Oral Surgery 101

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• Education
  – University of Wisconsin
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• Positions
  – LECOM OMFS Director
  – Bay Center for Jaw Surgery
  – Largo Medical Center
Conflicts of Interest and Disclaimers

• none
What is “Oral Surgery 101”? 

• 1000 pages of text?

• A 40 hour lecture series for dental students?

• 4-6 years of Residency?
Oral Surgery 101

- Case Selection
- Prevention of Complications
- Management of Complications
How to predict a difficult case

**Systemic**
- Uncontrolled systemic disease
- Bleeding disorders
- Medications
- Head and neck radiation

**Local**
- Associated lesions
- Infection
- Trismis
- Tooth Anatomy
- Adjacent restorations
- Proximity of anatomic structures
Associated Lesions

• Improper Diagnosis
Associated Lesions

- Cancer
Associated Lesions

- Risk of mandible fracture
Trismus

- Infection

- TMJ Dysfunction
Infection & Local Anesthesia

Normal tissue pH ~ 7.4

Infected tissue pH ~ 6.0 (acidic)
Tooth Anatomy
Tooth Anatomy
Tooth Anatomy
Tooth Anatomy
Tooth Anatomy
Anatomic Structures
Keys to Success

• Proper instrumentation
• Adequate access and visualization
• Unimpeded path for extraction
• Use of controlled force
Surgical Extraction Tray
Elevators

- Between tooth and alveolar bone
- Strong, slow turning
- Expands bone and PDL
Forceps
When a “simple extraction” becomes more than a “simple extraction”.
Flap Design

A

B

C

Area of compromised blood supply as a result of a "button hole" in flap
What is a flap?

- Section of soft tissue within surgical incision line
- Carries own blood supply
- Allows access to underlying tissue
- Can be placed in original position with sutures
Flap design

• Base must be broader than free margin (blood supply) ➔ Or NECROSIS
Adequate size to Visualize

- Instruments
- Tension-free
- Incisions lay on solid bone
Flap design

• Full thickness mucoperiosteal flap
• Avoid vital structures
  – Mandible
    • Lingual nerve
    • Mental nerve
  – Maxilla
    • Greater palatine artery
    • Nasopalatine artery
Flap design

• Releasing incisions
  – Placed in oblique fashion (broader base)
  – Should not cross bony prominences (canine)
  – Cross free-gingival margin at tooth line angle
    • Avoid damage to papilla
    • Avoid unneeded tension
The incision

- Usually 15 blade
- Sulcular incision
  - Blade inserted at slight angle to tooth into depth of sulcus (bone contact)
  - Incision posterior to anterior in one motion
  - Preservation of papilla
- Vertical Release
  - Tissue held taut apically (if not will have jagged tear)
  - Incision 90 deg to tissue
The incision

• Reflection
  – Begin at papilla with #9 periosteal elevator
  – Once entire edge is free, then use broad end
Surgical extractions

• May cause less morbidity
  – Less force
  – Less bone trauma/removal
    • Maxillary tuberosity, buccal plate
  – Less maxillary sinus complications
Surgical extractions

• Indications
  – Fractured tooth
  – Hypercementosis/bulbous roots
  – Excessive divergence/dilaceration
Surgical extractions

• Indications
  – Proximity to maxillary sinus
  – Extensive caries
Technique – single root

1. Visualization – flap if needed
2. Bone removal?
   1. May attempt extraction with forceps first
   2. May attempt extraction and grasp small portion of bone as well with forceps
   3. May attempt extraction with elevator apically into PDL space (caution maxillary sinus)
   4. Surgical bone removal
Technique – single root

• Surgical bone removal
  – Bur – 701, 702, 703, 556, 557, etc...
  – Buccal bone removal
    – Buccal trough vs. buccal plate removal
    – Width MD – size of tooth or slightly mesial and distal
    – Depth – 1/2 to 2/3 length of tooth
    – LIMIT BONE REMOVAL – esthetics, hygiene, implants
Technique – single root

• Use elevator or forceps to deliver tooth
• If this doesn’t work
  – Remove more bone and try again or
  – Place purchase point and elevate
Technique

• After tooth removal
  – Reduce sharp bony edges
    • Bur, bone file, rongeur
  – Copious irrigation
  – Suture as needed
Technique - Multi-root

• Tooth may be first divided into individual roots
• Then same technique as single rooted teeth is used
Technique – Multi-root

- Mandibular molars
  - Flap elevation as needed
  - Section B/L through furcation
  - Remove M and D portions separately
    - Use single root techniques as needed
Technique – multi-root

- **Maxillary molars**
  - Flap as needed
  - Section into 3 – 1 root portions
  - Use caution not to penetrate the maxillary sinus with bur or elevators
Technique – root tips

• Apical 3-4mm of root
  1. Initial attempt with root tip picks and small elevators
  2. Buccal trough for surgical removal
Technique – root tips

• Leaving a root tip?
  1. Root must be small <5mm length
  2. Root must be deeply embedded in bone
  3. Must be infection free w/o periapical radiolucency
  4. When risk of removal outweigh the benefits
     1. Excessive bone destruction
     2. Endangers Nerve – IAN
     3. Risk maxillary sinus displacement or submandibular space

• Must inform patient, radiographically document, routine follow-up
Post Operative Complications
Complications

• Best management is prevention
  – Preoperative assessment
  – Proper radiographs
  – Proper treatment plan
  – Careful surgical execution
Prevention

• Only perform surgeries if you are capable of managing its complications
Prevention

- Radiographs
- Include entire surgical area
  - Apices of roots
  - Regional anatomy
  - Maxillary sinus, IAN canal
Prevention

• Postoperative instructions
  – Review clearly
  – Stress importance and compliance
  – Pt will be more likely to comply
Prevention

• Surgical Field
  – Adequate visualization
    • Lighting
    • Retraction
    • Suction
  – Unimpeded path of removal
  – Controlled force
  – Sterility
  – Hemostasis
  – Irrigation and debridement
Complications

- Soft tissue injury
- Extraction Complications
- Injury to adjacent teeth
- Injury to osseous structures
- Oroantral communication
- Delayed healing
- Fractures
- Postoperative bleeding
- Infection
Soft Tissue Injury

• Usually due to
  – lack of attention
  – inadequate access
  – Excessive force

• Types
  – Tearing flap
  – Puncture wound
  – Stretch/abrasion
  – Burn
Soft Tissue Injury

• Torn Flaps
  – Forced Retraction
  – Prevention
    • Larger initial flap
    • Controlled retraction forces
    • Releasing incisions
  – Management
    • Lengthen incision or create vertical release if tear start
    • Create smooth edge for closure
    • Primary closure
Soft Tissue Injury

- **Puncture Wound**
  - Straight elevator, periosteal elevator
  - Slips and punctures/tear

- **Prevent**
  - Use controlled force
  - Finger rests

- **Management**
  - Do not close puncture wounds (leave path for infection drainage)
  - Hemostasis with pressure
  - Irrigate and allow for healing by secondary intention
  - Abx if infection results
Soft Tissue Injury

• Stretch or abrasion/burn
  – To lips or corners of mouth
  – To elevated flap
  – From rotating shank or excessive retraction

• Prevention
  – Be aware of location of shank

• Management
  – Most heal 7 days w/o scar
  – If on lip or skin
    • Abx ointment 5-10 days

• Possible scar or discoloring
Extraction Complications

• Root Fracture
  – Very common – long, curved, divergent, dense bone

• Prevention and Management
  – Surgical extraction technique
Extraction Complications

• Root or Tooth Displacement
  – Maxillary molar $\rightarrow$ maxillary sinus, infratemporal
  – Mandibular molar $\rightarrow$ submandibular, pterygomandibular space
  – Due to excessive apical pressure and thin wall of bone

• Management
  – Radiographic
  – Root size
  – Presence of infection
  – Condition of sinus (healthy vs. infected)
Extraction Complications

• Root or tooth displacement into maxillary sinus
  – If small 2-3mm
    • Radiograph for size and position
    • Irrigate and suction through small opening in sinus (may flush out root tip), radiographic confirmation if removed
    • If unable to retrieve may leave in place, inform patient and regularly monitor sinus
  – If small and infected root, infected sinus, large piece of root/tooth
    • Refer to OMFS for removal
Extraction Complications
Extraction Complications

- Maxillary 3rd Molar Displacement into infratemporal space

- **Management**
  - If visualized may attempt to remove
  - If unable to visualize
    - close site & abx
    - Radiographic Monitoring
    - Remove in 6-12 weeks
Extraction Complications

- Root or tooth displacement into submandibular or pterygomandibular space
  - Lingual cortex of mandibular molars thins as you move posteriorly and may even be absent in impacted 3rd molars

- Management
  - Immediate - Pressure onto lingual aspect of floor of mouth to elevate root and prevent further displacement, root tip pick or fine pickups
  - Late - lingual flap or no treatment
Extraction Complications

- Tooth/foreign material lost in pharynx
- Prevention = throat pack
- Management
  - Turn pt toward you with mouth towards and have cough/spit
  - May enter GI or respiratory tract (aspiration)
    - If severe coughing or shortness of breath then most likely aspirated
  - Transport pt to ER, chest and KUB radiographs to determine location
Extraction
Complications

• Aspiration
  – Urgent management, bronchosscopic removal or thorocotomy
Extraction Complications

- GI tract
  - Most likely will pass in 2-4 days
  - Radiographic confirmation
  - Possible for f/u radiograph to confirm it was passed
Injuries to Adjacent Teeth

- How?
  - Fracture of adjacent tooth from excessive force
  - Fracture of tooth in opposite arch from uncontrolled forces
  - Displacement of adjacent crown
  - Luxation of adjacent tooth
  - Fracture of restorative material
  - Excessive removal of supporting bone
Injuries to adjacent teeth

• Prevention –
  – Avoid applying forces to adjacent teeth (consider surgical extraction)
  – Controlled extraction technique
  – Minimal bone removal.
  – Explain risks to pt before starting procedure

• Management
  – Inform pt
  – Smooth or restore any chipped teeth
  – Stabilize any luxated tooth
  – Re-cement crown if displaced
Extraction of the Wrong Tooth!

- Common cause for malpractice suits
- Causes
  - Usually during referral extractions
  - Different numbering systems (14 may not mean left maxillary first molar)
  - Mixed dention
- Prevention
  - Clear, written communication
- Management
  - If immediately realized – place back in socket and stabilize
  - If for orthodontic purposes – check to see if tooth extracted can substitute
  - Most likely will have to pay for implant replacement
Injuries to osseous structures

• Fracture of alveolar process
  – Usually buccal plate (thinner) or tuberosity

• Prevention
  – Minimize excessive force
  – Surgical approach
Injuries to osseous structures

• Alveolar bone fracture
  – Management
    • If bone removed completely from socket it should not be replaced, just smooth sharp edges and obtain closure
    • If bone stays attached to periosteum, it can be dissected from tooth and left attached and primarily closed
Injuries to osseous structure

• Fracture of maxillary tuberosity
  – Extraction of erupted 3rd molars or last molar in maxillary arch
  – May compromise denture stability
  – Management
    • Similar to alveolar plate fracture
    • If removed with tooth, leave out
    • If fracture is felt and unable to be dissected from tooth, then splint tooth to adjacent tooth, 6-8 weeks healing and surgical extraction
Injuries to Adjacent Structures

- Nerves
- TMJ
- Oroantral Communication

Prevention
- Preoperative knowledge of all adjacent anatomy
- Surgical design to lessen injury
Injury to Adjacent Structures

• Trigeminal Nerve Injury
  – Inferior alveolar nerve (IAN)
  – Lingual nerve
  – Mental nerve
  – Nasopalatine nerve
  – Buccal nerve

• Injury due to flap elevation
  – Nasopalatine & Buccal - re-innervate
  – Mental nerve – if only stretched will usually return, if cut will not return

• Injury during extractions or implants
  – Mental, IAN, lingual
Injuries to Adjacent Structures

- Inferior Alveolar Nerve
  - Most commonly injured during 3rd molar extraction
  - May bruise, crush or cut nerve
  - Possibility for regeneration or surgical repair
Anatomic Structures
Injury to Adjacent Structures

- **Lingual Nerve**
  - Usually located directly against lingual aspect of mandible in 3\textsuperscript{rd} molar region
  - Occasionally courses over retromolar pad
  - Must place incisions buccally and avoid excessive stretching
  - Injuries rarely heal
Anatomic Structures
Anatomic Structures
Injuries to Adjacent Structures

• Temporomandibular Joint
  – Due to application of excessive force and inadequate support
  – Prevention
    • controlled force and jaw support with bite block
  – Management
    • Moist heat, soft diet, NSAIDs q4h
Injuries to Adjacent Structures

• Oroantral Communication
  – Usually during maxillary molar extractions especially with pneumatization or divergent roots
  – A communication between oral cavity and maxillary sinus
  – Must aim to prevent sinusitis and chronic oroantral fistula
Injuries to Adjacent Structures

- **Oroantral Communication**
  - Prevent – surgical ext if necessary
  - Diagnosis
    - Bone present at apex of extracted tooth
    - Mirror visualization
    - Plugged nose blowing?
    - Needle penetration
    - Don’t probe with instruments, will just make the tear worse
Injuries to Adjacent Structures

• Oroantral Communication
  – Treatment – depends on size
    • 2mm or less – no surgical intervention, sinus precautions (no nose blowing, sneezing, straws, smoking)
    • 2-6mm - help maintain blood clot (gelfoam), figure 8 suture, sinus precautions, 5 days of amox, clinda, nasal decongestant (allow proper drainage and prevent infection)
    • >7mm – closure w/ flap procedure
    • If communication persists, allow several weeks to close on own, if not will require buccal fat pad advancement or palatal finger flap
Oroantral Communication
Mandible Fractures

- Very rare
- Almost only see in removal of impacted lower 3rd molars
- Due to excessive application of force or severely atrophic mandible
- Refer to OMFS for definitive care
Postoperative Bleeding

“All Bleeding eventually stops”
Postoperative

- Many patients are more concerned about the post operative sequelae (pain and edema) than the procedure itself
- Postoperative instructions
  - Given to patient and anyone accompanying
  - Explain normal events and why they happen
  - How to manage typical situations
  - Given verbally and in writing
  - Include emergency telephone number
Postoperative Bleeding

• After extraction gauze is placed over extraction site
• Pt is informed to bite on gauze for 30-60 minutes
• Pt should not be talking during this period
• Gauze can be replaced every 30-60 minutes as needed
Postoperative Bleeding

- A slow ooze may take place for up to 24 hours and when mixed with saliva may appear to be a large amount of blood
- Pt may place additional gauze pack after first
- Pt may also use a tea bag for 30 minutes (tannic acid in tea acts as vasoconstrictor)
- Avoid causing further bleeding (24-48 hours)
  - No smoking/straws/spitting (negative pressure can cause bleeding)
  - No exercise (inc HR and BP can cause bleeding)
  - No alcohol use (can thin blood and cause bleeding)
Postoperative Bleeding

• Indications for a return visit
  – Prolonged oozing (>24hrs)
  – Bright red bleeding
  – Large clots (liver clots)
Prolonged Postoperative Bleeding

• More common in
  – Bleeding disorders
  – Plavix, asa, coumadin, etc
  – Alcoholics
  – Liver disease
  – Larger surgical procedures
  – Damage to larger blood vessels
    • IA vessels, palatine vessels
RELEVANCE

Hemorrhage

- Follows virtually all OMFS surgical procedures

Hemostasis

- Usually follows, but not always
Local Agents to aid Hemostasis

- Pressure on wound (e.g., Gauze)
- Anti-hemorrhagic stent
- Periodontal dressing
- Sutures (Resorbable & non-resorbable)
- Electrocoagulation
- Bone wax
- Absorbable gelatin sponge (Gelfoam, Collaplug, Collatape)
- Microfibular collagen (Avitene)
- Oxidized regenerated cellulose (Surgicel)
Local Agents to aid Hemostasis

- Silver nitrate sticks
- Tannic acid (tea bags)
- Topical epinephrine and cocaine
- Topical thrombin
- Tranexamic acid mouthwashes (antifibrinolytic))
- Fibrin sealants/glue (contain thrombin, proaccelerin, factor XIII & antifibrinolytic substance which induce fibrin formation locally and reduce the fibrinolysis.)
- Fibrinogen
Control of Head & Neck Vascular bleeding

- Selective Ligation of a Vessel
  - Lingual artery
  - External carotid artery

- Selective Embolization of a Vessel
  - Arteriovenous malformations
  - Hemangiomas, et al.
Angiography

- Extremely valuable in cases of post-operative bleeding.
In Summary- Hemorrhage & Hemostasis

- A good medical history usually helps.
- Consult with MD regarding known congenital & acquired bleeding conditions and medication questions.
- Atraumatic surgical technique
- Achieve good hemostasis at surgery
- Comprehensive instructions to patients and good follow-up.
- In most instances, local measures will control post-operative bleeding, if it occurs.
Postoperative Pain Control

- All pts will have some level of pain, so make sure they have a realistic expectation
- Reassure pts that discomfort will be managed appropriately
- Pain will be managed, but not completely eliminated
Postoperative Pain Control

• Pain after simple extractions
  – Usually not severe and managed with OTC meds
    • Ibuprofen
    • Acetaminophen
  – Peak pain at 12 hrs post op
  – Significant pain rarely persists longer than 2 days
    • So usually only OTCs needed after 2 days
    • If pain begins worsening 3-5 days after extraction possible infection or “dry socket”
Postoperative Pain Control

• Analgesics
  – OTC or prescription
  – First dose prior to anesthetic wearing off
  – N/V if narcotics taken on empty stomach
  – Drowsiness

<table>
<thead>
<tr>
<th>Oral Narcotic</th>
<th>Usual Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mild Pain Situations</strong></td>
<td></td>
</tr>
<tr>
<td>Ibuprofen</td>
<td>400–800 mg q4h</td>
</tr>
<tr>
<td>Acetaminophen</td>
<td>500–1000 mg q4h</td>
</tr>
<tr>
<td><strong>Moderate Pain Situations</strong></td>
<td></td>
</tr>
<tr>
<td>Codeine</td>
<td>15–60 mg</td>
</tr>
<tr>
<td>Hydrocodone</td>
<td>5–10 mg</td>
</tr>
<tr>
<td><strong>Severe Pain Situations</strong></td>
<td></td>
</tr>
<tr>
<td>Oxycodone</td>
<td>2.5–10 mg</td>
</tr>
</tbody>
</table>

*mg*, milligram; *q4h*, every 4 hours.
Postoperative Pain Control

- Drug combinations are most commonly used
- Acetaminophen or ibuprofen with
  - Codeine
  - Hydrocodone
  - Oxycodone
- Requires 500-1000mg of acetaminophen every 4 hrs for max effectiveness

*Vicodin is being discontinued and replaced by Norco 5/325mg*
Postoperative Edema

- Swelling peaks at ~ 48hrs
- Not commonly seen in simple extractions, but with soft tissue reflection and bone removal
- Starts resolving 3\textsuperscript{rd} and 4\textsuperscript{th} day
  - Increased swelling after this point may indicate infection
- Ice 20 minutes on/off for 48 yours, not directly placed on skin
- Moist heat starting 3\textsuperscript{rd} day as needed
Postoperative Trismis

- From injections or surgery causing trauma to muscles of mastication
  - Some trismis is normal after extraction of mandibular third molars due to edema
  - Usually resolves within one week
  - Moist heat at day 3 may help resolve
Postoperative Ecchymosis

- Normal bruising to tissues
- Usually more dramatic in older pts
- Travels with gravity
- Does NOT cause further pain or risk for infection
- Resolves 7-10 days
Wound Dehiscence

• Delayed healing
  – Compromised health – uncontrolled diabetes, immune suppression
    • Treatment – allow granulation
  – Soft tissue flaps over bony defects – flaps sags into defect leaving exposed bone
    • Treatment – allow granulation
  – Tension at suture line – leads to breakdown due to ischemia at wound edge or breakdown due to sharp bone under flap
    • Treatment – remove exposed bone, leave to slough on own (2-4 weeks)
Alveolar Osteitis (Dry socket)

• Delayed healing that is not associated with an infection.
  – Starts 3 or 4 days post op
  – Complete or partial loss of blood clot leaving exposed bone which is very sensitive
  – Mod-severe pain w/o fever, swelling, erythema
  – Usually lower molars
  – May have odor or foul taste

• Rare in open ext ~2%, but impacted mandibular molars up to 20%
Alveolar Osteitis

• Prevention
  – Minimize trauma and contamination of area
  – Atraumatic incisions and tissue reflection
  – Thorough irrigation
  – Possible placement of gelfoam or collagen sponge in socket
  – Antimicrobial rinses
Alveolar Osteitis

• Treatment
  – Single goal – relieve pain
  – Nothing you can do to make it heal faster
  – Irrigation and placement of medicated dressing (do not curette)
    • Iodoform or plain gauze with medication
    • Med – Eugenol (pain control), benzocaine (topical), balsam of Peru (carrying vehicle)
    • Medication is available commercially
  – Gentle placement of gauze, pain relief w/in 5 minutes
  – Changed every 3-6 days as needed (do not replace once pain is controlled, will delay healing)
References
