Dentoalveolar Surgery

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Disclosure

• Pierrel Pharma
  • Speakers bureau, honoraria

• Pacira Pharmaceuticals
  • Advisory board member
Terminology

• Impacted versus un-erupted teeth:

  • Impacted teeth have failed to fully erupt within an expected developmental time period
Impacted Teeth

- Most frequently third molars
- Maxillary Canines
  - Labial impactions secondary to arch length deficiency
  - Palatal due to extra space
    - Excessive growth
    - Premature eruption of the lateral
    - Agenesis or peg shaped lateral
- Second molars
- Mandibular Bicuspids
Which Tooth/Teeth will be Impacted?
Impacted Canines

• Usually palatal (>70%)
• <15% will spontaneously erupt if past the distal line angle of the lateral
Premolar impactions due to over retained deciduous teeth
Which Tooth/Teeth will be Impacted?
Can we Predict Impactions?
Impaction Due to Supernumerary Tooth
Impaction Due to Supernumerary Tooth/Dentigerous Cyst
Why Treat Impacted Teeth?

- Malocclusion
- Loss of arch length
- Migration/loss of adjacent teeth
- Root resorption/decay of adjacent teeth
- Resorption/decay of impacted tooth (especially if partially erupted)
- Pericoronitis
- Periodontal issues
Treatment Planning

- Patient opted to remove all 4 third molars
- sites #17 and #32 grafted with GTR
- no complications
6 MONTHS P/OP
Treatment options for impacted teeth

• Extraction

• Surgical exposure +/- bracket placement

• Surgical uprighting/repositioning

• Observation for development of symptoms
Indications for Exposure/Bracketing

- Associated cyst
- Not damaging adjacent root
- Morphology appears normal
- Contralateral tooth is indicated for retention
Maxillary vs. Mandibular Canine Impactions
Approach to this Case?

- Extract premolar
- Likely to resorb root of molar if left
- Likely to damage molar with eruption path
- Predictability of premolar development is “iffy”
Coding for Exposure/Bracketing

- D7280
  - Surgical exposure of tooth
- D7283
  - Placement of orthodontic attachment
Lower Second Molar Impactions

• Usually not amenable to placement of attachments
  • Requires at least partial eruption of the tooth
• Often not recognized until orthodontics nearly completed
  • Bracketing may require addition 9-12 months of treatment time
Incidence of Second Molar Impactions

- 3/10,000 in army recruits
  - Higher incidence of first molar loss
- 4/1000 in higher socioeconomic groups
Etiology of Second Molar Impactions

Third molar bud superior to the second molar
Impacted Second Molars

Too much space between the second molar and the first
Other Causes

- Failure of posterior ramus to resorb
- Over contoured first molar bands
- Failure of the first molar to move mesially following exfoliation of the deciduous second molar
- Dentigerous cyst/odontoma
Distoangular “hand-shake”

Note supraeruption
Treatment Options

- Second molar extraction & third molar eruption
  - Depends on third molar development and movement
  - Delays completion of orthodontic treatment
- Surgical exposure and bracketing of the second molar
Exposure/Bracketing of Second Molar
Surgical solutions for the inclined second molar

- 1. Extraction of the second molar to allow the third molar to erupt into the second molar position.
- 2. Transplantation of the third molar into the second molar site
- 3. Extraction of the second and third molar and placement of a dental implant
- 4. Extraction of the third molar and surgically uprighting the second molar
Boynton, T, Lieblich, S.

**Surgical Uprighting of Second Molars**

Surgical Procedure: Second Molar Uprighting
Buccal Trough and Third Molar Removal
Placement of Elevator
Repositioned Tooth
Two Week Post-Operative
Immediate Post-Operative
Six-Month Follow-up
Severely Tipped Second Molar
Immediate Post-op
9 Month Follow-up
22 Months Post-op
Maxillary second molar uprighting
Maxillary second molar uprighting
Antibiotics?

• Infection rate higher than third molar extractions
• Preop antibiotics
  • 2 gram of Pen VK p.o.
  • 600 Clindamycin
• Post operative for 5 days
• Peridex rinse preop and x 5 days
• Purely ANECDOTAL
Coding for the Procedure

• Full bony impaction removal
  • D7240

• Surgical uprighting
  • D7290
  • 75% of full bony impaction fee
Cysts of the Mandible

• Goldberg rule
Cysts of the Mandible

- Establish a tissue diagnosis

- Consideration for marsupialization versus enucleation and extraction of associated tooth
Marsupialization

- Useful for treatment of dentigerous cysts associated with tooth displacement
- Unites oral mucosa with lining of cyst
- Decompression achieved with gauze iodoform pack or drain
- Home irrigation (packs replaced q 2 weeks)
Marsupialization

Pre op

6 weeks

4 months
Marsupialization/Extirpation

Immediate post op (ext)

11 months post op
Management of Impaction

February 2007
4 months following marsupialization

August 2007
Does Age Matter?

Do we need to graft every hole in the bone?
Post Marsupialization, 3 months
6 months post marsupialization
12 months post marsupialization
None of the Previous Cases were “Grafted”
Third Molar Surgery Complications

• Post-operative infection
  Usage of antibiotics?

• Alveolar Osteitis (Dry Socket)

• Nerve injury
Age of patient

Hypothesis: adult third molar patients have a higher complication rate than young adults (<25)
The AAOMS Age-Related Third Molar Study
Haug, Perrott, Gonzales, Talwar
JOMS

- 4648 patients over age 25.
- Mean age 41.
- 16,664 third molars examined.
- 10,139 third molars removed.

- Parameters include:
  Preoperative pathology
  Intraoperative adverse outcomes
  Postoperative adverse outcomes
<table>
<thead>
<tr>
<th>Condition</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross caries</td>
<td>3593</td>
<td>21.6%</td>
</tr>
<tr>
<td>Periodontal Dis.</td>
<td>2408</td>
<td>14.5%</td>
</tr>
<tr>
<td>Infection</td>
<td>2028</td>
<td>12.2%</td>
</tr>
<tr>
<td>Pathol. adjacent</td>
<td>902</td>
<td>5.4%</td>
</tr>
<tr>
<td>Adjacent Inf.</td>
<td>871</td>
<td>5.2%</td>
</tr>
<tr>
<td>Cyst/tumor</td>
<td>144</td>
<td>0.8%</td>
</tr>
<tr>
<td>Fx tooth or root</td>
<td>97</td>
<td>0.6%</td>
</tr>
<tr>
<td>Int/ext resorptn</td>
<td>21</td>
<td>0.1%</td>
</tr>
<tr>
<td>Mand. Fx</td>
<td>1</td>
<td>0.1%</td>
</tr>
<tr>
<td>Ectopic position</td>
<td>1526</td>
<td>9.2%</td>
</tr>
<tr>
<td>“other”</td>
<td>443</td>
<td>2.7%</td>
</tr>
</tbody>
</table>
Preoperative Pathology

- Total Teeth Examined: 16,664
- Pathologic Diagnoses: 8796
- Teeth Extracted: 10,139

- (Extracted without Diagnosis: 1343)
<table>
<thead>
<tr>
<th>Outcome</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAN injury</td>
<td>16</td>
<td>0.3%</td>
</tr>
<tr>
<td>Lingual N injury</td>
<td>2</td>
<td>0.0%</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td>35</td>
<td>0.1%</td>
</tr>
<tr>
<td>I.V. fluid/drugs</td>
<td>3</td>
<td>0.1%</td>
</tr>
<tr>
<td>Transfusion</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Ingest/Aspir/Mi</td>
<td>32</td>
<td>0.7%</td>
</tr>
<tr>
<td>Airway</td>
<td>22</td>
<td>0.5%</td>
</tr>
<tr>
<td>Max/mand fx</td>
<td>1</td>
<td>0.0%</td>
</tr>
<tr>
<td>Adjcnt tooth inj</td>
<td>3</td>
<td>0.1%</td>
</tr>
<tr>
<td>Addnl surgery</td>
<td>6</td>
<td>0.1%</td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Other</td>
<td>77</td>
<td>1.4%</td>
</tr>
</tbody>
</table>
Postoperative Adverse Outcomes
Alveolar Osteitis and Infection
(n= 10,139 teeth)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alveolar Osteitis</strong> (Maxilla)</td>
<td>10</td>
<td>0.21%</td>
</tr>
<tr>
<td><strong>Alveolar Osteitis</strong> (Mandible)</td>
<td>547</td>
<td>14.23%</td>
</tr>
<tr>
<td><strong>Infection</strong> (Maxilla)</td>
<td>6</td>
<td>0.13%</td>
</tr>
<tr>
<td><strong>Infection</strong> (Mandible)</td>
<td>37</td>
<td>1.69%</td>
</tr>
</tbody>
</table>
Postoperative Adverse Outcomes: Nerve Injury (per tooth)

<table>
<thead>
<tr>
<th>Nerve Injury</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inferior Alveolar Nerve (mandible)</td>
<td>61</td>
<td>1.14%</td>
</tr>
<tr>
<td>Lingual Nerve (mandible)</td>
<td>12</td>
<td>0.22%</td>
</tr>
<tr>
<td>Facial/Trigeminal (maxilla/mand.)</td>
<td>9</td>
<td>0.09%</td>
</tr>
</tbody>
</table>
## Postoperative Adverse Outcomes: Other (per patient)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trismus</td>
<td>47</td>
<td>1.2%</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td>5</td>
<td>0.1%</td>
</tr>
<tr>
<td>I.V. drugs/fluids</td>
<td>1</td>
<td>0.0%</td>
</tr>
<tr>
<td>Ingest/asp/migr</td>
<td>5</td>
<td>0.1%</td>
</tr>
<tr>
<td>Injur. Adj. tooth</td>
<td>3</td>
<td>0.1%</td>
</tr>
<tr>
<td>O-A fistula</td>
<td>4</td>
<td>0.1%</td>
</tr>
<tr>
<td>Unplanned surg.</td>
<td>6</td>
<td>0.1%</td>
</tr>
<tr>
<td>Other</td>
<td>61</td>
<td>1.3%</td>
</tr>
</tbody>
</table>
Do you prescribe antibiotics for routine third molar surgery?
What is the infection rate?

What is an acceptable infection rate?
Postoperative Wound Infections: Considerations

- Clean
  - 3%
- Clean/contaminated
  - 5-15%
  - Most third molar surgery
- Contaminated
  - 15-40%
- Duration of surgery
- Morbidity of the infection
• Indications for prophylaxis of medically compromised patients
  • Cardiac lesions
  • Orthopedic prostheses
  • Immunocompromise
    • Chemotherapy
    • * HIV
Infection Rates, Mandibular M3 Extr.

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Cases</th>
<th>Infection Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitchell</td>
<td>1986</td>
<td>99</td>
<td>27%</td>
</tr>
<tr>
<td>Nordenram</td>
<td>1973</td>
<td>143</td>
<td>12.6%</td>
</tr>
<tr>
<td>Happonen</td>
<td>1990</td>
<td>136</td>
<td>11.8%</td>
</tr>
<tr>
<td>Mtchl/Mrrs</td>
<td>1987</td>
<td>172</td>
<td>11%</td>
</tr>
<tr>
<td>Curran</td>
<td>1974</td>
<td>133</td>
<td>8.2%</td>
</tr>
<tr>
<td>Piecuch</td>
<td>1995</td>
<td>3443</td>
<td>6.6%</td>
</tr>
<tr>
<td>Goldberg</td>
<td>1985</td>
<td>500</td>
<td>4.2%</td>
</tr>
<tr>
<td>Osborne</td>
<td>1985</td>
<td>16,127</td>
<td>3.4%</td>
</tr>
<tr>
<td>Sisk</td>
<td>1986</td>
<td>1202</td>
<td>1.2%</td>
</tr>
</tbody>
</table>
There Has Been No Consistency in Prophylactic Regimens

• Piecuch, Lieblich, Arzadon:
  • Survey of CT OMFS revealed over 20 different dose regimens for wound prophylaxis for impacted third molars

• AAOMS PBRN is currently investigating
Curran JB et al. Int JOS 1974: 3: 1

- 7.8% of sockets with AB got infected
- 8.7% of sockets without AB got infected
- Recommended against use of antibiotics
Prospective study of 136 patients:

- Penicillin: 13.6% infected
- Tinidazole: 10.6% infected
- Placebo: 11.1% infected

No statistical difference between groups
Capuzzi, P et al.

- Saw no difference in pain and swelling (did not assess infection rate) in patients on postoperative antibiotics versus no antibiotic

- Comment:
  - Authors violated a basic principle of prophylaxis, by not giving a pre-op dose
Piecuch/Arzadon/Lieblich 1995

- 2134 patients underwent extraction of 6713 third molars in a private OMS office
- 8 year period: 1985-1994
- 2 surgeons
- 2031 were examined post-op
- 103 had telephone responses logged at 48 hours and 7-8 days.
Maxillary Third Molars

- Extracted: 3270
- Infections: 9
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No AB</td>
<td>332</td>
<td>14.8%</td>
</tr>
<tr>
<td>Systemic</td>
<td>1242</td>
<td>10.3%</td>
</tr>
<tr>
<td>Topical TC</td>
<td>1597</td>
<td>2.6%</td>
</tr>
<tr>
<td>Systemic + Topical TC</td>
<td>250</td>
<td>2.4%</td>
</tr>
<tr>
<td>Post-op systemic</td>
<td>9</td>
<td>11.1%</td>
</tr>
<tr>
<td>Post-op syst + top</td>
<td>13</td>
<td>0.0%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3443</td>
<td>6.6%</td>
</tr>
</tbody>
</table>
### Mandibular M3 by Position

<table>
<thead>
<tr>
<th>Position</th>
<th># teeth</th>
<th>Type AB</th>
<th>% infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erupted</td>
<td>529</td>
<td>all</td>
<td>0.9%</td>
</tr>
<tr>
<td>Soft tissue</td>
<td>371</td>
<td>all</td>
<td>1.6%</td>
</tr>
<tr>
<td>Partial bony</td>
<td>1364</td>
<td>all</td>
<td>3.8%</td>
</tr>
<tr>
<td>Full bony</td>
<td>1179</td>
<td>all</td>
<td>13.9%</td>
</tr>
</tbody>
</table>
Piecuch/Arzadon/Lieblich 1995
Full Bony Mandibular M3

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No antibiotic</td>
<td>121</td>
<td>26.0%</td>
</tr>
<tr>
<td>Systemic</td>
<td>614</td>
<td>16.9%</td>
</tr>
<tr>
<td>Topical TC</td>
<td>364</td>
<td>6.6%</td>
</tr>
<tr>
<td>Systemic + top.</td>
<td>73</td>
<td>4.1%</td>
</tr>
<tr>
<td>Post-op syst.</td>
<td>7</td>
<td>14.2%</td>
</tr>
</tbody>
</table>
Tetracycline-Induced Neuritis

• Zuniga J. & Leist J. JOMS 1995: 53: 196
  “Case Report”

  “Experimental Neuritis... in the Rat”
• A nerve with damaged epineurium developed an intense inflammatory neuritis as a response to Tetracycline

• A nerve with intact epineurium did not develop an inflammatory response

• Gelfoam placed against an injured nerve elicited no response
AAOMS PBRN

• Be part of a nationwide study!
• AAOMS.org/pbrn
• First study: evaluation of infections with third molar extractions
• Contact me: StuL@comcast.net
What about dry sockets?
“There is a lack of absolute and objective clinical criteria and varying study designs as well as efficacy variables between studies, conflicting data (including intermingled data from ‘cases’, ‘teeth’, ‘surgical sites’), anecdotal reports, poorly designed studies, statistical biases or lack of analysis, and individual opinion camouflaged as scientific evidence make a scientifically sound comparison difficult.”
Alveolar Osteitis: Risk Factors

• “Difficult” extraction
• Poor oral hygiene
• Recent history of pericoronitis
• Age >25
• Experience of surgeon
• Time of operation
• _____________________________
• Oral contraceptives
• Immunocompromise
• Smoking
• Use of straws
Impact of Topical Minocycline With Third Molar Surgery on Clinical Recovery and Health Related Quality of Life Outcomes
Stavropoulos, Shugars, Phillips, et. al.

Prospective exploratory clinical trial conducted at multiple centers

63 patients with four impacted third molars below the occlusal plane treated with topical minocycline
60 patients were assigned to control group

Results:

Treatment group – 10% had one post-surgery visit with treatment, no patient had two visits

Control group – 28% had at least one post-surgery visit with treatment and 13% had at least two visits with treatment
Alveolar Osteitis: Prevention

- Antimicrobials
  - Systemic
    - Penicillin
    - Erythromycin
    - Clindamycin
    - Metronidazole
Alveolar Osteitis: Prevention

• Antimicrobials
  • Topical
    • Sulfonamides
    • Penicillin
    • Erythromycin
    • Lincomycin
    • Clindamycin
    • Metronidazole
    • Tetracycline
Alveolar Osteitis: Prevention

- Topical antiseptics
  - Chlorhexidine
  - Aminoacridine
- Antifibrinolytics
  - Apernyl (PABA + ASA)
  - Tranexamic acid
- Topical steroids
- Obtundent dressings
  - Zinc oxide/eugenol
  - Whitehead’s varnish
- Clot support agents
  - Polylactic acid
  - Gelfoam/SurgiCel
Alveolar Osteitis: Prevention

- Saline irrigation at time of surgery
  - AO incidence 10.9% with 25 cc. irrigation
  - AO incidence 5.9% with 175 cc. Irrigation

Butler JB and Sweet DP.
Alveolar Osteitis: Incidence
Arzadon/Piecuch/Lieblich
JOMS (suppl) 1995

- No antibiotic  6.6%
- Systemic  5.6%
- Systemic + topical  4.8%
- Topical  TC  3.0%
Repeat Review

• Frenini, E, et al (IADR abstract, 2007)
• 685 M3 extractions: Topical antibiotics
  • 97% office follow up
  • 2.4% dry socket
  • 3.4% infection rate
Anecdotal Benefit

• 17 year old female for extraction 1, 17 and 32 (#16 congenitally absent)
• Calls 2 hours later still bleeding
  • Upper right site
• Calls @ 8:00pm that night and seen
  • Irrigation, suturing, pack to #1 area
• Calls next day @7:00 am
  • Resuture, Surgi-Cell to #1 region
  • Still reports bleeding for 3 days
Hematology Evaluation

- Von Willebrand’s disease
- Why didn’t 17 and 32 bleed?
Conclusions: Antibiotics for Third Molar Surgery

• Antibiotics offer no benefit for maxillary third molar extractions.
• Minimal benefit for erupted/soft tissue impactions in the mandible.
• Both systemic and topical antibiotics are of benefit for partial and full bony mandibular third molars. Topical tetracycline is more effective.
• Topical tetracycline is of significant benefit in reducing the incidence of dry socket for third molar extractions.
Third Molar Treatment Options
Indications for Removal of Third Molars

- Recurrent pericoronitis
- Decay
- Impingement on adjacent tooth/periodontium
- Access for restoration of adjacent tooth
- Orthodontic
- Associated pathology
- Prevention of chronic inflammatory disease
- Upcoming orthognathic surgery
Options

• Observation

• Extraction
  • Risk of inferior alveolar nerve injury
    • 2-5% temporary
    • 0.1% permanent

• Risk Factors for IAN injury
  • Nerve visible in surgical site
Inferior Alveolar Nerve Injury

• Is there an adequate way to screen for who may be at risk?

• What do cone beam and CT scans provide us?

• What is the significance of cortical disruption of the IAN canal?

• What is the significance of IAN exposure at surgery?
Inferior Alveolar Nerve Injury

• Can we predict an injury, i.e. risk based on panorex?
  • Darkening of the root
  • Interruption of white line
  • Diversion of the canal
  • Deflection of the root
  • Narrowing of the root
Panoramic Radiographic Risk Factors for Inferior Alveolar Nerve Injury After Third Molar Extraction
Blaeser, August, Donoff, et.al.

- Purpose: estimate association between specific panoramic radiographic signs and inferior alveolar nerve injury during M3 removal

- Case control study design – sample consisted of patients who underwent extraction of impacted M3

- 8 cases, 17 controls (cases = people confirmed with IAN injury)

- Results:
  - Positive radiographic signs were associated with IAN injury – (PPV ranged from 1.4 to 2.7%), 40% or greater over the baseline likelihood of injury (1%)
  - Absence of radiographic findings had a strong negative predictive value (>99%)
Cortical Integrity of the IAN Canal

- Studies demonstrate that violation of the cortical integrity of the IAN canal determined via pre-operative imaging results in higher risk for nerve injury

- Is this accurate?

- What’s the best imaging technique to assess this?
Cortical Integrity of inferior Alveolar Canal as a Predictor of Paresthesia after Third-Molar Extraction

JADA March 2010 vol. 141 No.3 271-278
Park, Choi, Kim, et.al.

• Retrospective cohort study of 179 participants and 259 M3 extractions on patients considered high risk based on panoramic x-ray parameters.

• CT image analysis was performed to assess M3 contact with IAN canal
  • 85 cases were noted to have interruption of IAC cortex on CT slices
  • 10/85 cases involving interrupted IAC cortex experienced post-op paresthesia (11.8%)
  • Overall prevalence of paresthesia was 4.2% (11/259 teeth)

• Loss of cortical integrity of IAN canal is associated with increased risk of paresthesia after M3 extraction
ICAT Imaging
Digital Enhancement
Can we predict incidence of nerve exposure at surgery?

- Exposure of the inferior alveolar neurovascular bundle at surgery is associated with nerve injury

- Is there a role for CBCT?
Position of the impacted third molar in relation to the mandibular canal. Diagnostic accuracy of cone beam computed tomography compared with panoramic radiography.


- Panoramic and CBCT features were correlated with IAN exposure and injury
  - 53 third molars from 40 patients considered as “high risk” for IAN injury

- No significant difference in sensitivity and specificity was found between both modalities in predicting IAN exposure

- CBCT was not more accurate in predicting IAN exposure at surgery, but lingual position of IAN canal is associated with IAN injury
  - This can be helpful information when planning surgical approach
Conclusions on imaging:

• Panoramic x-ray is an excellent screening tool for predicting elevated risk for nerve injury after impacted M3 extraction
  • NPV >99%, PPV 1.4 – 2.7%

• CBCT scanning adds information about cortical integrity of the IAN canal

• CBCT scanning gives additional information about position of the nerve canal relative the root of the third molar

• A CBCT scan is not more effective than a panoramic x-ray when attempting to predict nerve exposure at time of surgery
Coronectomy Option

- Pogrel, MA, Lee JS, et.al.
  - Coronectomy: A technique to protect the inferior alveolar nerve

- Leung, Chung, et.al.
  - Safety of coronectomy versus excision of wisdom teeth: A randomized controlled trial

- Gady, J., Fletcher, M.C.
  - Coronectomy
  - Indications, Outcomes, and Description of Technique
Coronectomy

- Patients older than 25 years of age
- Radiographic findings suggest elevated risk for nerve injury
- Patients who report low tolerance for possibility of nerve injury
- Patient at risk for pathologic fracture or damage to adjacent structures with extraction
Pre-Op Panorex
Immediate Post Op
6 months post op
Coronectomy Option
6 Months Post Coronectomy
Coronectomy
Pre-Op Panorex
Immediate Post Op
6 months post op

- Coronal migration
  - May require treatment
69 Year-Old Female with Caries and Pericoronitis #17
Coronectomy

- Preoperative Antibiotics
  - Pen VK
  - Clindamycin
- Continue for 5 days
- Must remove ALL enamel
- Primary Closure
- Peridex rinses bid x 7 days
- Coding: D7251
Apicoectomy

Surgical Endodontics vs. Extraction/Implant
Failure of Conventional Endodontics

• Continued pain
• Persistent drainage
• Increasing size of radiolucency
Conventional Endodontics

• Failure rates: 82.3% success after one year
• 50% of all failures occur after one year

Bence, 1980
Retreatment of Endodontics Vs. Periapical Surgery?
Why the OMFS Should do Apical Surgery

• Most familiar with working in specific anatomical area
• Anesthesia/Sedation Skills
• GP and OMFS relationship
Indications for Periapical Surgery

- Access to the root canal system is blocked
  - Calcification, post, dilaceration of root
Indications for Periapical Surgery

- Chronic periapical lesion due to overfill of material past apex
Indications for Periapical Surgery

- Exploratory- to determine if fracture present
- Is it possible to predict root fractures?
Indications for Periapical Surgery

• Fracture of the apical portion of the root
• Continued infections/symptoms despite reinstrumentation of the tooth
Continued Infection
Indications for Periapical Surgery

• To obtain biopsy of periapical tissues
• Controversial question:
  • Should every case be submitted for histological examination? (Murphy’s Law Corollary)
Indications for Periapical Surgery

• To obtain biopsy of suspicious lesions?
Biopsy of Periapical Lesions

- Atypical periapical lesion
Indications for Periapical Surgery

• Retained instrument in apical end of root with persistent symptoms
Indications for Periapical Surgery: Chronic Pain(?)
Surgical Endodontics

- Exposure of the tooth and apical region
- Curettage of apical lesion
- Root resection
- Root apex preparation
- Retrograde filling
- Flap design/closure to prevent recession
  - Sulcular incisions
  - Sling suture closure
Flap Design
Sling Suture
Surgical Endodontics

• Exposure of root apex
  • Adequate flap and bone removal
  • Expose apical 1/3 before root resection

• Limited root resection (2-3mm)
Surgical Endodontics

• Curettage of periapical lesion
  • Removal of apical debris, foreign bodies, granulation tissue
  • Recovery of tissue if submitting for histology
Surgical Endodontics

- Preparation and placement of apical seal
  - Rotary instruments
  - Ultrasonic “Microapical preparation”
Unsuitable Materials for Apical Seals

• Cavit
• Gutta percha (warm, cold burnished or injected)
• Glass ionomers
Suitable Materials for Apical Seal

• Amalgam
• Composite resins
• IRM
• Super-EBA (alumina reinforced IRM)
• MTA
Mineral Trioxide Aggregate (MTA)

- Tricalcium silicate
- Tricalcium aluminate
- Tricalcium oxide
- Silicate oxide
Mineral Trioxide Aggregate (MTA)

- Powder
- Mixed with sterile water
- Hydrophilic particles
- Creates colloidal gel
- Solidifies in 3-4 hours
Cytotoxicity of Apical Seal Materials (Fresh)

Zone of cell lysis (mm)

- Amalgam
- Super EBA
- IRM
- MTA
Mean Gaps Between Dentinal Walls and Materials
Bacterial Leakage Time

Days for 3mm of S.epidermis penetration
Mesial Buccal Root Molar
Molar Apicoectomy
Flap Design: Molar
Initial Apical Exposure
MTA Seal
Root Resection With MTA Seal
Postoperative Result

Immediate Post Op

6 months Post Op
Sulcular Flap Indication
Sulcular Flap
Conclusion: Algorithm for Surgery

- Algorithm for Symptomatic tooth (continued pain, sinus tract, gross pulpal involvement)
- Failed previous endodontics? → NO → Refer for RCT → RCT successful → YES → final restoration
- YES → NO → Refer for RCT
- Final restoration
- YES → NO
- Can tooth be retreated? → YES → Will patient accept retreatment? → YES → Retreatment
- NO → Extract → implant /prosthesis
- Evidence of crack/fracture? → YES → Extract → implant /prosthesis
- NO → Adequate periodontal status? → NO → abutment for existing prosthesis? → NO
- (<25% vertical bone loss, pocket depth<5mm) → YES
- Adequate tooth structure for Prosthesis? → NO → Extract → implant /prosthesis
- YES → Abutments and prosthesis in good condition? → NO
- Patient able to tolerate surgery
- Surgical exploration
- when to do apical surgery
Skeletal Anchorage in Orthodontic Treatment

Stuart E. Lieblich, D.M.D.
A Paradigm Shift

- Nationally, there has been a decline in orthognathic surgical cases over past 10 years
  - Increasing health care costs
  - Decreasing reimbursement
  - “long treatment times”
  - Concern over “major” surgery
Goals of Temporary Anchorage Devices (TADs)

• “Indirect” re-positioning of jaw bone
  • i.e. maxillary molar intrusion, auto-rotation of mandible
• Extend the range of tooth movement through direct or indirect leverage
• Accelerate the speed of tooth movement

• Kyu-Rhim Chung, DDS, MSD, PhD
Temporary Anchorage Devices

• Mini-screws
• Anchorage Plates
• Combination of both screws and plates
Mini-screws
Mini-screws
Mini-screws
Skeletal Anchorage Plates

- offer enhanced device stability for direct and indirect leverage
- can be utilized in event of a failed mini-screw
- require a mucosal flap for surgical access
- can be placed with a local anesthetic
Skeletal Anchorage Plates

• They come in a variety of shapes and can be utilized in several areas
• Plates utilize self-drill screw technology that enhance the efficiency of the procedure. (traditional self-tapping screws are available for dense bone)
• have a polished isthmus that exits the incision and connects with the intra-oral component of the device
Skeletal Anchorage Plates
Skeletal Anchorage Plates
Skeletal Anchorage Plates
Clinical Case I

• Skeletal anchorage plates utilized to protract mandibular molars to address congenitally absent second bicuspids
  • Placed after mini-screw failure
  • Procedure accomplished with IV sedation in the office
Clinical Case I continued
Clinical case I continued
Clinical Case II

- Healthy adult female with anterior open bite
- Posterior vertical maxillary alveolar excess noted
- Patient interested in minimally-invasive office based technique versus conventional Lefort I osteotomy
Clinical Case II continued
Clinical Case II continued
Clinical Case II continued
Clinical Case II continued
Clinical Case II continued
Clinical case II continued
Clinical Case II continued
The “Nuts and Bolts”
Plate Anatomy

- Head Fixture
- Welding Seam
- Connecting Bar
- Plate Construct
Locking Anchor Plate

Configurations - Straight & “T”

Bar Lengths - 9mm & 11mm

Bar Diameter = .8mm

Head Diameter/Height = 4.4mm/4.23mm

Wire Range Capability = .018-.022 inch
What is Skeletal Anchorage?

- Orthodontic anchorage that is not tooth-borne (i.e. bone-borne)

- Most data to date is based on published case reports (few within the US)

- An evolving area with enormous clinical implications
Why is it significant?

- Does not depend on existing dentition
  - no unwanted tooth movements
- Does not depend on patient compliance
- Continuous force
- Fairly easy and simple surgical procedure
- Relatively inexpensive
- Don’t need to wait for osseointegration (can be loaded immediately)
- Easily removed after treatment
**Specialized Bone Anchor Plates**

**Advantages**
- Skeletal anchorage
  - Immediate loading
    - Mechanical stability versus osseointegration
  - Away from the roots
  - Tolerate relatively large forces
  - Easy removal

**Disadvantages**
- Requires surgery
  - Placement and removal
- Technically more difficult treatment plan
Management of Apertognathia
Case Example: Open Bite Closure

- Typical treatment: maxillary differential Lefort I impaction
Lefort I Osteotomy
Non-Surgical Outcome
Non-surgical Outcome: 8 months of therapy
Other Cases: Preprosthetics
4 months of therapy
Intrusion of Teeth: Reduction of “Gummy Smile”
Skeletal Anchorage - Summary

• Utilization of skeletal anchorage is a simple office-based procedure
• Skeletal anchorage provides versatility to the practitioner
  • Intrusion, extrusion, molar up-righting, protraction or retraction into edentulous spaces, correction of isolated occlusal cant, etc.
  • Can be used to simplify a complex orthognathic treatment plan
Skeletal Anchorage - Summary

- Skeletal anchorage must always be viewed in light of conventional treatment techniques. Limitations must be explained thoroughly along with treatment alternatives.

- Communication between the surgeon and orthodontist is critical to the success of the case. Device placement and subsequent orthodontic treatment must be understood by the surgeon.

- Continued device modification will be necessary to streamline the treatment process.
Thanks!