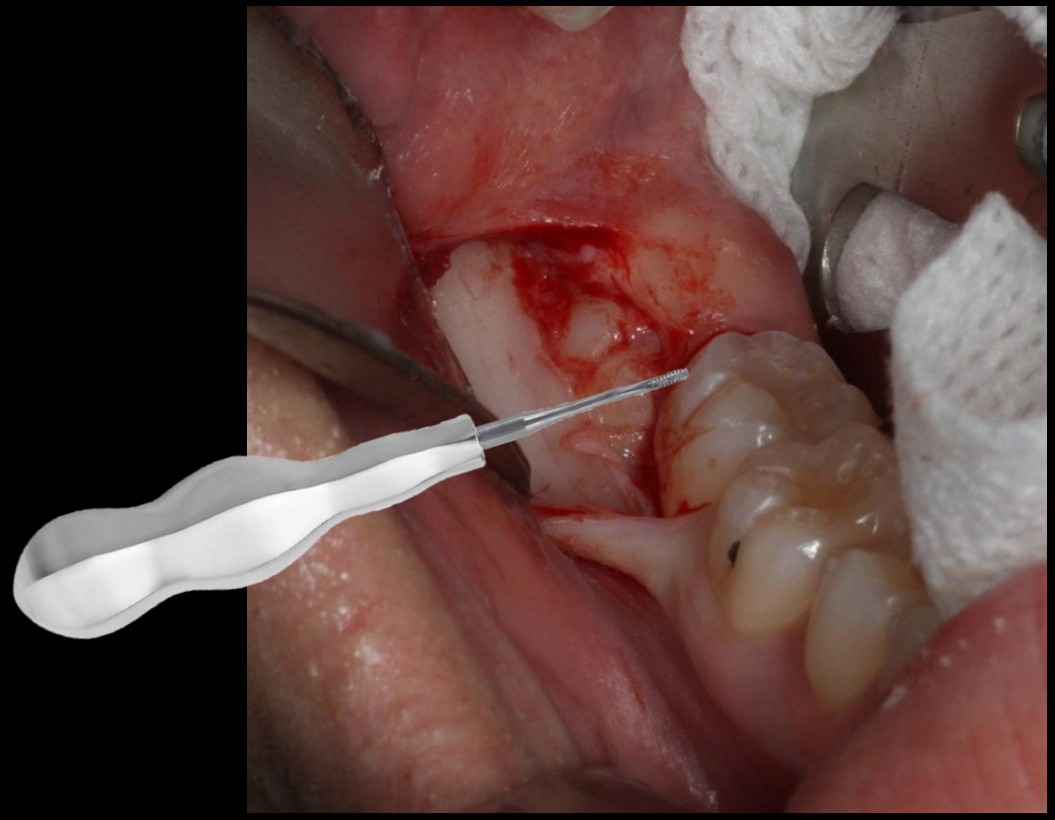
- #14 failing root canal and patient had limited finances, elected to extract
- PA reveals slight widening of PDL on MB root
- Peri-apical radiolucency noted on all 3 roots
- Purchase point was created, and roots were sectioned, and treated individually
- Peri-apical pathology noted on all 3 roots, sockets were curetted thoroughly

Hammerle et al. states the sectioning of multirooted teeth is advised, and all granulation tissue should be removed from the socket.




DoWell
DentalProducts, Inc.

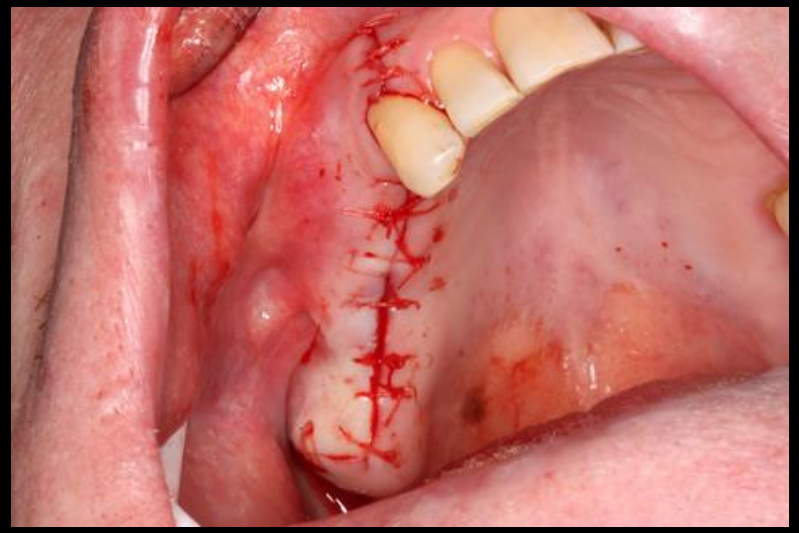
Surgical Technique



- Hockey stick incision done from mesial of second molar to distal of third with slight vertical release
- Buccal trough done to create space & slight mesial and distal purchase point created
- 77 R used on mesial to elevate tooth

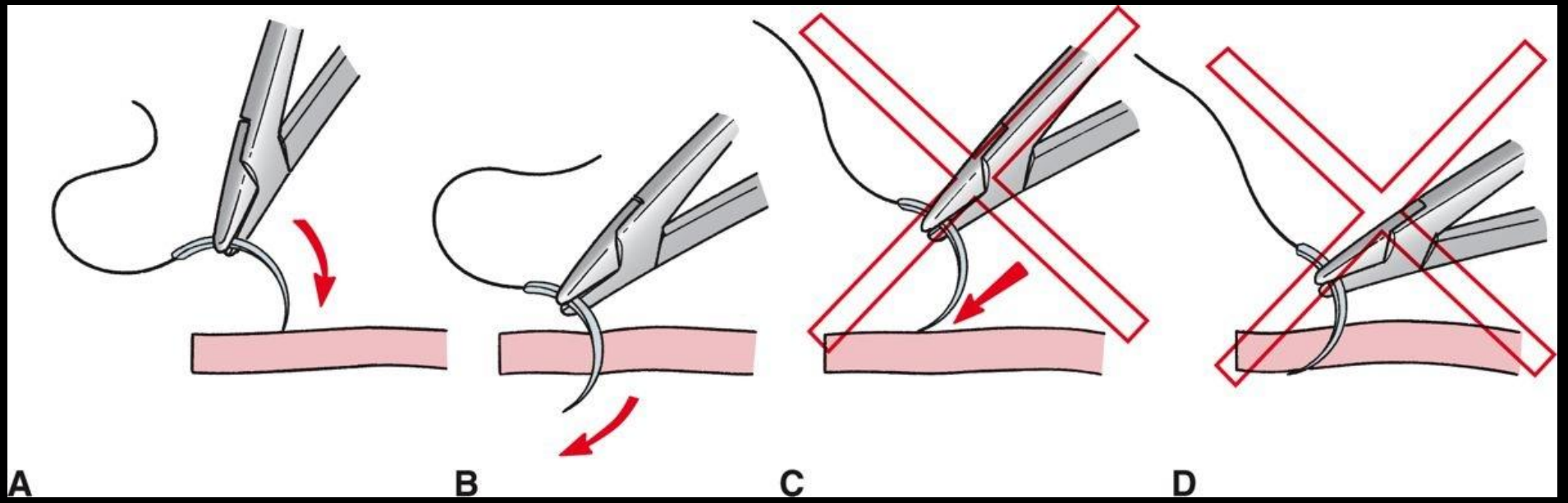
- Periotome #1,16 and use a bayonet to luxate tooth
- Most of time luxation will elevate tooth

Surgical Technique - Suturing Soft Tissue



- Once a surgical procedure completed, mucoperiosteal flap is held in place by sutures
- Just **my observation** based on anecdotal evidence that suturing a site can lower post-operative pain and morbidity
- Place sutures in keratinized tissue, if possible

Suturing



A. When passing through soft tissue of mucosa, needle should enter surface of tissue at a right angle

B. Needle holder should be turned so that the needle passes easily through the tissue at right angles

C. If needle enters the soft tissue at an acute angle and is pushed (rather than turned) through tissue, tearing of the mucosa with the needle or with the suture is likely to occur

D. Tearing will occur and soft tissue lacerations

Gauze or no gauze ?

- Place gauze at the end of the procedure
  - Promote hemostasis within the socket, minimize the risk of swallowing blood
  - Gauze may be removed in 30 minutes if bleeding stops, or replaced if oozing continues
  - Non-herbal tea bags contain tannic acid, a known pro-coagulant

Surgery Completion

- Review PO instructions & prescriptions with patient, prepare them for every scenario

  Normal to have:

  - **Pain**
  - Bleeding (oozing) x 24 hours
  - Swelling (reaches maximum at 48-72 hours)
  - Bruising (ecchymosis) - Common in older patients for bruising to occur
  - Sutures present x 1 week (then will dissolve)

- Consider an antibiotic, if indicated:
  - Poorly-controlled diabetic patient
  - Cellulitis present
  - Chronic steroid-using patient
  - Immunocompromised patient
  - Bone grafting sites
  - Peridex 0.12%, along with NSAIDs & APAP recommended

Atraumatic Extractions

- Currently, clinicians have a wide assortment of hard and/or soft tissue augmentation procedures & materials available to create optimal implant sites
- However, the most time efficient & cost-effective augmentation techniques start at the extraction appointment
- If we can maintain what we have, we can achieve optimal success
- “The first step in the transition from a failing tooth to an implant – supported prosthesis is the extraction of the tooth and management of the extraction socket” - Elian et al.

ALVEOLAR RESORPTION









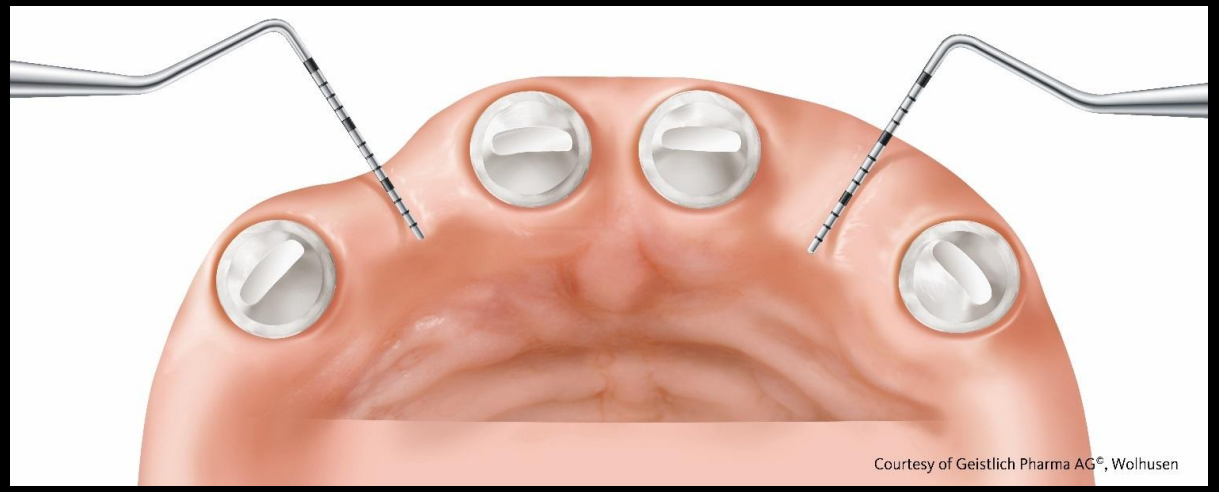

- A loss in the volume and size of alveolar portion in the maxilla or mandible

Lekholm & Zarb GA. Patient Selection & preparation in Tissue Integrated Prosthesis. Branemark, Zarb GA, Alberktsson (eds).pp 199-210. Quintessence, 1985.

Alveolar Post-Extraction Ridge Resorption

- Buccal bone resorbs more than lingual bone. Maxillary sites resorbs faster vs. mandibular sites
- Vertical bone loss ranges 0.8 mm-1.22 mm (first 3 month) & Horizontal bone loss ranges 5 mm-7 mm (50%), bone loss may continue at rate of 0.5 mm per year
- Mean 1.85 mm (4-month evaluation, a reduction of ~15% of the initial bone volume)
- Up to 50% of the alveolar ridge can be lost over 12 months & ~ 2/3rds of this reduction occurs within the first 3 months

Alveolar Post-Extraction Ridge Resorption



Diagrammatic representation of the alveolar ridge following tooth extraction

- LHS - atrophic ridge with NO ridge preservation
- RHS - preserved alveolar ridge after ridge preservation performed

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

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

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

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

Results: The width of the RP group decreased from 9.2 ± 1.2 mm to 8.0 ± 1.4 mm ($P<0.05$), while the width of the EXT group decreased from 9.1 ± 1.0 mm to 6.4 ± 2.2 mm ($P<0.05$), a difference of 1.6 mm. Both the EXT and RP groups lost ridge width, although an improved result was obtained in the RP group. Most of the resorption occurred from the buccal; maxillary sites lost more width than mandibular sites. The vertical change for the RP group was a gain of 1.3 ± 2.0 mm versus a loss of 0.9 ± 1.6 mm for the EXT group ($P<0.05$), a height difference of 2.2 mm. Histologic analysis revealed more bone in the RP group: about 65 ± 10% versus 54 ± 12% in the EXT group. The RP group included both vital bone (28%) and non-vital (37%) FDBA fragments.

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

KEY WORDS

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

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‡ Oral Pathology, University of Louisville.
§ Previously, University of Louisville; currently, Dental School, Medical College of Georgia, Augusta, GA.
‖ Private practice, Phoenix, AZ.
¶ Statistics, School of Dentistry, University of Louisville.

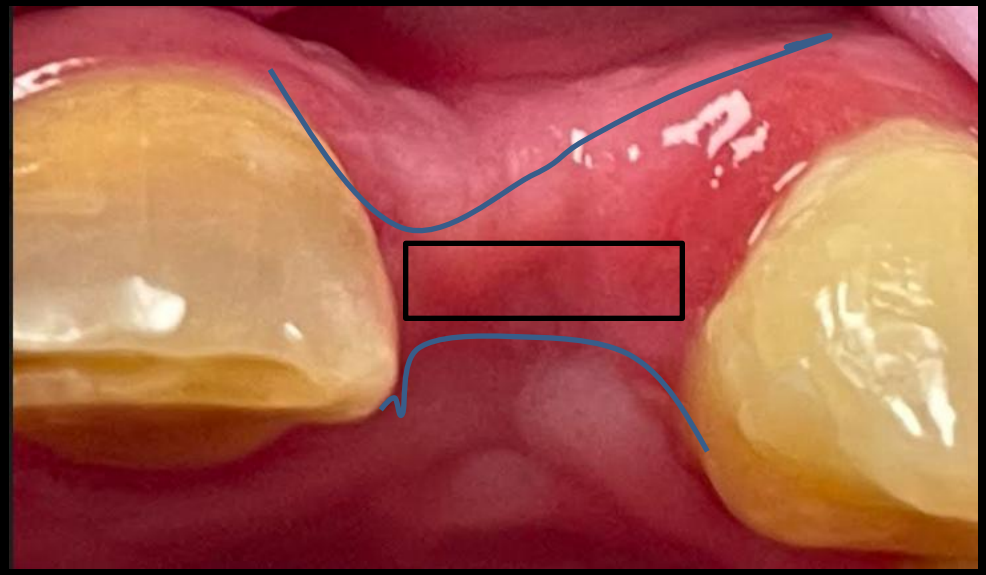
Iasella JM, Greenwell H, Miller RL, et al. Ridge preservation with freeze-dried bone allograft and a collagen membrane compared to extraction alone for implant site development: A clinical and histologic study in humans. J Periodontol 2003; 74: 990-999.

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

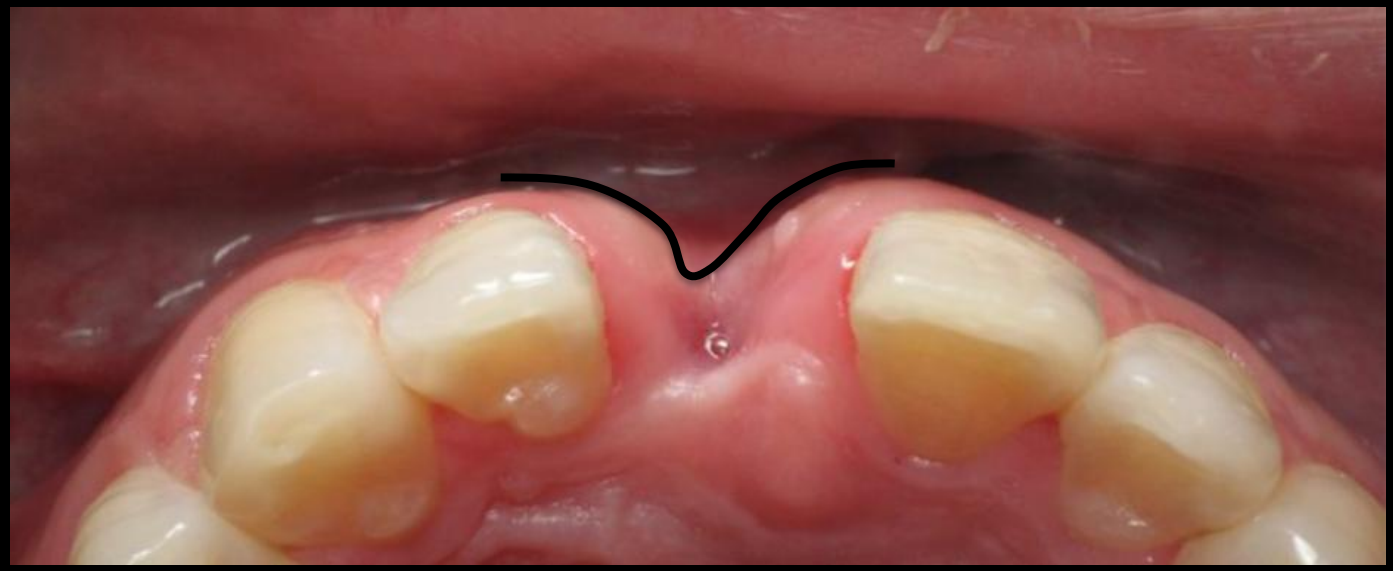
(Courtesy of Dr. Mardirossian DDS, MS)

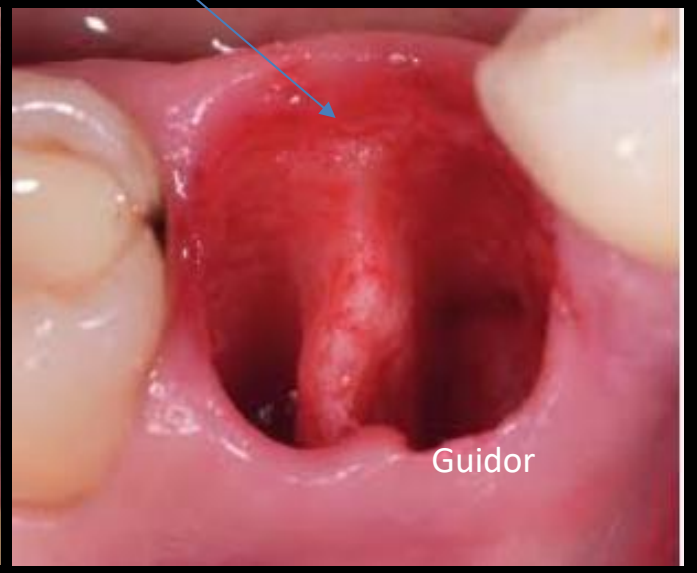
- Maxillary bone is much more delicate & keeping this in mind is critical for your overall success
- Proper management of extraction sites at time of tooth extraction can reduce or eliminate future need for advanced ridge augmentation procedures prior to implant placement
- In addition, poor extraction site management may lead to esthetic and functional prosthetic complications

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

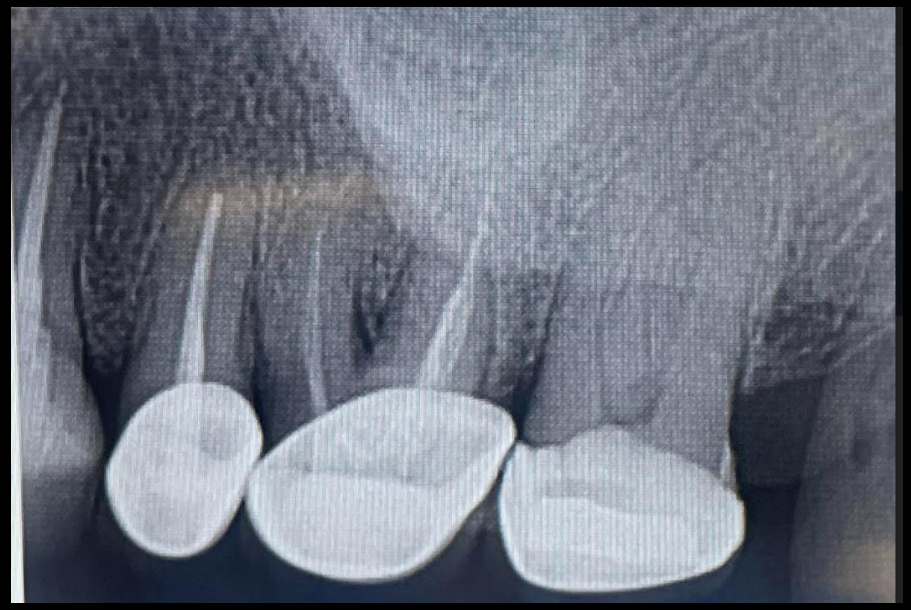


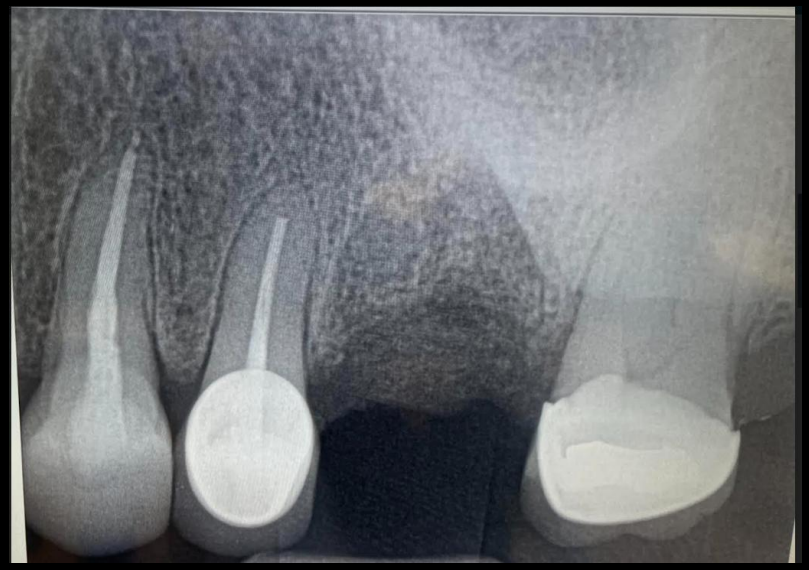
- If buccal bone is not preserved; there will be significant challenges in treatment planning for a fixed or removable appliance

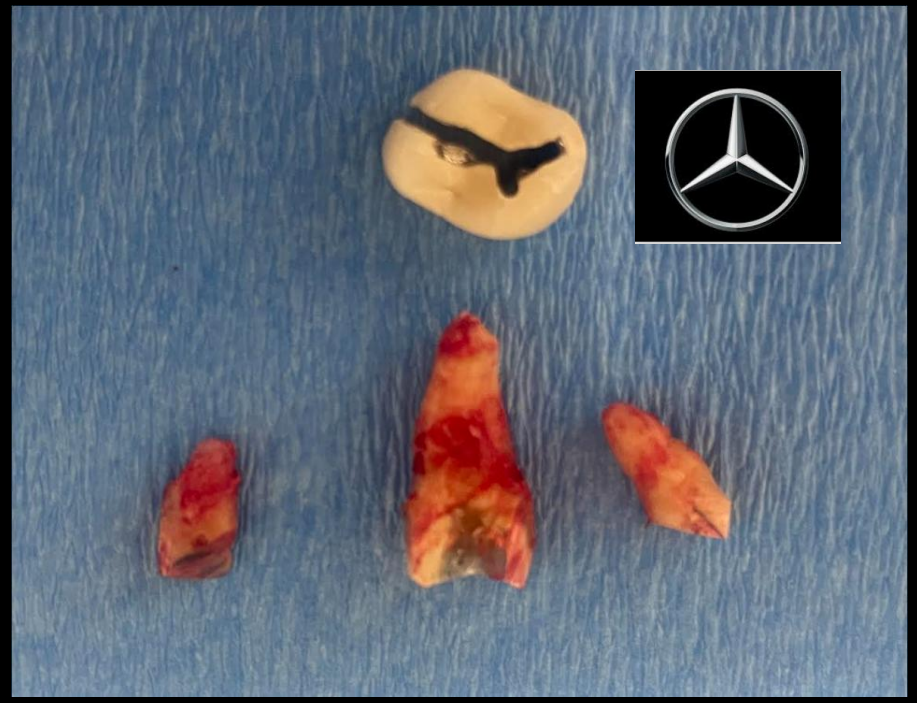




- Goal is to preserve buccal plate & achieve minimum trauma to soft tissue
- Healing and future prosthesis placement will be ideal
- If severe hard tissue damage, soft tissue will follow pattern of bony architecture
- Need to use atraumatic methods along with ridge preservation to minimize collapse



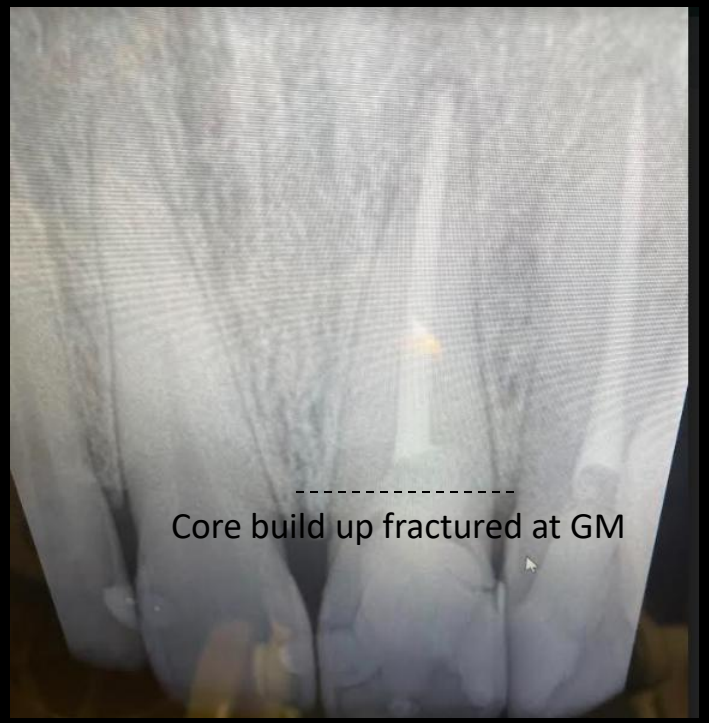


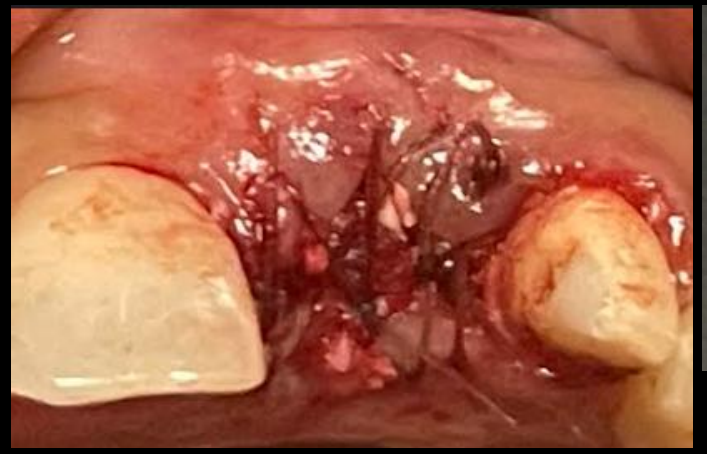


Alveolar Post-Extraction Ridge Resorption

Rationale for Bone Graft Usage

- Create sufficient bone volume for ideal implant placement
- Minimize bone resorption and soft tissue contraction
- Decrease treatment time if grafted at the time of extraction
- Grafting techniques are predictable & lead to improved esthetics
- Decrease patient Morbidity and lowers future expenses
- Ridge preservation code - D7953 & Resorbable membrane code - D4266





- In anterior cases the buccal plate is extremely thin & maximum preservation is needed
- If you are unsure on the thickness of the residual plate, use a perio probe to evaluate
- Ridge preservation & application of a membrane with resorbable sutures
- Refer if you don’t feel comfortable

Ridge Preservation

Graft Material Options:

- Autogenous
- Allograft
- Xenograft
- Alloplast

Ridge Preservation

Biologic Process of Bone Grafts

- Osteogenesis – formation of new bone from osteocompetent cells (autograft only)

- Osteoconduction – formation of new bone through a scaffold (bone graft) from the host's osteocompetent cells

- Osteoinduction – formation of new bone from the differentiation and stimulation of mesenchymal cells by the bone-inductive protein

Ridge Preservation

Properties of bone grafts

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

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

Ridge Preservation

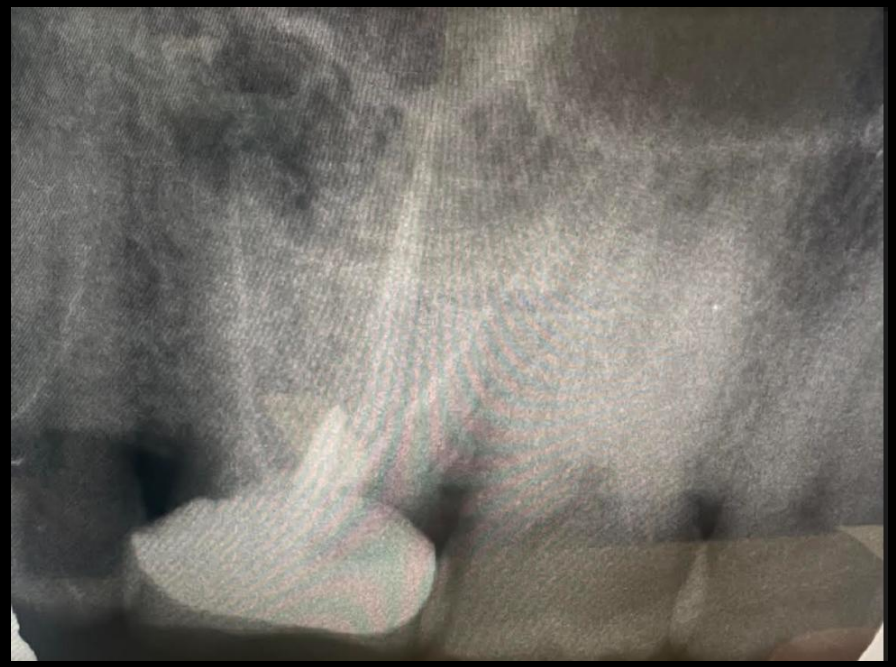
What material should I use & Why?

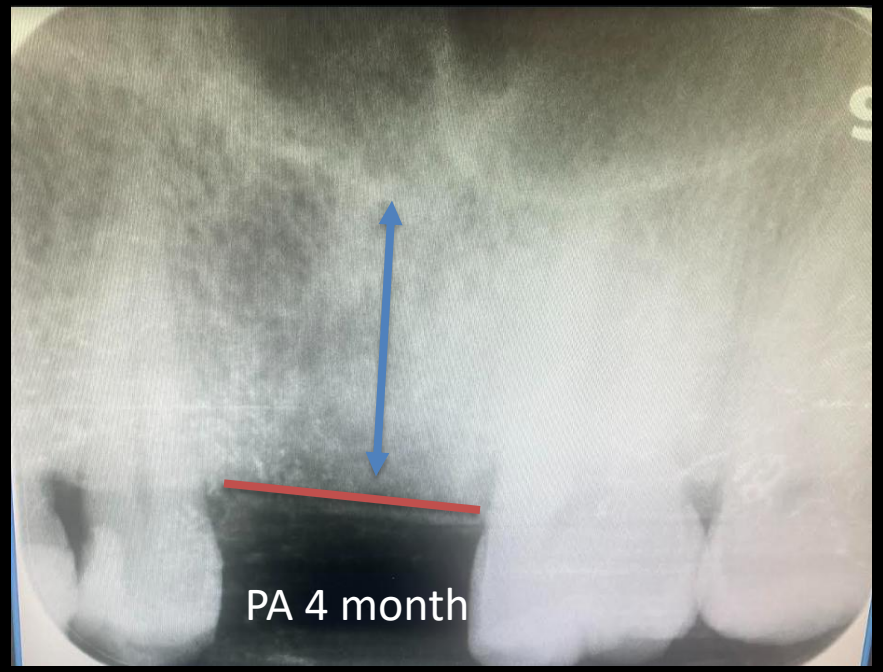
- Allografts- high resorption rate but inconsistent volume stability, osteoconductive scaffold & slight osteoinductive potential
- Xenograft- slower resorption rate with higher volume stability, osteoconductive
- Autograft- gold standard, both osteoinductive & osteoconductive, high morbidity in larger quantities
- Alloplast- primarily osteoconductive serves as a scaffold with no osteoinduction, variable resorption but HA has slow resorption rate

Ridge Preservation

Tooth Needing Extraction

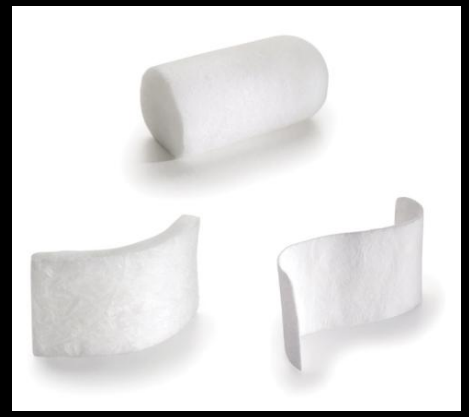
Grafted Immediately After Extraction





- PO site have good crestal level for future implant site

Ridge Preservation - Membranes



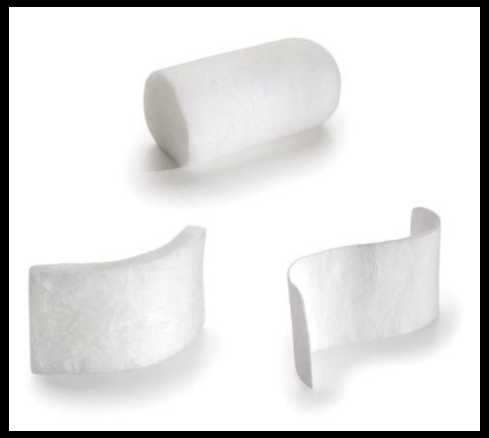
- Main function of membrane is to prevent epithelial migration of cells into graft
- Can be either resorbable or non resorbable
- Ideal properties:
  - Biocompatibility
  - Space maintenance
  - Cell occlusiveness
  - Good handling properties
  - Resorbability or ease of removal

Ridge Preservation - Membranes

When do I use resorbable vs non-resorbable membranes in large defects ?

- Resorbable: mainly used for horizontal augmentation with tacks or screws to hold in place
- Non-resorbable: when horizontal and vertical augmentation is needed or a large non-containable defect needs to be grafted

Ridge Preservation - Resorbable Collagen Membranes



- Human or bovine collagen
- Collagen cross-linking determines resorption time
- Hydrophilic, does not promote structural support
- Not as susceptible to infection
- Hemostatic agents such as Gelfoam are NOT membranes

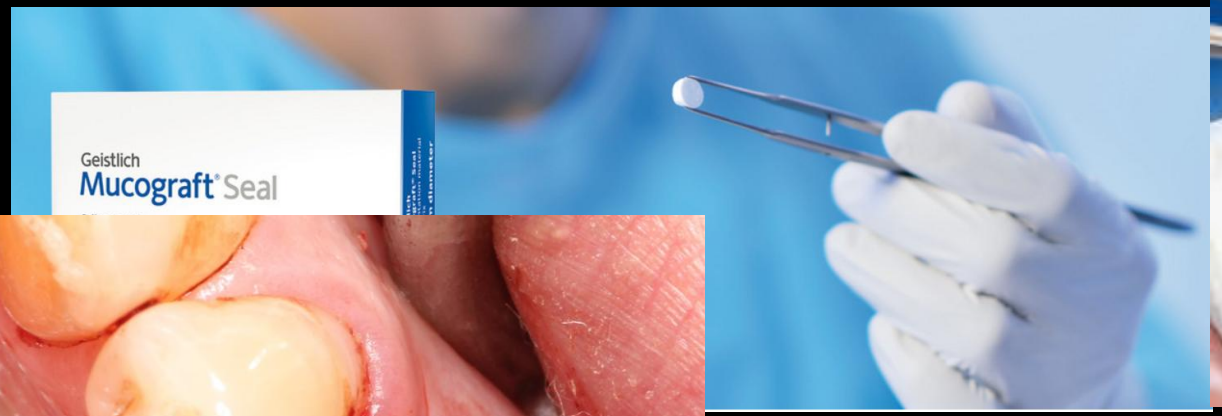
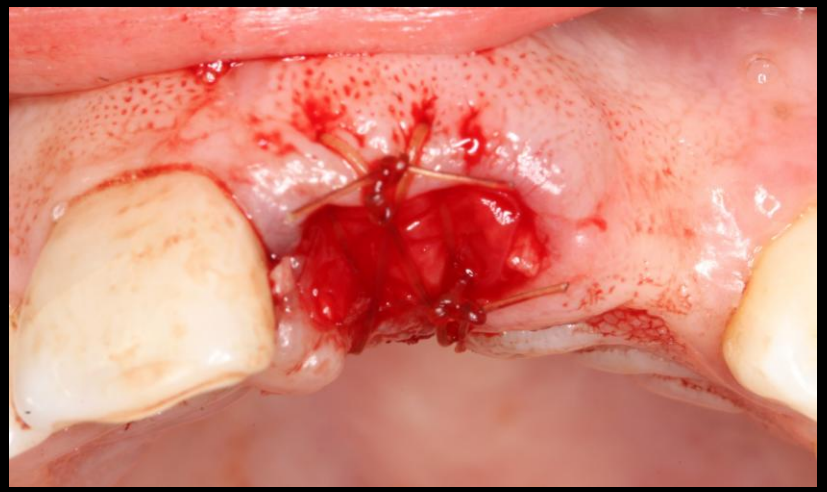
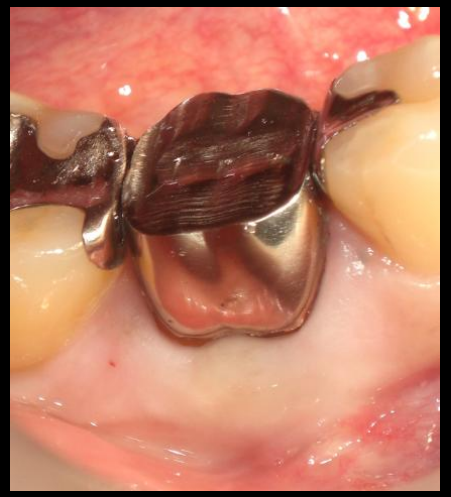
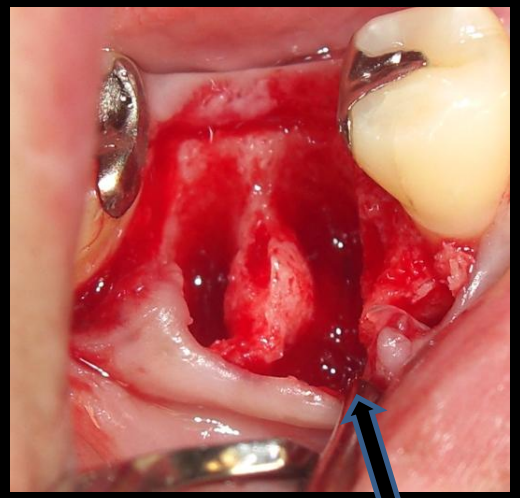


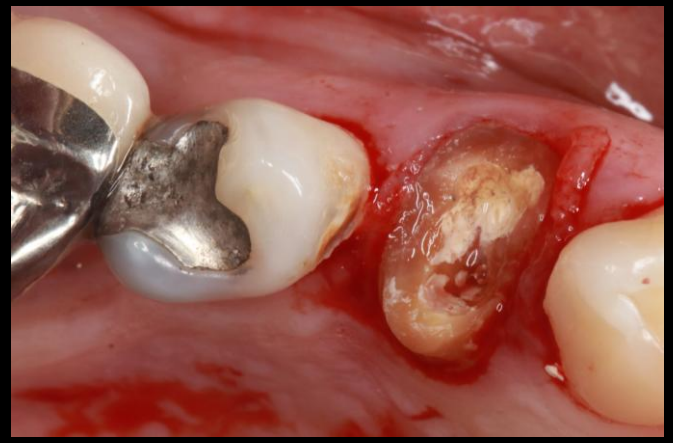
Fig 8 suture

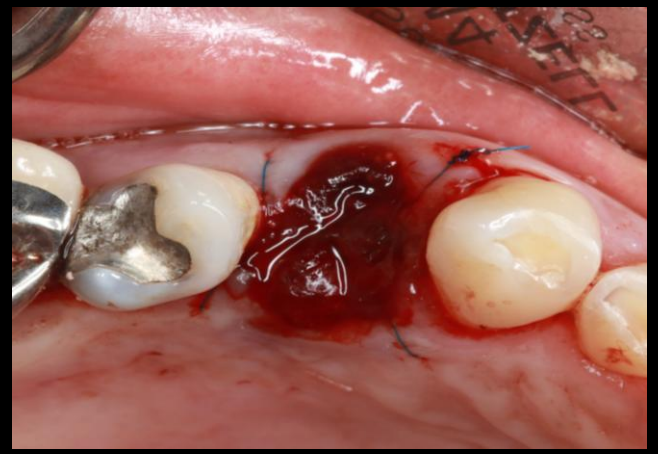


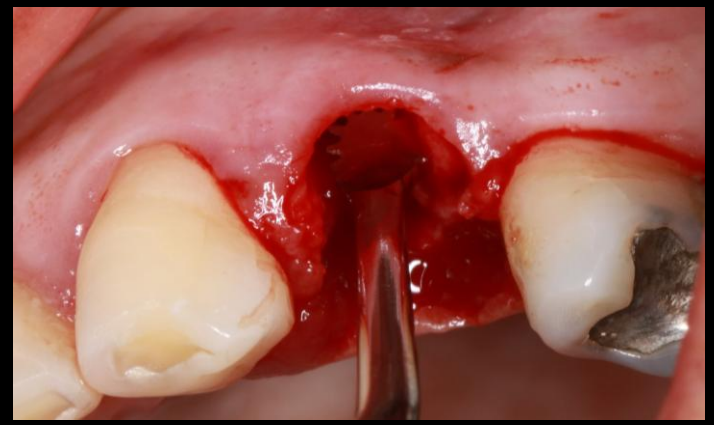
Make a better foundation of bone, slight buccal plate fracture

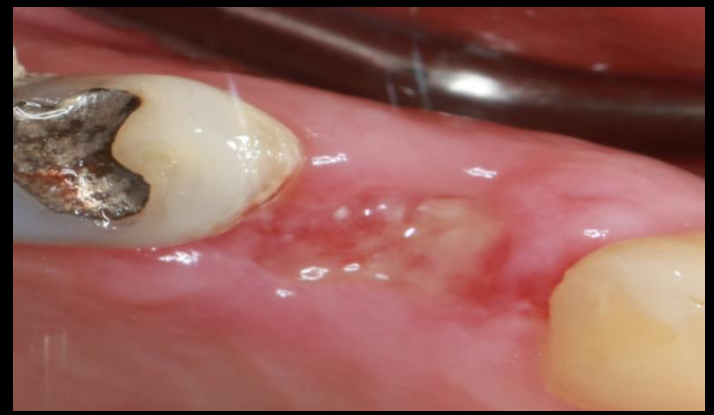
- Using bone graft material and non-resorbable membrane



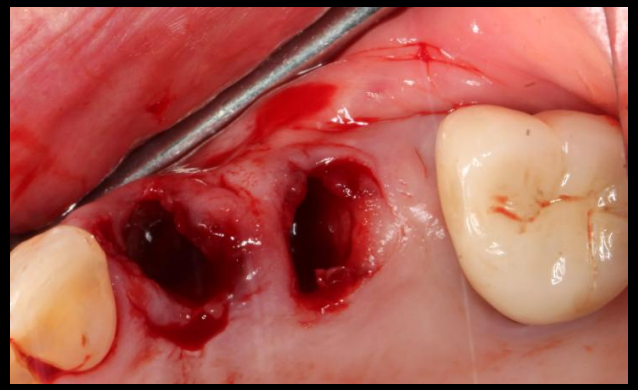


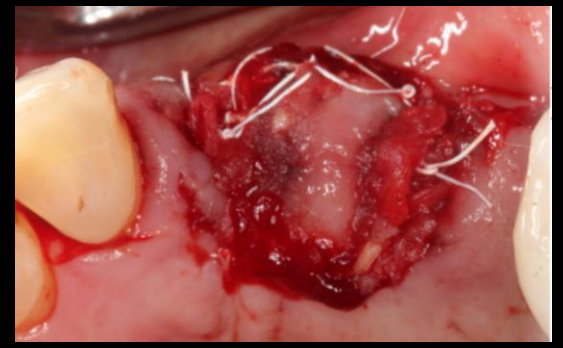
1-week post-op





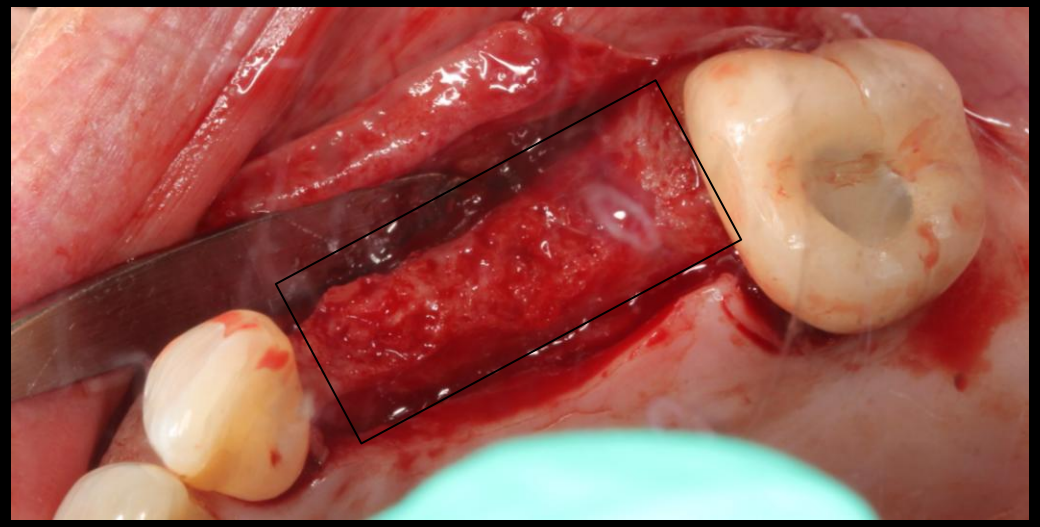
Clinical Case

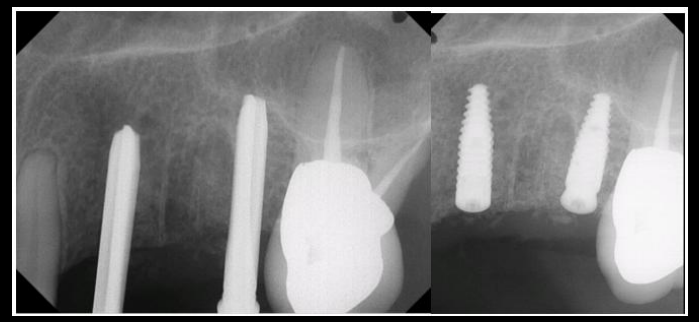





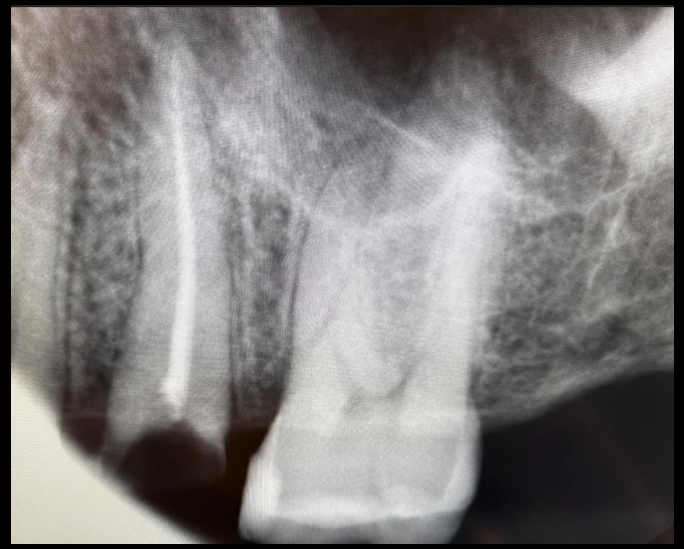
- Referral for ext and implant placement in future

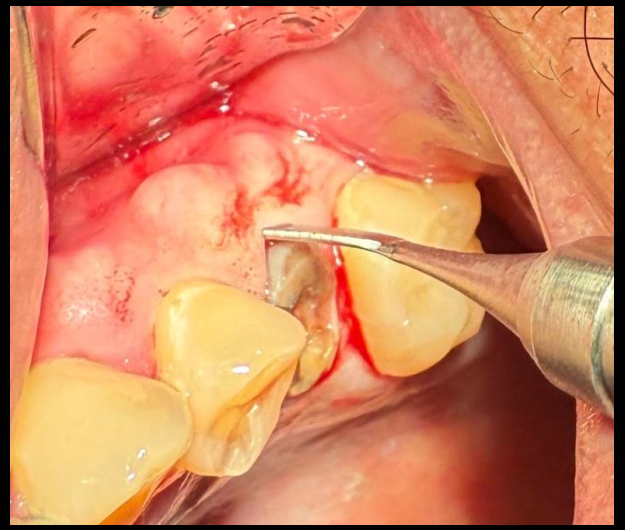
- Recurrent decay on existing PFM's, short clinical crowns, lack of ferrule, preps angulation?



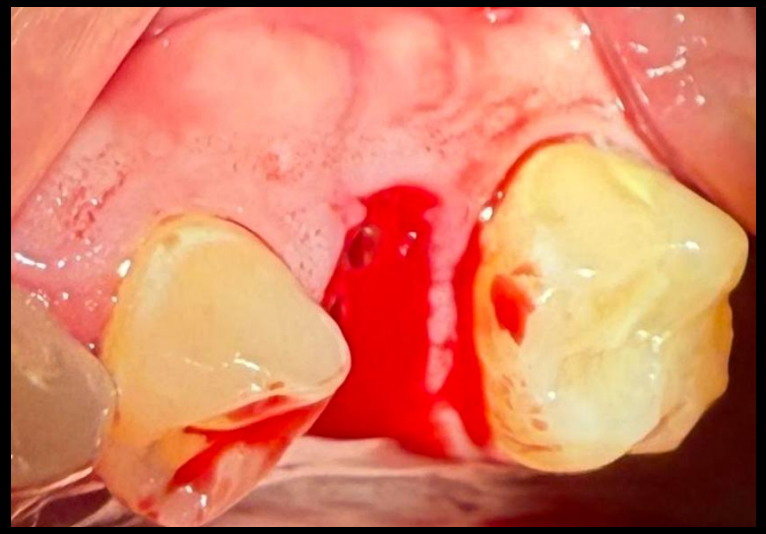


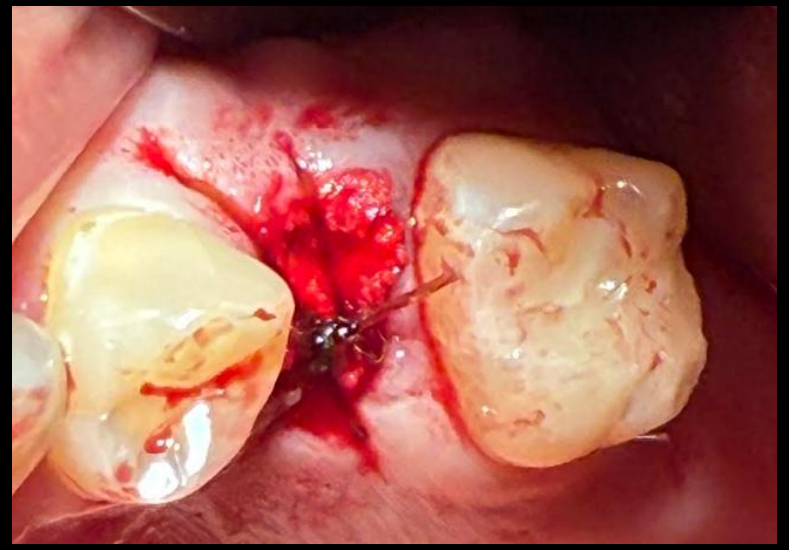
- Good bone fill seen after 4 months, implant placement #11-13 Straumann BLT
- Surgical guide created for optimal placement





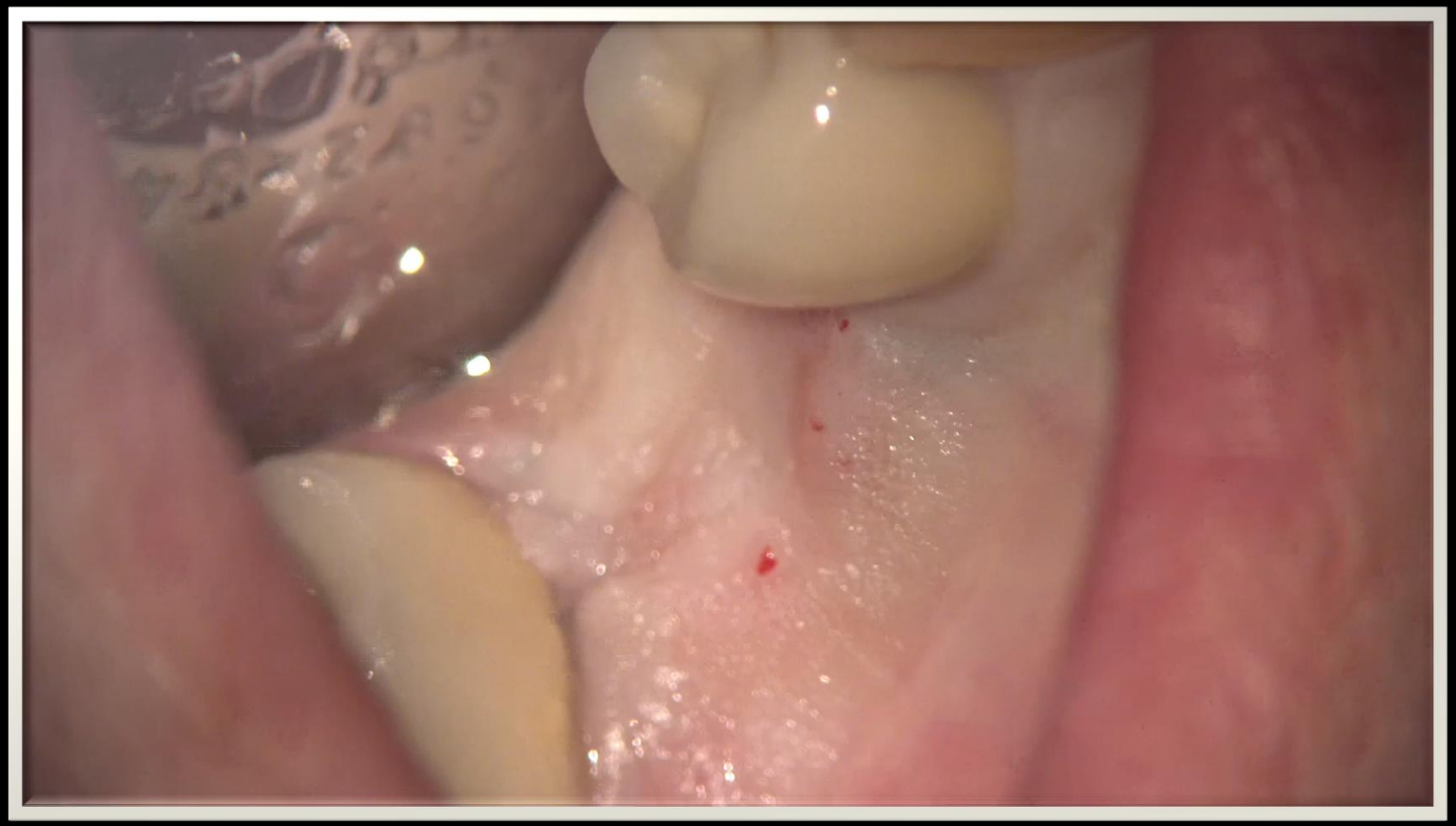

- Extracted #13, periotome used, always preserve buccal plate
- Good surgical technique leads to predictable result





- Always put bone graft in a bleeding socket for better vascularity
- PA will show radiolucency initially, and become radiopaque over time


B
P
0
20
(mm)
H
20
(mm)
A
B
0
F
0
40
(mm)
M
20
(mm)



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

Video courtesy of Dr. Robert Miller

Identifying Bone Regeneration via X-Ray

Images courtesy of: Dr. Robert Miller

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

Socket Preservation Materials Comparison

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

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

Complications

Delayed Healing

- Abnormal to have, but there is a risk of:

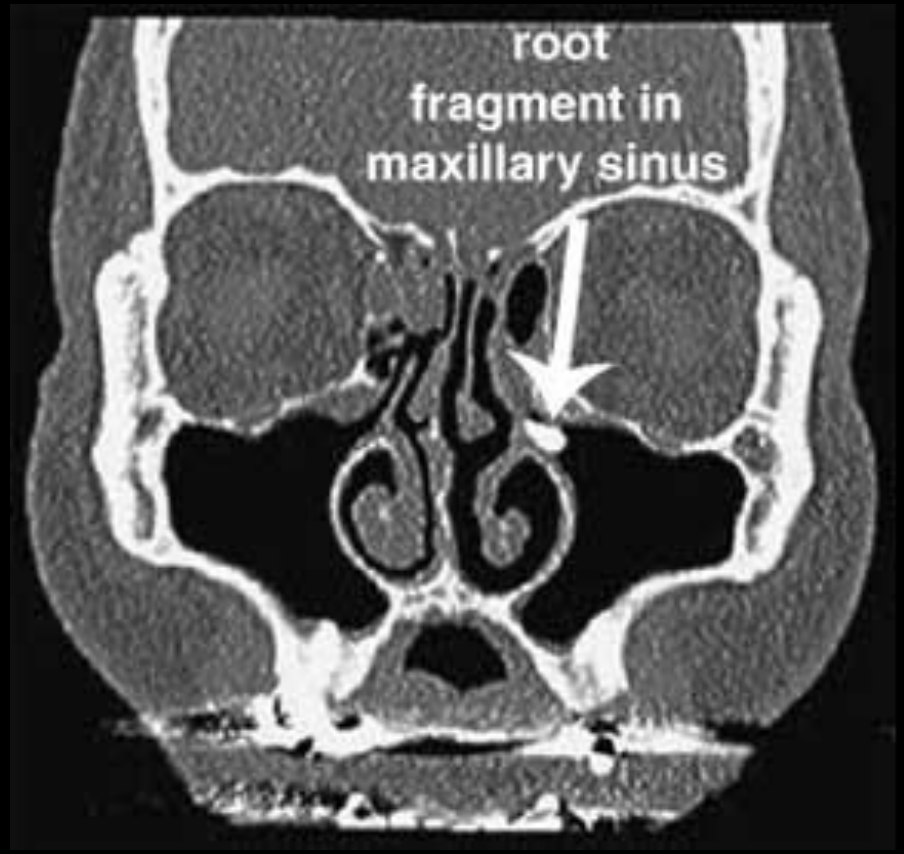
  Infection

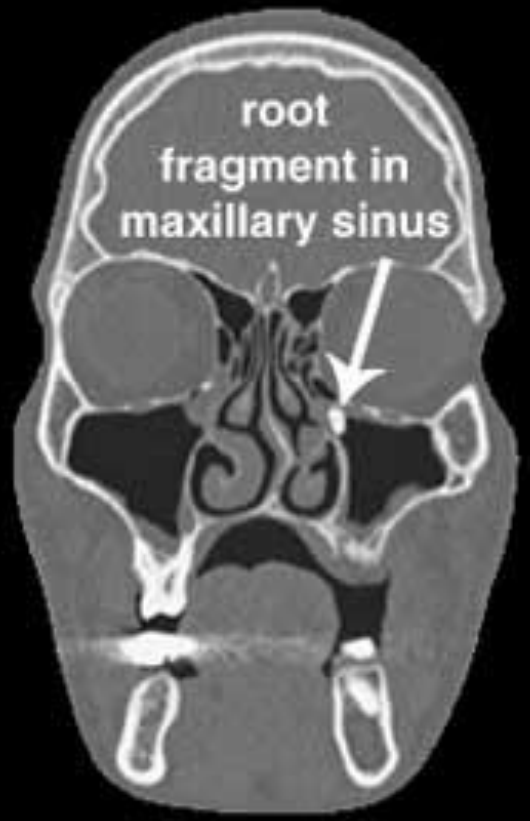
  - Noted by:
    - Redness
    - New-onset swelling (after the first 72 hours)
    - Drainage
    - Fevers, Malaise

  Bone spurs

  - Sometimes, these form or show up days, weeks, or months later; and require removal in most cases

Root Displacement





- Maxillary molar roots are most displaced into unfavorable anatomic spaces; it is forced or lost into the maxillary sinus

If this occurs:

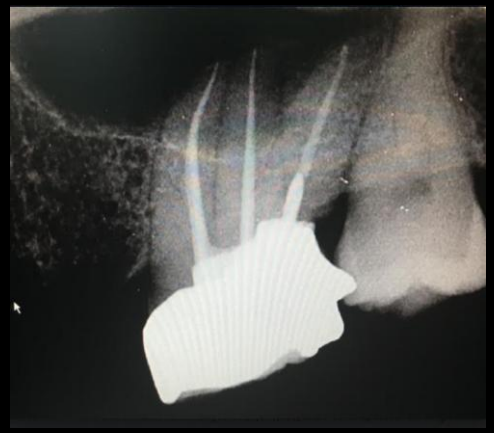
- First, identify the size of the root tip lost
  - Root tip may be several mms, or an entire tooth root
- Next, assess if presence of infection of the tooth or periapical tissues
  - If the tooth was not infected, management is more straightforward than if the tooth had been acutely infected
- Finally, assess the pre-operative condition of the maxillary sinus
  - For the patient who has a healthy sinus, it is easier to manage a displaced root than if the sinus is or has been chronically infected

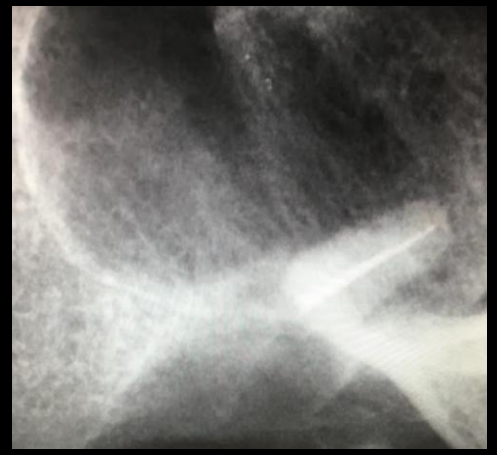
- If the displaced tooth fragment is a small (2 or 3 mm) root tip and the tooth & sinus have no pre-existing infection, the surgeon should make a brief attempt at removing the root

  - First, a radiograph of the fractured root should be taken to document its position and size
  - Then, irrigate through the socket apex and suction the irrigating solution from the sinus via the socket

    This occasionally flushes the root apex from the sinus through the socket
  - Confirm radiographically that the root has been removed

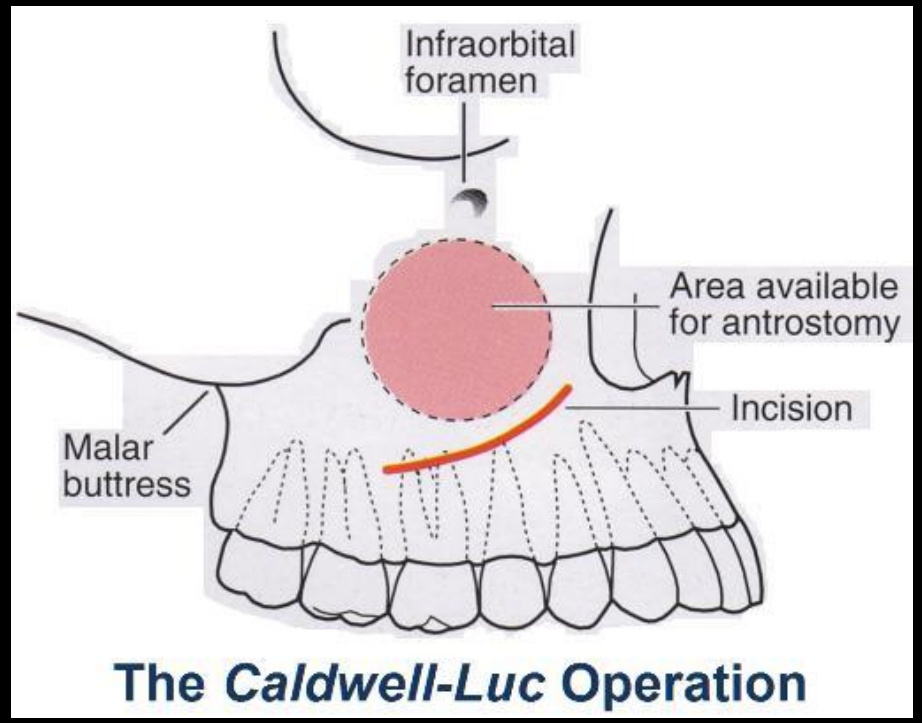
Root tip in the Maxillary Sinus

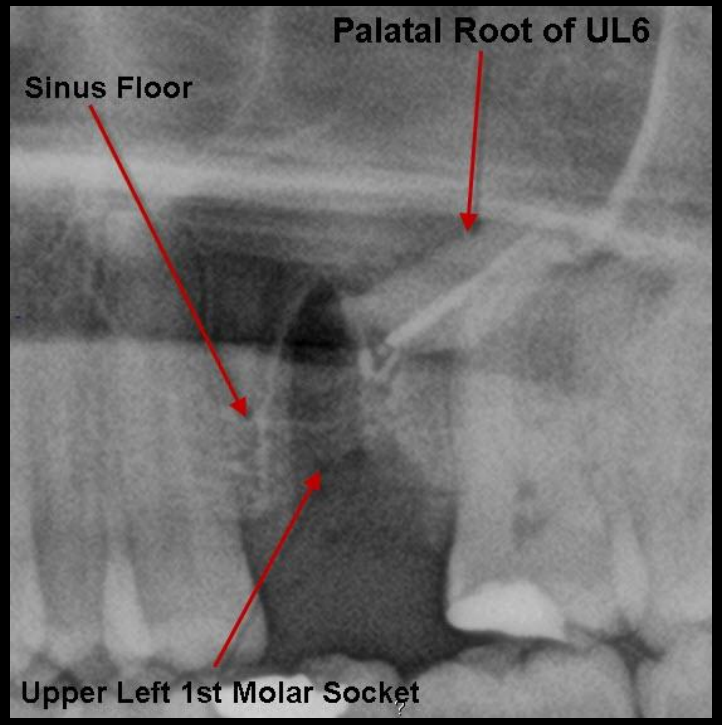




- If unsuccessful, NO additional surgical procedures should be performed, root tip can be left in the sinus
- The small, non-infected root tip can be left in place, unlikely to cause any troublesome sequelae
- If the root tip is left in the sinus, measures should be taken like those when leaving any root tip in place
- Pt must be informed of the decision with proper follow-up instructions for regular monitoring of site
- However, infected root tips of larger size should be referred for Caldwell-Luc procedure

Root tip in the Maxillary Sinus -Caldwell-Luc





- If a large root fragment or the entire tooth is displaced into the maxillary sinus, it should be removed
- The usual method is a Caldwell-Luc approach into the maxillary sinus in the canine fossa region and then removal of the tooth

Sinus Perforations

Courtesy of Dr Bakry

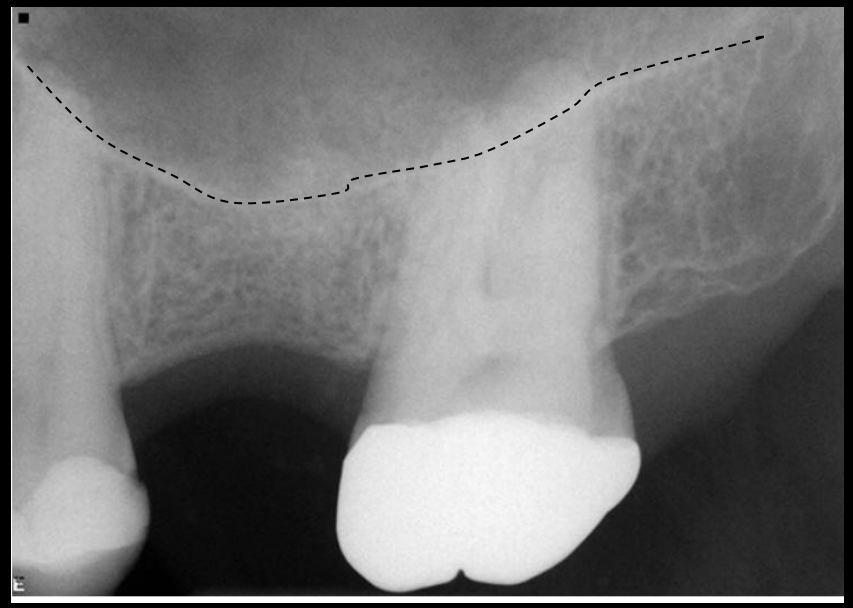
- An Oral Antral Fistula is a persistent communication b/w the mouth & sinus

  3 types of OAC:
- Alveolar - after traumatic tooth extraction
- Sublabial - complication after Caldwell-Luc procedure
- Palatal - malignancy, following upper jaw resection for cancer tx

Etiology of Perforations

- During extractions from pushing root inadvertently or during retrieval attempt from the alveolar socket
- During implant surgery from perforation of sinus floor via osteotomy or sinus lift
- During or after removal of cysts/tumors in sinus
- Severe trauma to middle 1/3 rd. of face

VS.



How to anticipate & possibly avoid a perforation?

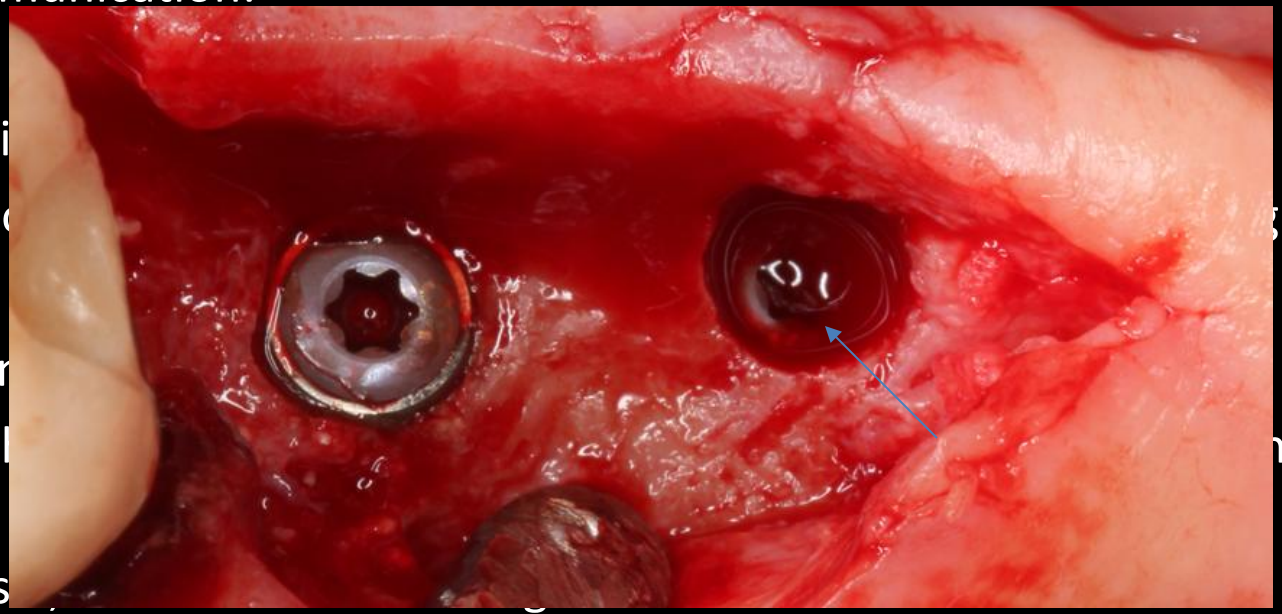
- Explain to the patient prior to the extraction the complexity of the extraction
- Obtain a CBCT scan, most likely lack of demarcation of sinus floor will be seen on PA
- Have pt sign an informed consent understanding ALL R/B/A and all complications
- Have a plan of action in the event of a perforation

Diagnosing an Oroantral Communication

- Diagnosis of the oroantral communication:

1. Examine the tooth once it i
   - If a section or small amo exists

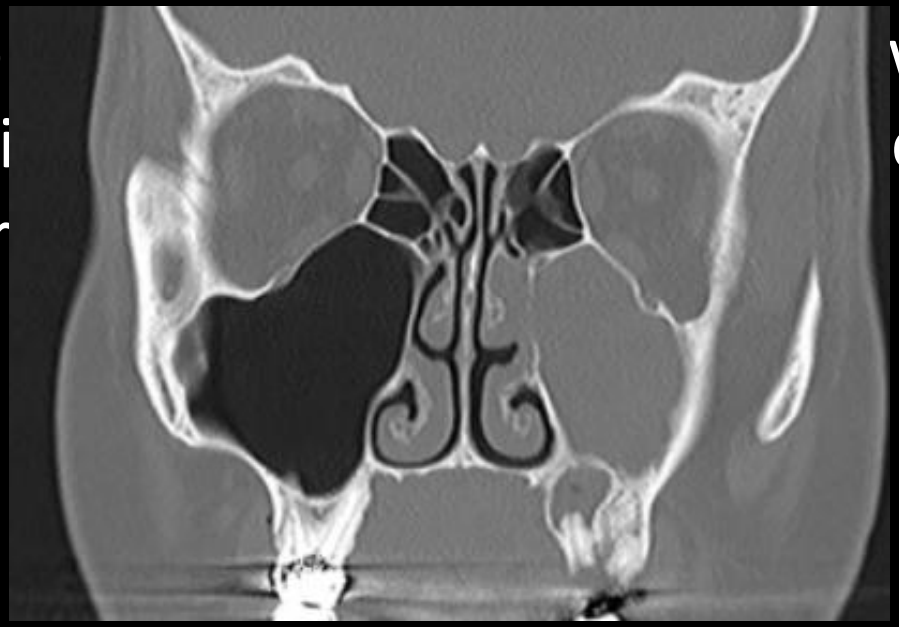
2. Nose-blowing test to confirm
   - Pinch the nostrils togeth hile observing the socket
   - If a communication exis

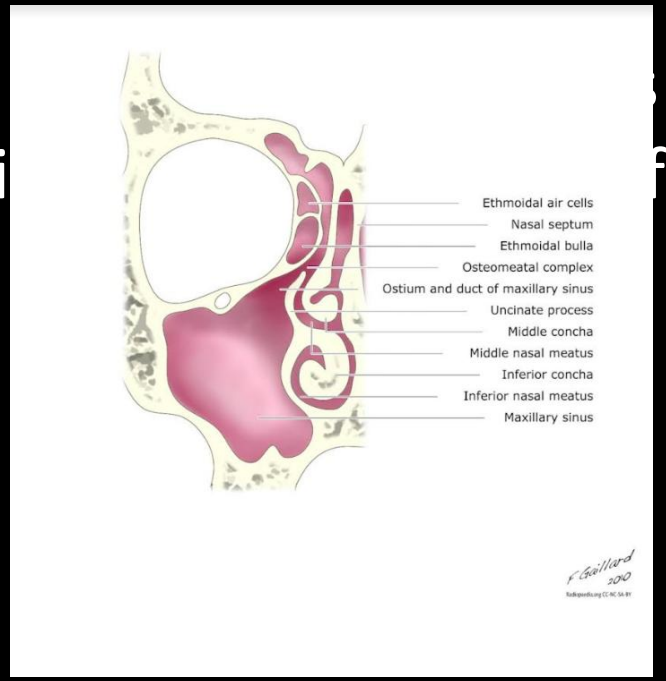


Oroantral Communication

- The two sequelae of most concern are post-operative maxillary sinusitis & formation of a chronic oroantral fistula

- The pro wo related to the si cati f the exposur

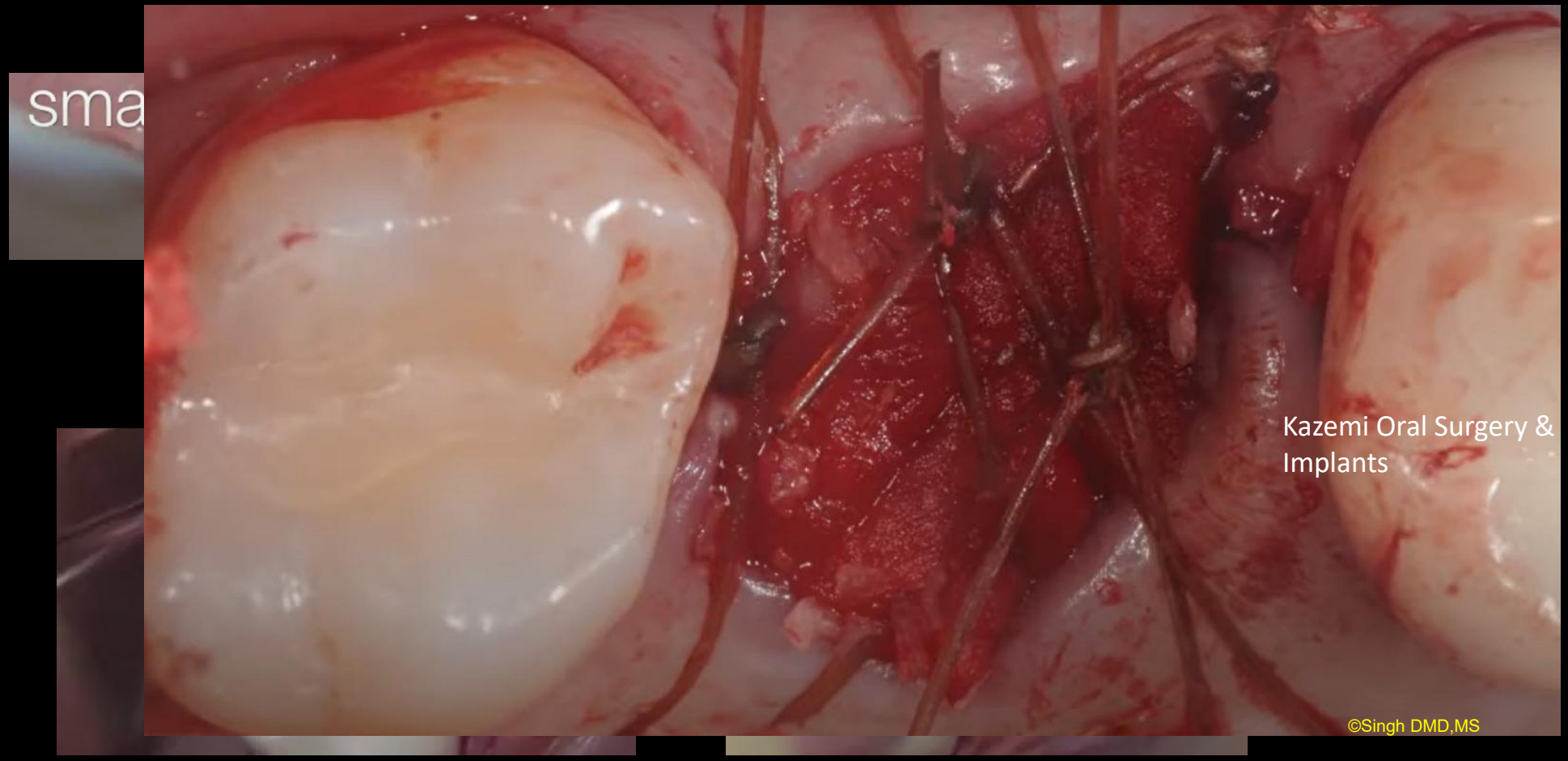




Perforations Less Than 3mm

- If there is a slight opening < 2-3mm tell patient not to blow their nose too hard or sneeze
- Determine the need to place patient on an antibiotic such as Augmentin, Z- pack or decongestant such as Sudafed per the opening size
- SOME COMPLICATIONS ARE BEYOND CONTROL!!

- Consider three layered repair technique-apply small collagen plug-bone graft-followed by another plug



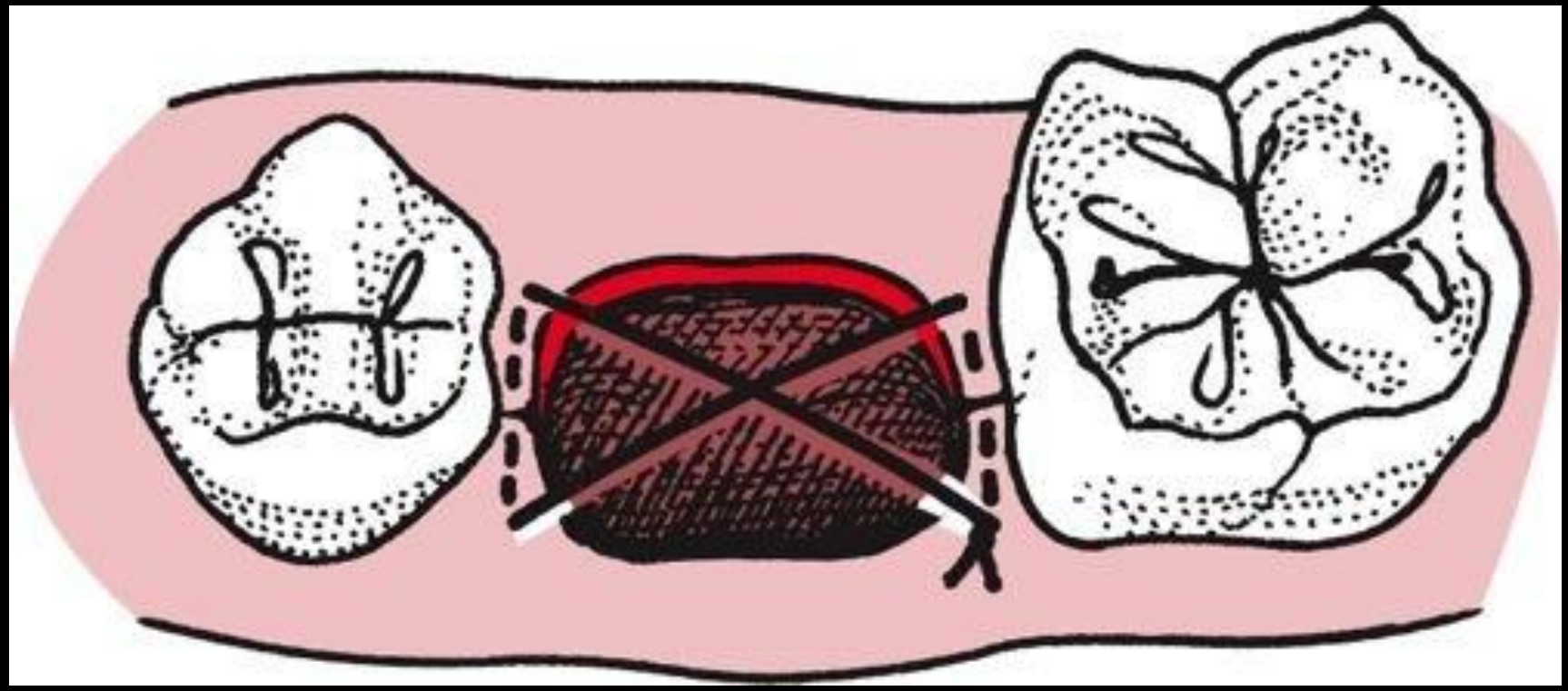
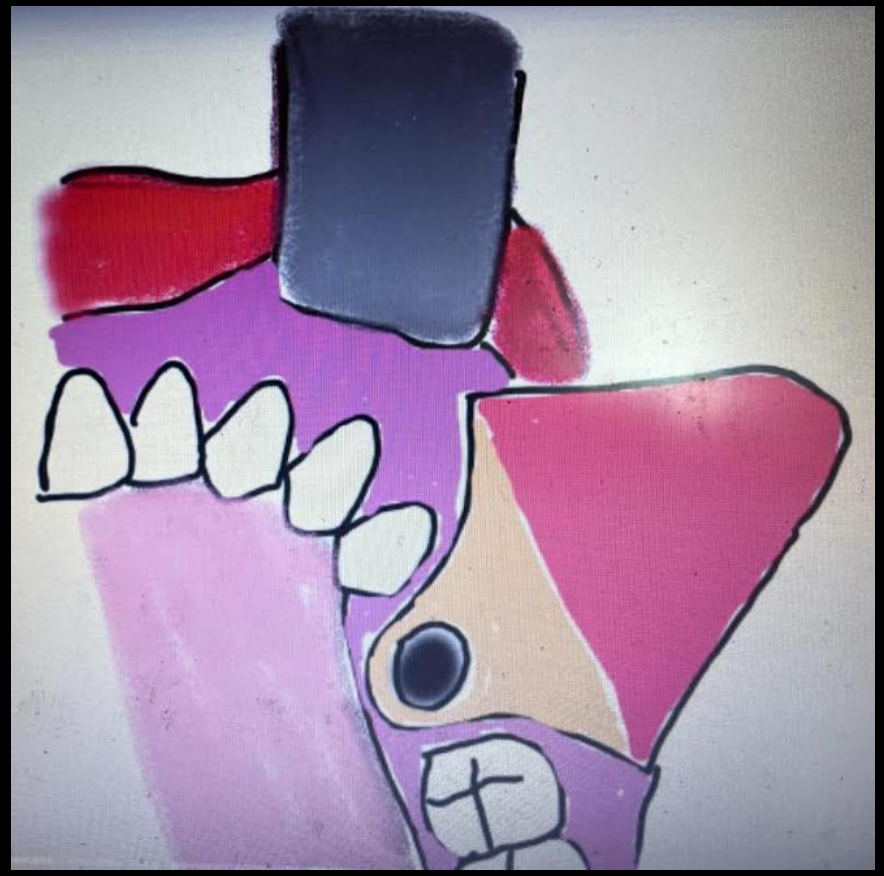


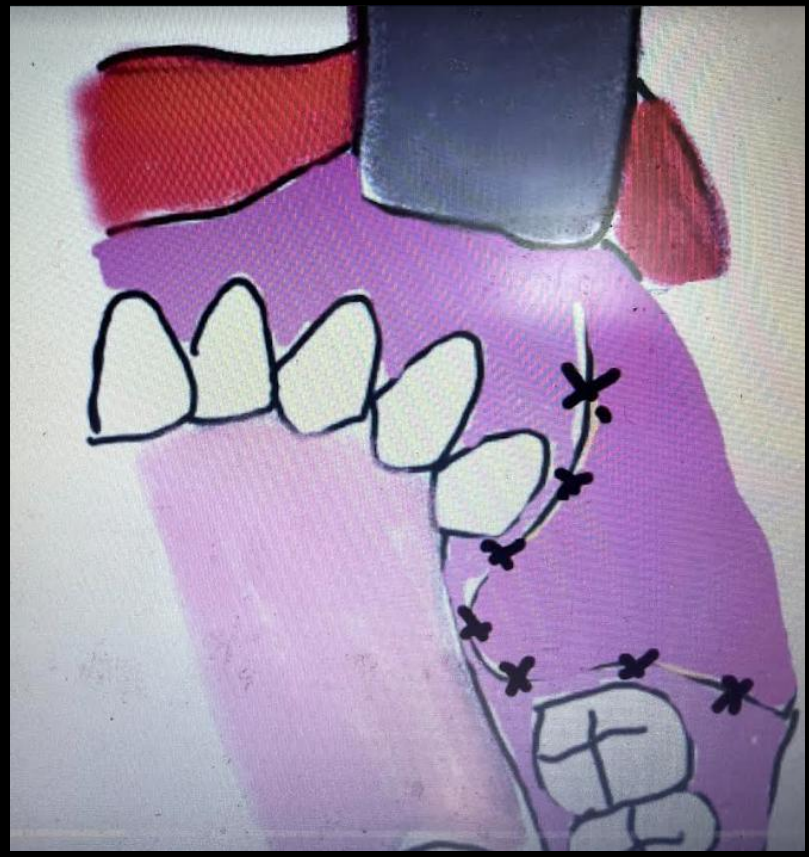
Figure-of-eight suture

- A figure-of-eight stitch is usually performed to help maintain piece of oxidized cellulose in the tooth socket

Larger O-A Communications

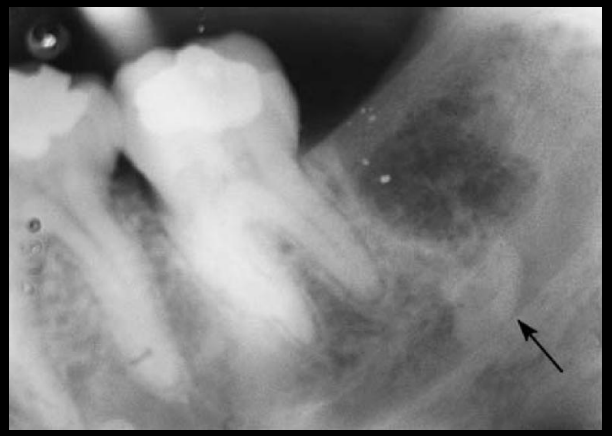
- If the O-A opening is of moderate size (3- 6 mm), additional measures should be taken
- Maintain the blood clot in the area, with a figure-of-eight suture over the tooth socket
- You can place some clot-promoting substances, such as a gelatin sponge (Gelfoam) into the socket
- Patient needs to follow sinus precautions, If the sinus opening is large (7 mm or larger), consider having the sinus communication repaired with a flap procedure





- Buccal advancement flap is one way if you are trained to handle this complication
- Remove the marginal epithelium & release the periosteum to advance flap
- Suture with primary closure, disadvantage is severe loss of vestibule in site

Root Fracture



- The most common problem associated is root fracture
- Long, curved, divergent roots that lie in dense bone are the most likely to be fractured
- The main method of preventing fracture of roots is to try using periotomes to severe the PDL, sectioning the roots as needed
- Use an open (surgical) extraction technique & remove minimum bone if needed to decrease the amount of force necessary to remove the tooth
- However, bone removal should NOT be the first option

Alveolar Osteitis (AO)/Dry Socket

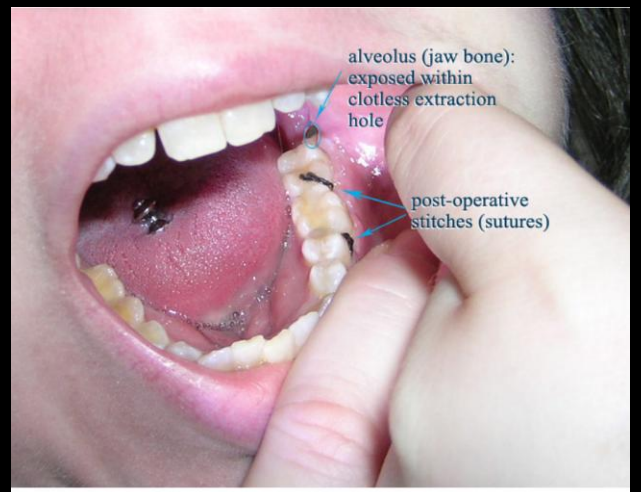
- AO is delayed healing in a post-extraction socket, NOT associated with an infection
  - No signs and symptoms of infection, such as fever, swelling, and erythema
  - Pain onset: 3-4 days post extraction, complains of bad odor and/or foul taste with pain radiating to ear

- *Dry socket term* describes appearance of tooth extraction socket when the pain begins

- Frequency
  - Women have greater incidence than men
  - 2% occurs after routine extractions & 20% occurs after impacted mandibular 3rd molar

Differentiation b/w AO vs PO infection

- Absence of a fever
- No erythema
- No lymphadenopathy
- No localized edema
- NO Need for ABX



A dry socket. (Beatgoddess [CC BY 3.0 (https://creativecommons.org/licenses/by/3.0)])

Treatment - Available Medicaments

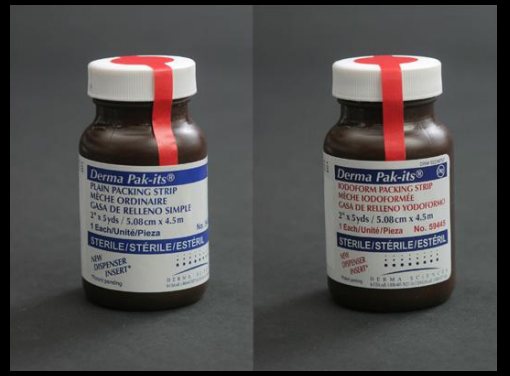
- Resorbable Materials:
  Gel foam Dental Pak
  – Gelatin sponge

  Alvogyl (Septodont)
  – Snuff chewing tobacco appearance
  – Harder to apply

- Non-Resorbable Material:
  Dry Socket Paste (Sultan discontinued**)**
  – Make sure to remove iodoform dressing it after 2-3 days

Treatment

- Socket irrigation
- Eugenol/Anesthetic dressing
- One dressing at a time
- Ensure removal of dressing



Treatment

- Conservative measures needed
- Primary goal is alleviating pain during healing phase& enhance vascularity
- No curettage of socket recommended
- Gently irrigate area with saline or Peridex
- Make sure pt is comfortable, possible anesthetize
- Dry socket dressing as needed until relief of pain

Post-Operative bleeding

Prevention of Post-operative bleeding:

Obtain a history of bleeding prior to surgery

- Coumadin, Plavix, Aspirin, Chemotherapy, Liver disease, Alcohol abuse

Use atraumatic surgical technique

- Periotomes, luxators, careful instrumentation

Obtain good hemostasis at surgery

- Remove ALL granulation tissue, pro-clotting products, sutures

Provide excellent patient instructions

How To Control Bleeding

- Primary control of bleeding during routine surgery depends on gaining control of all factors that may prolong bleeding
- Surgery should be as atraumatic as possible, with clean incisions and gentle soft tissue management
- Care should be taken not to crush the soft tissue because crushed tissue tends to ooze for longer periods

Bleeding Control

- Sharp bony spicules should be smoothed or removed
- All granulation tissue should be curetted from the periapical region of the socket and from around the necks of adjacent teeth and soft tissue flaps
- However, this should be deferred around sinus or inferior alveolar canal

Oxidized Regenerated Cellulose - Surgicel

- A second material that can be used to control bleeding is oxidized regenerated cellulose (e.g., Surgicel)
- This material promotes coagulation better than the absorbable gelatin sponge because it can be packed into the socket under pressure
- Gelatin sponge becomes friable when wet and cannot be packed into a bleeding socket

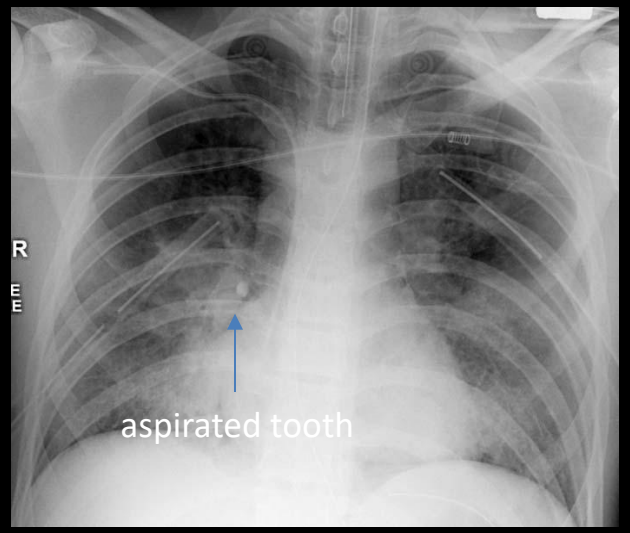
Tooth Lost Into The Pharynx

- Occasionally, the crown or an entire tooth might be lost into the pharynx (throat)
- Position the patient with their mouth toward the floor as much as possible
- Encourage patient to cough and spit the tooth out onto the floor
- Prevent this by placing gauze in the back to serve as a throat pack!

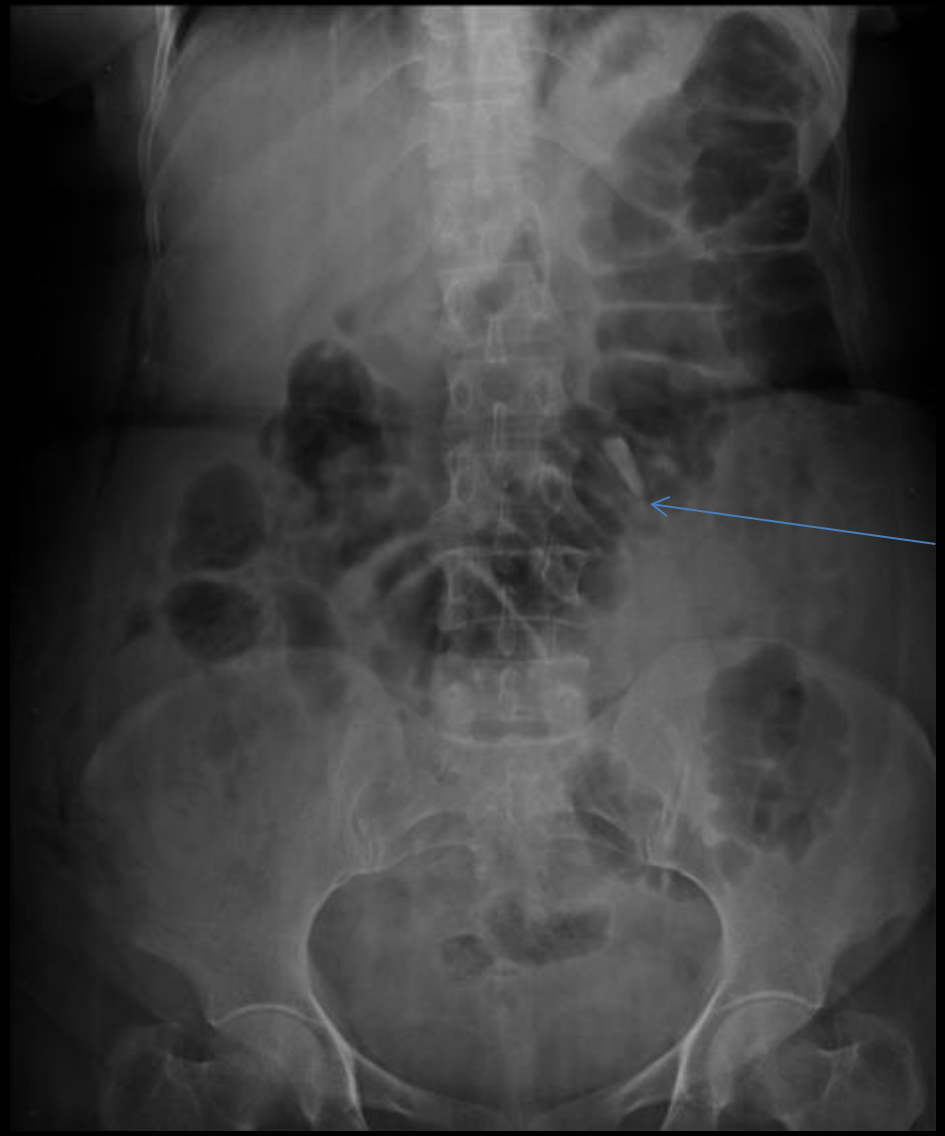
Tooth Lost Into The Trachea

- Despite these efforts, the tooth may be swallowed or aspirated
- If the patient has no coughing or respiratory distress, most likely that the tooth was swallowed & has traveled down the esophagus into the stomach
- However, if the patient has a violent episode of coughing or shortness of breath, possible aspiration through the vocal cords into the tracheobronchial tree

Management Of Lost Tooth



- The patient should be transported to an ER, chest & abdominal radiographs should be taken to determine the specific tooth location
- If the tooth is aspirated, patient may get a bronchoscopy to remove the tooth
- The urgent management of aspiration is to maintaining patient's airway & breathing



Swallowed tooth located in the GI tract

Swallowed Teeth

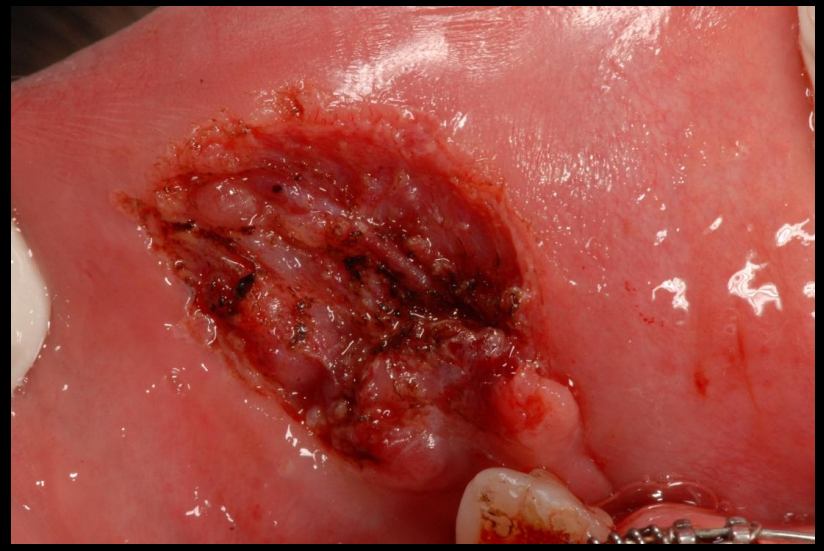
- If swallowed, likely tooth will pass through the G.I. tract within 2-4 days
- Recommend for patient go to the ER and have a radiograph of the abdomen to confirm the presence of the tooth in the G.I. vs. respiratory tract
- Follow-up radiographs likely not necessary because the usual fate of tooth is passage

Teeth Luxation

Savas, Selcuk & Küçükyılmaz, Ebru & Akçay, Merve & Köseoğlu, Serhat. (2015). Delayed Replantation of Avulsed Teeth: Two Case Reports. Case reports in dentistry. 2015. 197202. 10.1155/2015/197202.

- Stabilize with semi-rigid fixation to maintain the tooth in its position, only if significant luxation has occurred. Avoid rigid fixation
- A simple 24-gauge wire with resin bonding to adjacent teeth is usually sufficient
- Check to ensure tooth not into hyper-erupted & traumatic occlusion

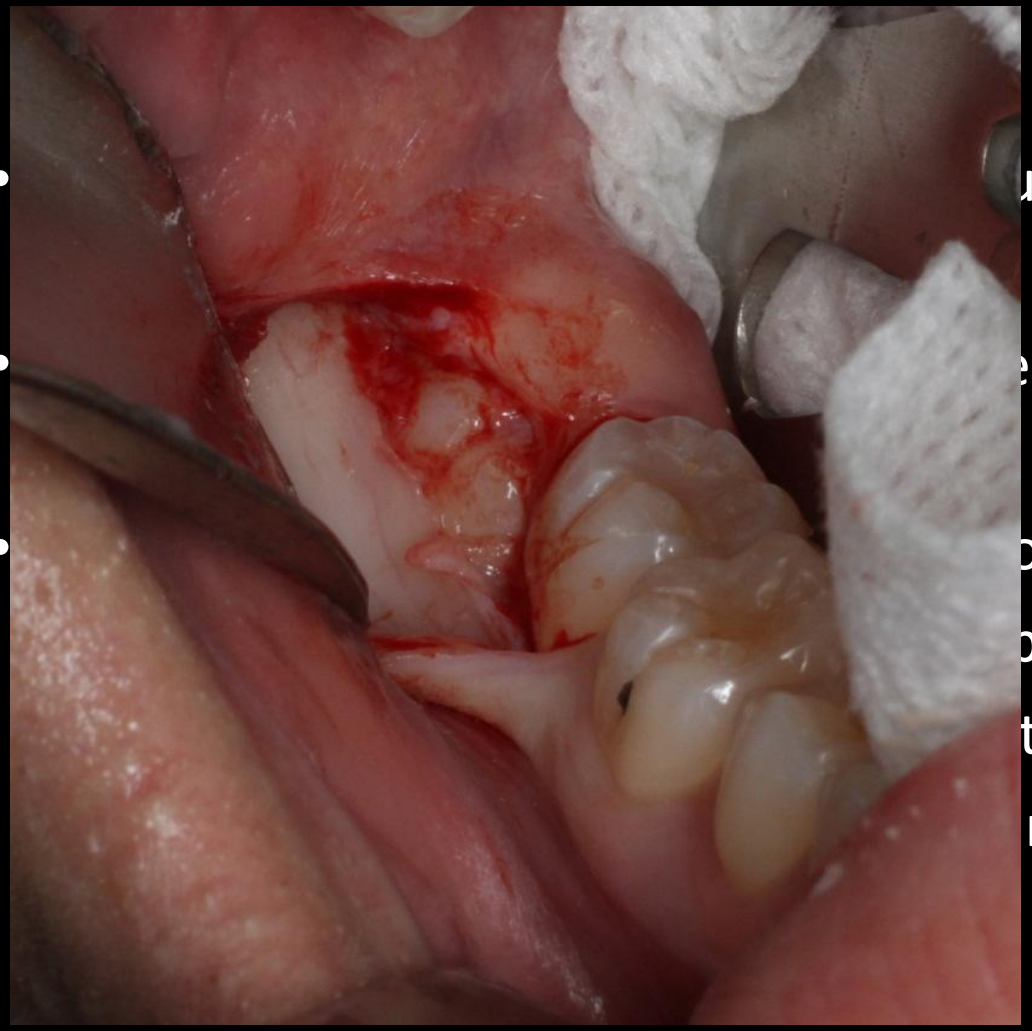
Soft Tissue Abrasion



Injuries to the soft tissues are usually the result of:

- Lack of attention to the delicate nature of the mucosa
- Doing surgery with inadequate access Excessive and uncontrolled force
- Prevent this by paying attention to surgical field

Mucosal Flap Tear

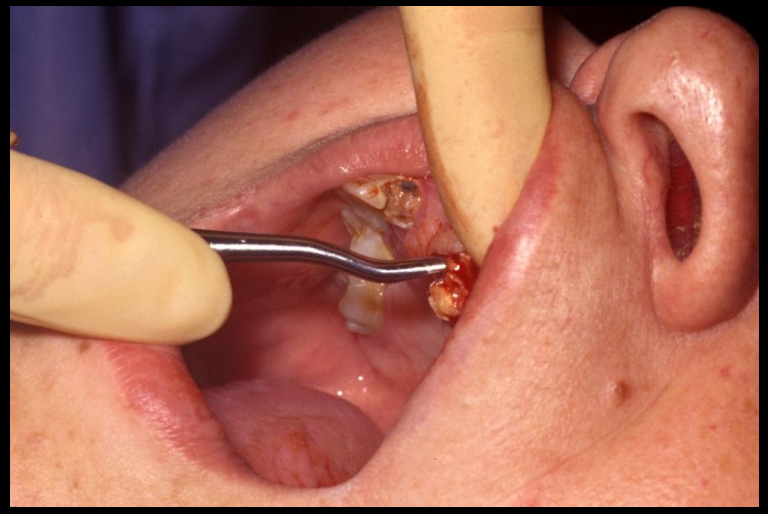


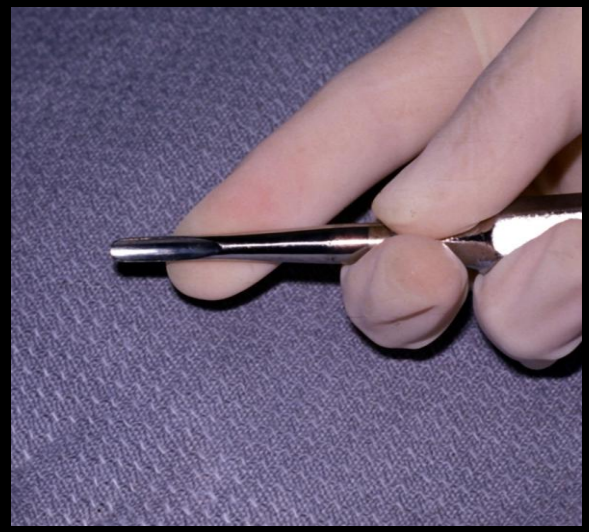
- ucosal flap tears during surgical extractions
- elope flap
- old:
  - prevent excess tension on the flap
  - tion force on the flap
  - ndicated

Take Care To Repair The Tear

- If a tear does occur, the flap should be carefully repositioned once the surgery is complete
- Or, if you see the flap beginning to tear, surgery can be stopped & the incision can be lengthened to gain better access before continuing
- Careful suturing of the tear results in adequate, but delayed healing can occur
- More critical in older or pts with systemic or immunocompromised issues

Prevention Of Soft Tissue Injuries



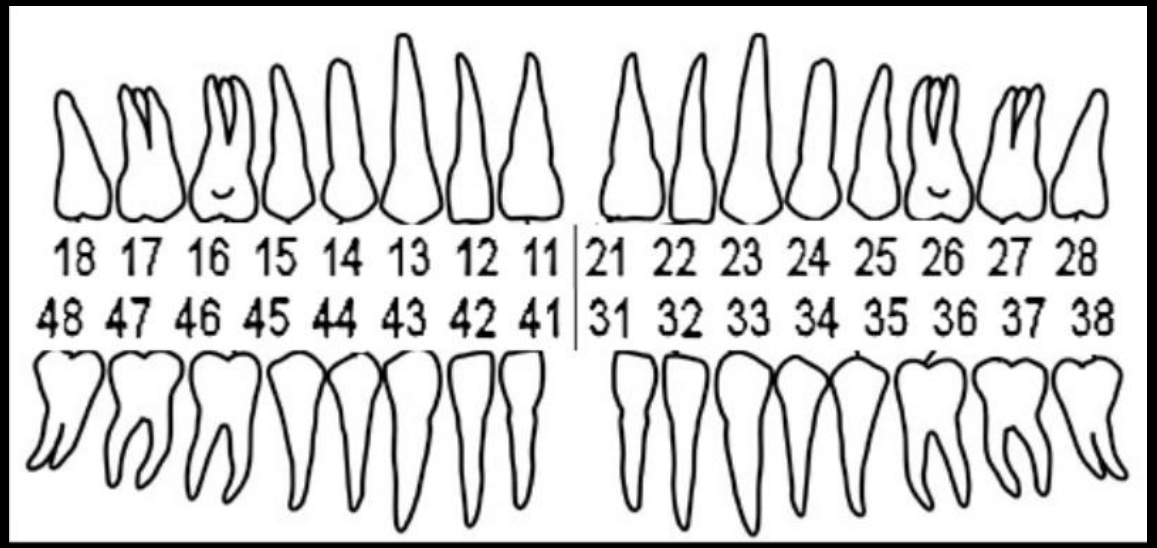


- Pay strict attention to soft tissue injuries
- Use minimal force for retraction of soft tissue
- Certain areas are more vascular especially close to floor of mouth

Extraction Of The Wrong Tooth

Extraction Of The Wrong Tooth

- A complication that every dentist believes can never happen - but happens surprisingly often
- Usually, the most common cause of malpractice lawsuits against dentists
- Extraction of the wrong tooth should never occur if appropriate attention is given to the planning and execution of the surgical procedure



- Possibly occurs from the inadequate attention during preoperative assessment
- Common reason for removing the wrong tooth is that a dentist removes a tooth for another dentist
- The use of differing tooth numbering systems or differences in the mounting of radiographs can easily lead the treating dentist to misunderstand the instructions from the referring dentist

- This happens especially in patients who are in mixed dentition stages and whose orthodontists have asked for unusual extractions
- Careful preoperative planning, good communications with referring dentists, and clinical assessment of site before the elevator and forceps are applied are the main methods of preventing this complication
- Establish a good rapport with your specialists, If not sure just call

What If It's Too Late

- If the wrong tooth is extracted and it's recognized immediately, the tooth should be replaced quickly into the socket
- If the extraction is for orthodontic purposes, contact the orthodontist immediately & discuss whether the tooth that was removed can substitute for the tooth that should have been removed
- Hopefully, teamwork can save the day

- If the orthodontist believes the original tooth must be removed, the correct extraction should be deferred for 4-5 weeks until the fate of the replanted tooth can be assessed

- DEFER all extractions until a definite alternative treatment plan is made

- In some cases, the orthodontist may be able to adjust the treatment plan

- When the wrong tooth is extracted, it is important to inform the patient or parents, and any other dentist involved with the patient’s care (ortho)
- If the case did not involve orthodontic care, a dental implant-supported restoration may restore the patient’s dental status back to pre-morbid condition
- Be honest, document and contact your malpractice insurance ASAP

Conclusions

- Preservation of all hard & soft tissues DURING extractions is critical for success
- Incorporate atraumatic techniques into your procedure
- Examine radiographs carefully to determine the level of complexity of planned extractions
- Be CONSISTENT with your treatment planning when it involves exodontia
- Understand how to treat complications effectively!

THANK YOU

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