ABOI Board Review Course

Part II
Patient Assessment and Clinical Guidelines “Specific Clinical Scenarios”
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Dr. Minichetti Mini-Residency
Patient Assessment

Specific Clinical Scenarios

• Cardiovascular System
• Respiratory System
• Endocrine System
• Hematologic Disorders
• Gastrointestinal Disorders
• Renal Disease
• Neurologic Disorders
• Musculoskeletal System
• Miscellaneous

• “In all patients ASA class II or greater, considerations should be given to consultation with appropriate medical colleagues for medical clearance to proceed with implant related procedures which might also include sedation or general anesthesia”

   – AAOMS ParCare 2012 Patient Assessment

ASA II, A patient with mild systemic disease without substantive functional limitations
Cardiovascular System

- Rheumatic heart disease
- Valvular heart disease
- Heart murmurs
- Congenital heart disease
  - ASA II classification
    - Consider cardiology consultation, if indicated
    - Follow American Heart Association SBE prophylaxis
  - IE Prophylaxis recommended for:
    - Prosthetic heart valve or valve repaired with prosthetic material
    - History of endocarditis
    - Heart transplant with abnormal heart valve function
    - Certain congenital heart defects

<table>
<thead>
<tr>
<th>SITUATION</th>
<th>AGENT</th>
<th>REGIMEN: SINGLE DOSE 30-60 MINUTES BEFORE PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>Amoxicillin</td>
<td>2 grams</td>
</tr>
<tr>
<td>Unable to Take Oral Medication</td>
<td>Amoxicillin OR Cefazolin or ceftriaxone</td>
<td>2 g IM* or IV†</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 g IM or IV</td>
</tr>
<tr>
<td>Allergic to Penicillins or Ampicillin Oral</td>
<td>Cephalexin† OR Clindamycin OR Azithromycin or clarithromycin</td>
<td>2 g</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600 mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 mg</td>
</tr>
<tr>
<td>Allergic to Penicillins or Ampicillin and Unable to Take Oral Medication</td>
<td>Cefazolin or ceftriaxone‡ OR Clindamycin</td>
<td>1 g IM or IV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>600 mg IM or IV</td>
</tr>
</tbody>
</table>

* IM: Intramuscular.
† IV: Intravenous.
‡ Or other first- or second-generation oral cephalosporin in equivalent adult or pediatric dosage.
§ Cephalosporins should not be used in a person with a history of anaphylaxis, angioedema or urticaria with penicillins or ampicillin.
Cardiovascular System

- **Hypertension**
  - abnormally high arterial blood pressure that is usually indicated by an adult systolic blood pressure of 140 mm Hg or greater or a diastolic blood pressure of 90 mm Hg or greater, is chiefly of unknown cause but may be attributable to a preexisting condition (as a renal or endocrine disorder)
    - Stage I (controlled with meds)
      - ASA I
    - Stage II (poor control)
      - ASA III
      - ASA IV

- **Ischemic heart disease**
  - When arteries are narrowed, less blood and oxygen reaches the heart muscle. This is also called coronary artery disease
    - ASA II, III, IV

- **Physician consult and clearance**
  - Do not discontinue anti-platelet therapy without consult
  - Defer elective treatment 1-3 months following MI

- **Use stress reduction techniques**
  - Limit epinephrine in local anesthesia
  - Topical before injections
  - Nitrous Oxide
  - Pre medication with sedative
  - Music, aromatherapy, vocal sedation, etc.

- **BLS / ACLS training**
  - Yellow flag to proceed with more extreme caution for dental procedures, stress reduction protocols needed
  - Red flag and treatment should be delayed until patient is re-classified as ASA III
Cardiovascular System

• Angina pectoris
  – *Angina* is chest pain or discomfort caused when your heart muscle doesn't get enough oxygen-rich blood
    • Stable (ASA II) not limiting activity
    • Unstable (ASA III)

• Myocardial infarction (MI)
  – *Myocardial infarction (MI)* (heart attack) is the irreversible death (necrosis) of heart muscle secondary to prolonged lack of oxygen supply (ischemia)
    • < 1 month ASA IV
    • 1 – 6 months ASA III
    • > 6 months ASA II

Physician consult and clearance
  – Do not discontinue anti-platelet therapy without consult
  – Defer elective treatment 1-3 months following MI

• Use stress reduction techniques
  – Limit epinephrine in local anesthesia
  – Topical before injections
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• BLS / ACLS training
  – Yellow flag to proceed with more extreme caution for dental procedures, stress reduction protocols needed
  – Red flag and treatment should be delayed until patient is re-classified as ASA III
Cardiovascular System

• Congestive Heart Failure
  – Heart failure (HF), often referred to as congestive heart failure (CHF), occurs when the heart is unable to pump sufficiently to maintain blood flow to meet demands
    • Shortness of breath (SOB)
    • Dyspnea on exertion
    • Ankle edema
    • Oxygen supplementation
      – ASA II (stable, well controlled on medication)
      – ASA III
      – ASA IV

  Physician consult and clearance

  – Yellow flag to proceed with more extreme caution for dental procedures, stress reduction protocols needed
  – Red flag and treatment should be delayed until patient is re-classified as ASA III
Respiratory System

- Chronic obstructive pulmonary disease (COPD)
  - Lung disease characterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible
  - Emphysema and chronic bronchitis
    - Stable on medication ASA II
    - Poorly controlled, limits activity ASA III or ASA IV

Physician consult and clearance

- Steroids when indicated or recommended
- **Yellow flag** to proceed with more extreme caution for dental procedures, stress reduction protocols needed
- **Red flag** and treatment should be delayed until patient is re-classified as ASA III
Respiratory System

• Asthma
  – Respiratory condition marked by spasms in the bronchi of the lungs, causing difficulty in breathing
  – It usually results from an allergic reaction or other forms of hypersensitivity
    • Allergy induced ASA II
    • Exercise induced ASA III

• Physician consult and clearance
  – Severity
    • Frequency of inhaler use
    • Hospitalizations
    • Wheezing
  – Consider prophylactic use of inhaler
  – Yellow flag to proceed with more extreme caution for dental procedures, stress reduction protocols needed
Endocrine System

- Diabetes mellitus
  - Caused by a deficiency of the pancreatic hormone insulin, which results in a failure to metabolize sugars and starch
  - Without insulin, cells cannot absorb sugar (glucose), which they need to produce energy.
  - Sugars accumulate in the blood and urine, and the byproducts of alternative fat metabolism disturb the acid–base balance of the blood, causing a risk of convulsions and coma

<table>
<thead>
<tr>
<th></th>
<th>Type I Diabetes</th>
<th>Type II Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age of Onset</strong></td>
<td>Juvenile</td>
<td>Adult</td>
</tr>
<tr>
<td><strong>Cause</strong></td>
<td>No insulin</td>
<td>Insulin resistance, obesity</td>
</tr>
<tr>
<td><strong>Prevalence</strong></td>
<td>5%</td>
<td>95%</td>
</tr>
<tr>
<td><strong>Symptoms</strong></td>
<td>Severe</td>
<td>Less severe, obesity</td>
</tr>
<tr>
<td><strong>Progression</strong></td>
<td>Abrupt</td>
<td>Gradual</td>
</tr>
<tr>
<td><strong>Consequences</strong></td>
<td>Kidney, eyes, cardio</td>
<td>Kidney, eyes, cardio</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td>Insulin</td>
<td>Weight loss</td>
</tr>
</tbody>
</table>
Type I Diabetes Mellitus

- Type I Diabetes Mellitus
  - IDDM
    - Type 1 diabetes is an immune disorder in which the body attacks and destroys insulin-producing beta cells in the pancreas
      - 5 – 10% of diabetics
    - ASA III (well controlled)
    - ASA IV (uncontrolled)
  - Yellow flag to proceed with more extreme caution for dental procedures, stress reduction protocols needed
  - Red flag and treatment should be delayed until patient is re-classified as ASA III
**Type II Diabetes Mellitus**

- **Type II Diabetes Mellitus**
  - NIDDM
    - In type 2 diabetes, the body isn't able to use insulin the right way. This is called **insulin resistance**.
    - As type 2 diabetes gets worse, the **pancreas** may make less and less insulin. This is called **insulin deficiency**
      - Type 2 diabetes accounts for the vast majority of people who have diabetes-90 to 95 out of 100 people
  
- **ASA II (well controlled)**
- **ASA III (Poorly controlled)**
  - Yellow flag to proceed with more extreme caution for dental procedures, stress reduction protocols needed
  - Red flag and treatment should be delayed until patient is re-classified as ASA III
Type III Diabetes Mellitus

- Type III Gestational Diabetes Mellitus
  - Hormones from the placenta help fetal development, but may also block the action of the mother's insulin in her body resulting in insulin resistance.
  - 4-9% incidence in pregnancy
  - Similar to Type II DM
Diabetes Mellitus
Assessment for Dental Treatment

• **Determine level of diabetic control**
  – History
  – Hemoglobin A1c
    • The A1C test result reflects your average blood sugar level for the past two to three months
      – Specifically, the A1C test measures what percentage of your hemoglobin — a protein in red blood cells that carries oxygen — is coated with sugar (glycated).
      – The higher your A1C level, the poorer your blood sugar control and the higher your risk of diabetes complications

• Fasting blood glucose analysis
  • **Fasting blood** sugar (FBS) measures **blood glucose** after you have not eaten for at least 8 hours
  • Doctors use fasting blood sugar levels and hemoglobin A1c values to diagnose type 1 and type 2 diabetes, and pre diabetes

• Glucose tolerance test
  • A glucose tolerance test measures how well your body’s cells are able to absorb glucose, or sugar, after you ingest a given amount of sugar. A glucose tolerance test to primarily used to diagnose gestational diabetes
Diabetes Mellitus
Assessment for Dental Treatment

Conventional A.D.A.-Endorsed A1c Blood Glucose Protocols

The American Diabetes Association typically considers a person with diabetes to be "well-controlled" if they are able to maintain an A1c level below 7.0. Studies show that significant long-term damage to precious cellular proteins and internal organs occurs at blood glucose levels above 120 (~A1c levels of 5.6). So why does the ADA recommend/mislead diabetics?

<table>
<thead>
<tr>
<th>A1c%</th>
<th>60-90 days average Blood Glucose</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.0+</td>
<td>345</td>
</tr>
<tr>
<td>11.5</td>
<td>328</td>
</tr>
<tr>
<td>11.0</td>
<td>310</td>
</tr>
<tr>
<td>10.5</td>
<td>293</td>
</tr>
<tr>
<td>10.0</td>
<td>275</td>
</tr>
<tr>
<td>9.5</td>
<td>258</td>
</tr>
<tr>
<td>9.0</td>
<td>240</td>
</tr>
<tr>
<td>8.5</td>
<td>222</td>
</tr>
<tr>
<td>8.0</td>
<td>204</td>
</tr>
<tr>
<td>7.5</td>
<td>187</td>
</tr>
<tr>
<td>7.0</td>
<td>170</td>
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<tr>
<td>6.5</td>
<td>153</td>
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<tr>
<td>6.0</td>
<td>135</td>
</tr>
<tr>
<td>5.5</td>
<td>118</td>
</tr>
<tr>
<td>5.0</td>
<td>100</td>
</tr>
<tr>
<td>4.5</td>
<td>83</td>
</tr>
<tr>
<td>4.0</td>
<td>65</td>
</tr>
</tbody>
</table>

A1c target or goal for all diabetics should be in the range of 5.5 or lower.

Realistic A1c-Glucose Chart

A1c % Levels:
- Non-diabetic: <5.6
- Elevated: 5.7-6.4
- Slightly Elevated: 6.5-7.0
- Moderately Elevated: 7.1-7.9
- Elevated: 8.0-9.9
- Severely Elevated: ≥10.0

A1c represents the average blood glucose over the past 2-3 months. Higher A1c values indicate poorer control of diabetes.

Estimated Average Glucose (eAG):
- <126 mg/dL: Non-diabetic
- 126-154 mg/dL: Good Goal
- 155-183 mg/dL: Slightly Elevated
- 183-240 mg/dL: Elevated
- >240 mg/dL: Severely Elevated

(Formula: 28.7 X A1c - 40.7 = eAG)

ADA Study: Diabetes Care 2008
Diabetes Mellitus Guidelines

- Avoid hypoglycemia
- Consider hypoglycemic agent scheduling adjustment (oral)
- Insulin reduction, as necessary
- Consider prophylactic antibiotics
- Stress reduction techniques

<table>
<thead>
<tr>
<th>Insulin Regimen</th>
<th>Day of Surgery</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulin Pump</td>
<td>No change</td>
<td>Use “sick or sleep” basal rates Medical consult/clearance</td>
</tr>
<tr>
<td>Long –acting insulin</td>
<td>75 - 100% of AM dose</td>
<td>Medical consult/clearance</td>
</tr>
<tr>
<td>Intermediate-acting insulin</td>
<td>50 -75% of AM dose</td>
<td>Medical consult/clearance</td>
</tr>
<tr>
<td>Fixed combination insulin</td>
<td>50 – 75% of AM dose of intermediate-component</td>
<td>Medical consult/clearance</td>
</tr>
<tr>
<td>Short and rapid acting insulin</td>
<td>Hold the dose</td>
<td>Medical consult/clearance</td>
</tr>
<tr>
<td>Non-insulin injectables</td>
<td>Hold the dose</td>
<td>Medical consult/clearance</td>
</tr>
</tbody>
</table>

Dental implants and diabetes mellitus: systematic review

- Diabetes as a relative contraindication for implant surgery is controversially discussed
- Because the number of patients suffering from diabetes increases, there are more diabetic patients demanding implant procedures
- In 1980, more than 150 million people worldwide were affected and that number had grown to 350 million by 2008
Dental implants and diabetes mellitus: systematic review

Purpose

• Answer the question:
  – “Do diabetic patients with dental implants have a higher complication rate in comparison to healthy controls?”

• Strategy:
  – Systematic literature search identified 22 clinical studies and 20 publications of aggregated literature, (N=327)
  – Studies were quite heterogeneous concerning methods and results
  – All studies < 15 years and > 10 patients
  – > 20,000 implants total

  • Most studies include patients with well controlled diabetes
  • It would be non-ethical to observe patients with poor glycemic control, because health threatening side effects develop

Review Diabetes and:

– Osseointegration
– Peri-implantitis
– Implant survival
– Bone augmentation
– Influence of glycemic control
– Influence of duration of disease
– Influence of supportive therapy
Conclusions

• Dental implants are safe and predictable procedures for dental rehabilitation in diabetics

• The survival rate of implants in diabetics does not differ from the survival rate in healthy patients within the first 6 years

• The long-term observation up to 20 years showed a reduced implant survival rate in diabetic patients

• Patients with poorly controlled diabetes seem to have delayed osseointegration following implantation. After 1 year, there is no difference between diabetic and healthy individuals, not even to the poorly controlled HbA1c. Therefore, it is a recommendation to avoiding immediate loading of the implants

• The supportive administration of antibiotics and chlorhexidine seems to improve implant success

• Good glycemic control improves osseointegration and implant survival
  — A1C evaluation and improvement of antidiabetic therapy

• Patients with poorly controlled diabetes suffer from elevated risk of peri-implantitis
  — Risk-adapted dental recall is helpful to detect early signs of gingivitis

• no evidence that bone augmentation procedures like guided bone regeneration and sinus lifts have a higher complication and failure rate in patients with well- to fairly well-controlled diabetes
Hematologic Disorders

- Anti platelet agents
- Anticoagulation drugs
- Fibrinolytic drugs
- Von Willebrands disease
- Hemophilia

- Medical consult/clearance
  - Pertinent labs
    - CBC with platelets
    - PT, PTT, INR
  - Temporary discontinuation of anticoagulation therapy
  - Adjustment of medication (s) for patients on multiple anticoagulants
  - Supplement with blood products
  - Subcutaneous medications
Anticoagulant and Antiplatelet Medications and Dental Procedures

• There is a growing number of patients prescribed anticoagulation or antiplatelet therapy
• There is strong evidence for the older medications, as well as limited evidence for the newer medications that, for the most part, it is not necessary to alter anticoagulation or antiplatelet therapy prior to dental intervention

• These drugs prescribed for patients at high risk for or who have had thromboembolic events (blood clots)
  – DVT
  – PE
  – A Fib
  – Stroke
    • ASA II – IV

Anticoagulant and Antiplatelet Medications and Dental Procedures
www.ada.org/.../oral.../anticoagulant-antiplatelet-medications-and-dental-
Oct 22, 2015
Anticoagulant and Antiplatelet Medications and Dental Procedures

• Risks
  – Without the anticoagulant/antiplatelet medications, patients are at higher risk for blood clot development which can result in:
    • Thromboembolism
    • Stroke
    • Myocardial infarction
  – The serious risks of stopping or reducing these medication regimens need to be balanced against the potential consequences of prolonged bleeding which can be controlled with local measures

• Local measures to control bleeding include:
  – Gelfoam
  – Surgicel
  – Suture
  – Tranexamic acid mouthwash
Hematologic Disorders
Therapeutic anticoagulation

Anti platelet drugs

- *Clot formation requires release of the chemical thromboxane from platelets.*
- *Thromboxane signals platelets to stick together to form blood clot*
- *Anti platelet agents work by inhibiting the production of thromboxane*
  - Aspirin *
  - Plavix *
  - Effient *
  (strong evidence *)

- Fibrinolytic drugs
  - *Fibrinolytic or thrombolytic drugs, are medications that are capable of stimulating the dissolution of a blood clot (thrombus)*
  - *thrombolytic medicines are approved for the emergency treatment of stroke and heart attack*
  - Three classes:
    - tissue plasminogen activator (tPA)
    - streptokinase (SK)
    - urokinase (UK). While drugs

- Anticoagulants
  - Anticoagulants target clotting factors, which are proteins made in the liver that are crucial to the blood-clotting process
    - Warfarin (coumadin)*
      - Vit K antagonist
    - Pradaxa **
      - Direct thrombin inhibitor
    - Eliquis and Xarelto **
      - Factor Xa inhibitor
  (newer target specific anticoagulants; lesser evidence **)
• General consensus that older anticoagulants (Warfarin) and antiplatelet agents (Aspirin, Plavix) should not be altered before dental surgical procedures.

• The risks of stopping or reducing these medication regimens far outweigh the consequences of prolonged bleeding which can be locally controlled.

• General consensus that patients taking newer target-specific anticoagulants (Pradaxa, Eliquis, Xarelto) should not be changed.

• Consideration may be given, in consultation with physician, to alter timing of medication until after the procedure, or temporarily interrupting drug therapy for 24 – 48 hours.
Gastrointestinal Disorders
Inflammatory Bowel Disease (IBD)

• Crohn Disease
  – Crohn’s disease is a chronic inflammatory bowel disease (IBD) characterized by inflammation of the digestive, or gastrointestinal (GI) tract
  – Crohn's disease can occur in all the layers of the bowel walls.

• Ulcerative Colitis
  – Ulcerative colitis, on the other hand, is continuous inflammation of the colon
  – Ulcerative colitis only affects the inner most lining of the colon

• The cause of the inflammatory bowel diseases (IBD), ulcerative colitis, and Crohn's disease, is not known. Studies suggest they are caused by a combination of things, including genes, environmental factors, and problems with the immune system
• Steroid medications help reduce inflammation by suppressing the immune system and are usually given to help with moderate to severe Crohn’s symptoms
• Dietary and nutritional supplements
• Surgery
Gastrointestinal Disorders
Inflammatory Bowel Disease (IBD)

- Retrospective studies to assess the influence of local and systemic factors on dental implant failures in IBD patients are scarce.
- IBD patients often have more dental decay, bone loss secondary to xerostomia, acidity.
- IBD patients may be candidates for removal of teeth and implant supported restorations due to poor prognosis of debilitated dentition.
- Long-term corticosteroid therapy delay wound healing, decrease the blood leukocyte count and decrease the patient's ability of antibacterial defense.
- Decision to rehabilitate dental patient with implant supported restorations should include consultation with physician to assess patient IBD classification and status.

- Retrospective study
  - Crohn disease was found to be significantly related to early implant failure in study of patients treated from 1982-2003.
  - Authors speculate that the presence of antibody-antigen complexes might lead to autoimmune inflammatory processes in several parts of the body including the bone-implant interface.

- Follow up Retrospective study
  - Implants placed between 2003-2005 which had oxidized titanium surface integrated successfully.
Renal Disease and Dental Treatment

Sulejmanagic et al.; Clinic for Oral Surgery and Oral Medicine, School of Dental Medicine, University of Sarajevo, Hemodialysis Centre, University Clinics Center 2005

• Kidney Function
  – Kidney is an organ responsible for a set of complex functions in the body including:
    • Excretion of metabolic waste products
    • Regulation of the salt and water in the body
    • Preservation of acid balance
    • Excretion of different hormones and organic substances

• Kidney disease
  – Kidney disease can be the result of developmental anomalies and inherited diseases and acquired
  – Acute vs. Chronic

• Chronic Renal Disease is the most important renal pathology in dentistry

• Up to 90% of patients with CRD have a degree of dysfunction including
  – Prolonged bleeding
  – Hypertension
  – Increased infection risk
  – Dental implants contra-indicated
  – Gingival overgrowth

• Every Dentist should be prepared to treat patients with impaired renal function
  – Chronic renal disease
  – Nephrotic syndrome
  – Dialysis
  – Transplant patients
Renal Disease and Dental Treatment

Sulejmanagic et; Clinic for Oral Surgery and Oral Medicine, School of Dental Medicine, University of Sarajevo, Hemodialysis Centre, University Clinics Center 2005

• Nephrotic Syndrome
  – Characterized by proteinurea
  – Most common cause Lupus, diabetes, and amilodosis
  – Usually appears in children age 2-6
  – Characterized by edemas in face, lids, and lower extremities

• Patients with nephrotic syndrome are prone to infection and endodontic treatment of primary teeth is contra-indicated

• ASA III - IV

• Treatment should only be undertaken after consultation with nephrologist or urologist

• Dental implants contra-indicated
Renal Disease and Dental Treatment

Sulejmanagic et; Clinic for Oral Surgery and Oral Medicine, School of Dental Medicine, University of Sarajevo, Hemodialysis Centre, University Clinics Center 2005

• Chronic Kidney Disease
  – The stages of CKD (Chronic Kidney Disease) are mainly based on measured or estimated GFR (Glomerular Filtration Rate).
  – There are five stages but kidney function is normal in Stage 1, and minimally reduced in Stage 2.
  – Characterized by:
    • Polyuria
    • Polydipsia
    • Hematuria
    • Tremor
    • Edema secondary to fluid retention and impaired balance of electrolytes

<table>
<thead>
<tr>
<th>Stage</th>
<th>Qualitative Description</th>
<th>Renal Function (mL/min/1.73 m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kidney damage-normal GFR</td>
<td>≥90</td>
</tr>
<tr>
<td>2</td>
<td>Kidney damage-mild ↓ GFR</td>
<td>60-89</td>
</tr>
<tr>
<td>3</td>
<td>Moderate ↓ GFR</td>
<td>30-59</td>
</tr>
<tr>
<td>4</td>
<td>Severe ↓ GFR</td>
<td>15-29</td>
</tr>
<tr>
<td>5</td>
<td>End-stage renal disease</td>
<td>&lt;15 (or dialysis)</td>
</tr>
</tbody>
</table>

http://www.renal.org/information-resources/
Renal Disease and Dental Treatment
Sulejmanagic et; Clinic for Oral Surgery and Oral Medicine, School of Dental Medicine, University of Sarajecvo, Hemodialysis Centre, University Clinics Center 2005

• Oral findings in CRD
  – Increased risk of infection
  – Candidiasis and ulcers
  – Soft tissues are pale due to anemia
  – Decrease saliva
  – Stomatitis
  – Hepatitis B and C are frequent
  – Reduced rate of absorption of medications
  – Increased bleeding due to platelet dysfunction
  – Painful plaques and crusts
  – Ammonia taste and smell
    • halitosis
  – Burning
  – exudate
  – Variable blood pressure
  – Hyperparathyroidism
    • Increase loss of calcium in bones
  – Acid-base disorders
    • Reduce effectiveness of local anesthesia
  – Hypercalcemia
    • General anesthesia should be avoided in patients with increased potassium level (.5.5 mmol/l)
Renal Disease and Dental Treatment

Sulejmanagic et; Clinic for Oral Surgery and Oral Medicine, School of Dental Medicine, University of Sarajecvo, Hemodialysis Centre, University Clinics Center 2005

• Dental Treatment in CRD
  – Kidney disease may be more or less severe with no uniform dental treatment
  – Invasive dental treatment requires consultation with nephrologist who administers prophylactic antibiotic therapy
    • PCN or Cephalosporin or if allergic, use antibiotics that are not nephrotoxic
    • ASA III

• Extractions with local anesthetics
  – Amide type with liver reabsorption (lidocaine, xylocain)
  – Liver metabolized pain meds
Renal Disease and Dental Treatment

Sulejmanagic et; Clinic for Oral Surgery and Oral Medicine, School of Dental Medicine, University of Sarajecvo, Hemodialysis Centre, University Clinics Center 2005

• Dental Treatment and Dialysis
  – Patients typically treated 3X per week for 4 hours per tx.
  – Heparin anti-coagulant to prevent blood coagulation outside the body (prevents Xa activation) (4-6 hours)
    • Since heparin prolongs bleeding time, extractions should be performed a day after dialysis when anticoagulant effect is minimal and dialysis effect is maximal.
    • Check INR prior to dental surgery

• Nephrologist consult to direct preparatory measures
• Prophylactic antibiotics recommended
• As for dental considerations and management strategies for these patients, we should take into account that the drug dose adjustment must be done using creatinine clearance before invasive dental procedures

• Local anesthesia

Table 3. Dose adjustment of antibiotics most commonly used in dental practice, in patients with chronic kidney failure, according to creatinine clearance.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Normal dose</th>
<th>Dosage with creatinine clearance 10-50 ml/min.</th>
<th>Dosage with creatinine clearance &lt;10 ml/min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin</td>
<td>500-1000 mg/day</td>
<td>Every 8-12 h</td>
<td>Every 12-14 h</td>
</tr>
<tr>
<td>Amoxicillin-clavulinate</td>
<td>500-875 mg/day</td>
<td>Every 8 hours</td>
<td>Every 12-24 hours</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>300 mg/8h</td>
<td>No adjustment needed</td>
<td>No adjustment needed</td>
</tr>
<tr>
<td>Doxycline</td>
<td>100 mg/24h</td>
<td>No adjustment needed</td>
<td>No adjustment needed</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>250-500 mg/8h</td>
<td>No adjustment needed</td>
<td>No adjustment needed</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>250-500 mg/8h</td>
<td>Every 8-12 hours</td>
<td>Every 12-24 hours</td>
</tr>
<tr>
<td>Penicillin G</td>
<td>0.3-1.2 million IU/6-12 h</td>
<td>50-100% of the dose every 8-12 hours</td>
<td>25-50% of the dose every 12 hours</td>
</tr>
<tr>
<td>Azithromycin</td>
<td>500 mg/24h 3 days</td>
<td>No adjustment needed</td>
<td>No adjustment needed</td>
</tr>
</tbody>
</table>
Renal Disease and Dental Treatment
Sulejmanagic et; Clinic for Oral Surgery and Oral Medicine, School of Dental Medicine, University of Sarajevo, Hemodialysis Centre, University Clinics Center 2005

• Dental Treatment and Kidney transplant patient (Post)
  – Extremely sensitive to infection
  – Impaired wound healing after extraction
  – Risk of organ rejection requires these patients to take immunosuppressant medications
    • Corticosteroids
    • Cyclosporine A

• Consultation with supporting physician
  – Prophylactic antibiotics
  – Steroid therapy
    • Possible increased dosage schedule
  – ASA III - IV

• Dental Treatment for Kidney Transplant patient (Pre)
  – Comprehensive treatment including prophylactic measures, caries control, extractions
  – Antimicrobial rinses pre-operatively one day prior to organ transplant
  – Motivate patient to maintain regular oral hygiene
  – Administer antibiotics
Renal Disease and Dental Treatment
Conclusions

- Patients with kidney diseases are an extremely delicate group of patients
- Kidney disease patients have a tendency to infection and therefore, prophylactic antibiotics is required prior to surgical interventions
- Prone to bleeding and therefore surgical interventions should be undertaken in the days when the patient does not use dialysis
- Kidney transplant patients take immunosuppressant therapy
- Dental treatment of patients with Kidney disease requires close cooperation between the professional Dental and Medical staff
- Dental implants may be contraindicated in patients with severe renal disease
   - No specific guidelines
Neorologic Disorders and Dental Treatment

• Some neurologic disorders may affect the ability of Dental health provider to perform an adequate patient assessment and subsequent management.

• Consideration should be given to comprehensive dental and surgical management in a controlled facility under sedation or general anesthesia.

• Neurologic conditions facing the dentist include abnormalities associated:
  • Autism
  • Epilepsy
  • Parkinson disease
  • Multiple sclerosis
  • Stroke
  • Myasthenia gravis
  • Alzheimer’s
Neorologic Disorders and Dental Treatment

- Ensure patients compliant with medications
- Treatment plan with attention to comprehensive oral hygiene care and maintenance
- Shorter appointments to reduce stress
- Fixed restorations might be better than removable
- Implants not contraindicated if patient assessment allows
  - “Begin with end in mind”
- Consider consultation with physician regarding patient medical status for planned surgical and restorative plan
- Review emergency treatment for office complications that might arise during treatment
  - Seizure
  - Restlessness
• It is likely that the demand for dental services for the community placed individual with mental illness will dramatically increase over the next decade

• With sound planning, clear communication, and carefully drawn limits to services provided, successful efforts can be made to alleviate the dental neglect experienced by so many of these individuals

• Relative contraindication for dental implants

• Consider consultation with physician regarding patient medical status for planned surgical and restorative plan

• Treatment often planned for ambulatory surgical setting
Osteoporosis

- Osteoporosis is the most common bone disease in humans and is characterized by low bone mass, disrupted bone architecture, and increased fracture risk.
- Based on data from the National Health and Nutrition Survey III (NHANES III), the National Osteoporosis Foundation in 2014 estimated that more than 9.9 million Americans have osteoporosis.
- Osteoporosis results in 1.5 million fractures per year in the U.S., with the vast majority of these occurring in postmenopausal women.
Osteoporosis and Dental Treatment

- The potential morbidity and mortality associated with osteoporosis-related fracture is considerable and treatment with anti resorptive agents outweighs the low risk of ONJ in patients with osteoporosis receiving these drugs.
- A 2011 ADA CSA report provides potential treatment management strategies based on expert opinion for patients receiving these drugs for osteoporosis indications and also recommends that “An oral health program consisting of sound hygiene practices and regular dental care may be the optimal approach for lowering risk” in these patients.
Osteoporosis Medications

• Mechanism of action
  – Bone remodeling relies on a balance of osteoclastic (cells that resorb bone) and osteoblastic (cells that build bone) activity
  – Anti resorptive agents suppress bone resorption by binding to active sites of bone remodeling and inhibiting osteoclasts
  – Numerous medications are FDA approved for the treatment or prevention of postmenopausal osteoporosis in women, osteoporosis in men, or osteoporosis that is related to drug therapy

• There are two classes of anti resorptive drugs approved by the U.S. Food and Drug Administration (FDA) for use in osteoporosis:
  – Bisphosphonates
  – RANKL inhibitors
Osteoporosis Medications

• Common IV Bisphosphonates
  – Alendronate sodium
  – Ibandronate sodium
  – Risendronate sodium
  – Zoledronic acid

• Common Oral Bisphosphonates
  – Fosamax (alendronate, Merck)
  – Fosamax Plus D (alendronate, Merck)
  – Didronel (etidronate, P&G)
  – Actonel (risedronate, P&G)
  – Boniva (ibandronate, Roche)

• Rankl Inhibitors
  – Denosumab (Prolia) inhibits osteoclastic precursors to differentiate into mature osteoclasts.
    • Administered every 6 months as a 60-mg subcutaneous injection
  – Denosumab is also approved by the FDA under the trade name Xgeva® for use in solid cancer metastatic to bone, giant cell tumor of bone, and hypercalcemia of malignancy.
    • Administered as 120 mg subcutaneously every 4 weeks
Osteonecrosis of the Jaw (ONJ)

• Osteonecrosis of the jaw (ONJ) is a rare but serious adverse effect of anti resorptive agents
• Although ONJ is associated with bone-invasive dental procedures such as tooth extraction, it can also occur spontaneously.
  – Osteoporosis Medications: Osteonecrosis of the Jaw
  – www.ada.org/member-center/oral-health-topics/osteoporosis-medications 2016 update
Osteonecrosis of the Jaw (ONJ)

- ONJ associated with use of anti resorptive drugs such as Bisphosphonates and Rankl inhibitors is referred to as “Medication-related ONJ” or “MRONJ”
- Mechanism not clearly understood but perhaps caused by suppression of bone turnover and remodeling impairs the body’s ability to repair microfractures in the maxilla and mandible.
- Patient history and clinical examination remain the most sensitive diagnostic tools for MRONJ
  - Exposed bone in mouth > 6 weeks after surgery
- Differential diagnosis includes:
  - Gingivitis/periodontitis
  - Alveolar osteitis
  - Sinusitis
  - Periapical pathology
- Bone markers to evaluate bone turnover
  - CTx
- Incidence of MRONJ varies
  - IV medication 1-10%
  - Oral medication .001% - .01%

- Risk Factors
  - Receiving the anti resorptive agents at higher dosages and more frequent treatment schedules associated with cancer-related indications, as compared with those for prevention/treatment of osteoporosis
  - >65 years
  - Periodontitis
  - Poor oral hygiene
  - Dentoalveolar surgery
  - High dose or prolonged use of anti resorptive drugs for > 2 years
  - Smoking
  - Malignant disease (Multiple myeloma and breast, prostate, and lung cancer)
  - Chemotherapy, corticosteroid therapy
  - Dentures
  - Diabetes
# ONJ Staging and Treatment

<table>
<thead>
<tr>
<th>BRONJ</th>
<th>Clinical condition</th>
<th>Treatment Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk stage</td>
<td>No evidence of necrotic bone in asymptomatic patients who have been treated with IV or oral bisphosphonates.</td>
<td>No treatment indicated, patient education</td>
</tr>
<tr>
<td>Stage 0</td>
<td>No clinical evidence of necrotic bone, but non-specific clinical findings and symptoms.</td>
<td>Systemic administration, including the use of pain medication and antibiotics.</td>
</tr>
<tr>
<td>Stage 1</td>
<td>Asymptomatic exposed necrotic bone without soft tissue infection.</td>
<td>Antimicrobial mouthwashes (ie, chlorhexidine 0.12%, hydrogen peroxide), no surgical treatment is indicated, clinical follow-up.</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Presence of symptoms around the area of necrotic and exposed bone associated with pain, soft tissue inflammatory swelling or secondary infection.</td>
<td>Antimicrobial rinses (ie, chlorhexidine 0.12%), systemic antibiotics or antifungals (infections may exacerbate BRONJ), pain control, and superficial debridement to relieve soft tissue irritation.</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Presence of a pathological fracture (not related to metastatic disease), necrotic and exposed bone with associated infection, pain, and at least one of the following: pathologic fracture, extraoral fistula, oral antral/oral nasal communication osteolysis extending to the inferior border of mandible.</td>
<td>This stage of necrosis usually requires surgical debridement/resection to reduce the volume of necrotic bone in addition to conservative measures of analgesics, culture directed oral/intravenous antibiotics and oral antimicrobial rinses (ie, chlorhexidine 0.12%).</td>
</tr>
</tbody>
</table>
Use of the CTX biomarker

- In the early 2000s, a link between 
  **bisphosphonate** use and impaired bone physiology was noted.
- The strong inhibition of **osteoclast** function precipitated by bisphosphonate therapy can lead to inhibition of normal bone turnover, leading to impaired wound healing following trauma (such as dental surgery) or even spontaneous non-healing bone exposure.
- Because bisphosphonates are preferentially deposited in bone with high turnover rates, it is possible that the levels of bisphosphonate within the jaw bones are selectively elevated.
- In order to evaluate the risk of osteonecrosis for a patient taking bisphosphonates, use of the CTX biomarker was introduced in 2000 by Rosen.

  - **CTX <= 100 pg/ml:** HIGH risk
  - **CTX = 101-150 pg/ml:** Moderate risk
  - **CTX >= 150 pg/ml:** Low risk

- the serum CTX marker was chosen because it is both highly correlated to bone turnover rate and already available for detection in a laboratory test carried out by a major lab testing corporation.
- Actual normal values are usually well over 300 pg/mL and are most commonly 400 pg/mL to 550 pg/mL in patients not taking bisphosphonates.
- Lower values represent varying degrees of suppression of normal bone turnover.
- Patients who are placed on a 6-month **drug holiday** exhibit marked improvements in their serum CTX values; in one study, patients showed an improvement of 155.3 pg/mL over 6 months or a rate of 25.9 pg/mL each month.

**Note:** Serum CTx levels have not shown reliability or accuracy in predicting risk for ONJ.
Summary and Guidelines

Osteoporosis Medications: Osteonecrosis of the Jaw

www.ada.org/member-center/oral-health-topics/osteoporosis-medication 2016 update

- Anti resorptive therapy does not appear to be a contraindication for dental implant placement; however, larger and longer-term studies are needed to determine if implants placed in patients exposed to antiresorptive agents perform as well as those placed in patients who have not been exposed to these agents.
- It is appropriate to discuss therapy as related to patient’s oral health with physician.
- Discontinuation of antiresorptive therapy should be a medical decision based primarily upon the risk for skeletally related events (fractures) secondary to low bone density, NOT the potential risk of ONJ.
- Risk continues to increase with therapy >2 years.
- Complete needed dental rehabilitation before anti resorptive therapy.
- Utilize chlorhexidine rinse until wound healing complete.
- Endo preferable to extractions.
- Adjust prosthetic appliances for fit.
- Conservative manipulation of hard and soft tissue.
- Trial segmental approach has not been studied in perspective fashion, it should help limit the extent of ONJ in a given patient.
- Antimicrobials and antibiotics.
- Extractions or dento-alveolar surgeries required on the basis of dental or medical emergency are appropriate, regardless of number and multifocality.
- Dental implant assessment of oral vs. IV anti resorptive medication.
- No dental surgery/treatment strictly contraindicated although treatment plans that minimize periosteal and/or intrabony exposure or disruption are preferred.
Allograph Block Augmentation
Oral Bisphosphonate Patient
Allograph Block Augmentation
Oral Bisphosphonate Patient
Dental implants in irradiated jaws: A literature review

Kanchan P Dholam, Sandeep V Gurav
Department of Dental and Prosthetics Surgery, Tata Memorial Hospital, Mumbai, India

Factors which contribute to the success of implants in radiated patients are:

- careful selection of patients after evaluating the clinical conditions and results following surgery, reconstruction, radiation, prognosis and the cost factor.
- Insertion of implant should be undertaken after one year of radiation and attachment of abutment and prosthesis fabrication after six months of insertion of implant.
  - This period is necessary to achieve osseointegration after receiving radiation.

The implant success rate is higher in the mandibular symphyseal region followed by the mandibular posterior region and least maxilla.

Most of the studies are on titanium implants. The hydroxyapatite coated implants are also found to be successful mainly because of its rough surface and the osseoconductive properties of hydroxyapatite.

Advanced dental implant surfaces like TPS [titanium plasma spreaded], SLA [sandblasted and acid etched], Ti-Unite and different implant materials like zirconia [zirconium oxide] have showed comparable results in non irradiated bones but long-term evaluation and studies are required to judge their survival rate in irradiated bones.
Dental implants in irradiated jaws: A literature review

Kanchan P Dholam, Sandeep V Gurav
Department of Dental and Prosthetics Surgery, Tata Memorial Hospital, Mumbai, India

- Fabrication of over denture in radiated jaw and fixed denture in microvascular grafted jaw is advocated.
  - Insertion of implants should be preferably done in microvascular grafted jaws
  - Placement of a minimum number of implants is advocated. Prosthesis can be fabricated on two implants
  - To assess the effects of HBO treatment on acceleration of osseointegration, more randomized trials are required
  - Increased failure rates are observed when the radiation dose exceeds 45Gy.
    - 45 Gy = 4500 Rads
    - 1 Rad = .01 Gray
Pharmacology in Implant Dentistry

There is no consensus on a prescribing pharmacologic protocol used in implant dentistry today.

Antimicrobial therapy is an essential component of surgical procedures to prevent infection.

Most common antimicrobials in implant dentistry:
1. Antibiotics
2. Antimicrobial rinses

Antibiotic therapy
1. Prophylactic (prevent infection)
   1. No consensus
   2. Several studies have concluded there is benefit of preoperative antibiotics for dental implantology
      1. 4.6% failure vs. 10% failure
2. Therapeutic (treat infection)
### American College of Surgeons

**Classification of Operative Wounds and Risk of Infection**

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| Class 1    | Clean (<2%)                                      | Elective non-traumatic surgery  
No acute inflammation  
GI, respiratory, and biliary tract not entered |
| Class 2    | Clean-Contaminated (10 – 15%)                    | Elective opening of GI, respiratory, and biliary tracts  
Elective dental implant and bone procedures (<1% with proper surgical technique and antibiotic prophylaxis) |
| Class 3    | Contaminated (20 -30%)                           | Inflammation with gross spillage from GI and biliary tracts                   |
| Class 4    | Dirty (50%)                                      | Established clinical infection, perforation of respiratory, GI, and biliary tracts |

- **Prophylactic use of antibiotics for procedures with significant risk for postoperative antibiotics**
- **Factors associated with risk of infection**
  - **Systemic factors**
    - Diabetes, smoking, obesity, etc.
  - **Local factors**
    - Periodontal disease, odontogenic infection
  - **Surgical**
    - Skill, length of procedure, aseptic technique
Prophylactic Antibiotics for Implant Surgery

- Principle I:
  - Appropriate antibiotic for procedure
    - Ideal Antibiotic should be effective against the bacteria most likely to cause infection
      - Aerobic Gram + cocci
      - Anaerobic Gram + cocci
      - Anaerobic Gram – rods
        - Oral infections mixed anaerobes: aerobes (2:1)
    - Use antibiotic with least amount of adverse effects
      - Nausea
      - Allergic reactions

- Principle 2:
  - Antibiotic should be ideally bactericidal
    - Less reliance on host resistance
    - Bacteria may be destroyed by antibiotic alone
    - Faster results
    - Better flexibility with dosage intervals
Prophylactic Antibiotics for Implant Surgery

• Principle 3:
  • Appropriate tissue concentration of antibiotic should be present at time of dental surgery
  • X2 therapeutic dose of antibiotic at least 1 hour prior to surgery

• Principle 4:
  • Healthy Patient
    – Continuation of antibiotic after surgery does not decrease rate of infection
    – A single dose of antibiotic is sufficient
    – ASA I
  
  • High Risk Patient
    – Longer dose of antibiotic
    – ASA II or >
Prophylactic Antibiotics for Implant Surgery

- Amoxicillin
  - Drug of choice
- Cephalexin
  - non-anaphylactic allergy to penicillin
- Clindamycin
  - anaphylactic allergy to penicillin
- Augmentin
  - Sinus involvement procedures
- Levaquin
  - History of taking antibiotics within past 4 weeks

- A literature review suggests that a prophylactic antibiotic regimen reduces failure of dental implants placed under ordinary conditions
- However, there are no apparent differences in the occurrence of postoperative infections in patients receiving or not receiving antibiotics
- The results have to be interpreted with caution due to the presence of several cofounding factors in the studies

Evid Based Dent. 2015 Jun;16(2):52-3. doi: 10.1038/sj.ebd.6401097.
Antibiotic prophylaxis for dental implant placement?
Keenan JR¹, Veitz-Keenan A²
Prophylactic Antibiotics for Implant Surgery
Most Common in Implant Dentistry

- **Beta Lactams Antibiotics**
  - Inhibit bacterial cell walls synthesis
- **Penicillin**
  - Good absorption
  - Broad Spectrum
    - Most Strep; oral anaerobes
  - Prone to resistant bacteria
- **Amoxicillen**
  - Drug of choice
  - Superior absorption
  - Very low toxicity
  - Broad spectrum (> PCN)
- **Augmentin**
  - Very practical for sinus augmentation procedures
  - Inactivates PCN resistant bacteria
- **Cephalexin**
  - Use when Non-anaphylactic sensitivity to PCN
  - Similar spectrum to Amoxicillen
  - Greater resistance to Beta Lactamase destruction (Staph Aureus)
- **Clindamycin**
  - Use when anaphylactic allergy to PCN
  - Primarily active against anaerobes
  - Bacteriostatic
    - Diarrhea (20-30%)
- **Levaquin**
  - History of taking antibiotics in past 4 weeks
- **Macrolides**
  - Biaxin (Clarithromycin)
    - Less nausea
  - Zithromax (Azithromycin)
    - Effective against H. Flu
- **Tetracycline**
  - Wide spectrum
  - High degree of bacterial resistance
  - High incidence of Candidiasis
- **Metronidazole**
  - Bactericidal
  - Anaerobic infections
  - + PCN severe infections
Complications of Antibiotics for Implant Surgery

- GI complications
  - Pseudomembranous Colitis
  - Caused by C. Difficile (intestinal flora)
  - Most common treatment: Vancomycin, Metronidazole

- Resistant strains
  - Takes at least 3 days of antibiotic use
  - Short term use (1 day) little effect

- Cross reactions
- Allergic reactions
  - Rash 1-3%
  - Anaphylaxis .01 - .04 %
Antibiotics Used in Implant Dentistry

• Beta-Lactams:
  – Inhibit bacterial cell wall synthesis
    • Penicillin V
      – Good absorption
      – Effective against:
        » Most Strep. Species and Oral anaerobes
        » Disadvantage
          • Compliance QID
          • Prone to resistant bacteria
• Amoxicillin
  – Superior absorption to PCN
  – Excellent tissue diffusion in infected areas
  – Broad-spectrum > PCN

• Augmentin
  – Effective against penicillinase bacteria
  – Very practical perioperative antibiotic for sinus augmentation
• Cephalexin
  – Similar to amoxicillin
  – Advantage: not susceptible to beta-lactimase (S. Aureus)
  – Cross reactivity with penicillin (8 – 18%)
Antibiotics Used in Implant Dentistry

- **Macrolides:**
  - Most common used in dentistry
  - **Erthromycin**
    - Bacteriostatic
      » Not ideal first choice
    - Effective against
      » Strep., Staph., and some anaerobes
    - Excellent absorption but affected by food consumption
    - High incidence of nausea
    - Numerous drug interactions

- **Azithromycin (Zithromax)**
  - Less nausea than Erythromycin
  - Better Gram activity
  - Effective against H. Influenza
Antibiotics Used in Implant Dentistry

• Clindamycin
  – Active against:
    • Anaerobes primarily
    • Aerobes Strep and Staph
    • Bacteriostatic in normal doses
    • Disadvantage: Diarrhea in 20-30% of patients treated
      – If persist > 3 days seek medical consult
    • Can also cause pseudomembranous colitis (PMC)

• Tetracyclines
  – Wide-spectrum activity
    • Strep., Staph., oral anaerobes, G- rods
    • High degree of bacterial resistance
    • Primary agents for treating implant diseases and infections
    • Disadvantages: high incidence of Candida
Therapeutic Use of Antibiotics:  
Post Operative Infection

• Acute post-op infections
  – 3rd to 4th day after surgery
  – Pain, inflammation, bleeding, exudate
  – Fever, headache, nausea, muscle aches, vomiting, weakness

• Treatment
  – Broad-spectrum beta-lactam (7 days)
    • Amoxicillin
      – 1 g stat
      – 500mg TID x 7 days
    • Clindamycin (if allergic)
      – 600 mg stat
      – 300 mg TID x 1 week

• Surgical drainage
• Systemic antibiotics
• Chlorhexidine Gluconate
  – Germicidal mouthwash
  – ½ oz. BID x 2 weeks
Antimicrobial Rinse
Chlorhexidine

- Reduce plaque accumulation
- Enhance mucosal health
- Improve soft tissue healing
- Prevent alveolar osteitis
- Tissue healing after extractions
- Reverse peri-implantitis
- No adverse effects on implants

- Patient pre-surgical rinse
- Reduction of infectious complications
- Surface antiseptic
- Post-surgical rinse BID until incision closed
- Peri-implant maintaining on daily basis
- Treatment of post-operative infections
Sinus Augmentation in Implant Dentistry

- A sinus lift is done when there is not enough bone height in the upper jaw, or the sinuses are too close to the jaw, for dental implants to be placed.
- The bone is added between the jaw and the maxillary sinuses.
- To make room for the bone, the sinus membrane has to be moved upward, or "lifted."

- Lateral

- Crestal
Sinus Augmentation in Implant Dentistry Assessment

- **Step 1**
  - **Preventative-diagnostic** step aimed at excluding any naso-sinus diseases that may lead to failure of surgery

- **Step 2**
  - **Preventative-therapeutic** step aimed at correcting any pathological findings that represent reversible contraindications to sinus lift

- **Step 3**
  - **Diagnostic-therapeutic** step (if necessary) aimed at ensuring the prompt diagnosis and appropriate treatment of any sinus lift-related complications
Sinus Augmentation in Implant Dentistry Assessment

Step I Preventive-Diagnostic

- History to identify
  - Previous trauma or surgery
  - Nasal respiratory obstruction
  - Chronic naso-sinus disease
  - Periapical diseases
  - Smoking, cocaine use

- Conventional radiographic imaging
  - 73% reliable
  - CT extremely useful in managing implant surgery when naso-sinus diseases are suspected

- Any patient with evidence suggesting sinus dysventilation should undergo ENT examination with nasal endoscopy and CT in order to identify any possible contraindications to sinus lifting

- Nasal endoscopy allows direct visualization of the OMC to detect factors impairing maxillary sinus drainage which might result in negative surgical outcome

- Good medico-legal step for surgeon
Sinus Augmentation in Implant Dentistry Assessment

Step I Preventive-Diagnostic

- Pre-operative evaluation with CT decreases risk of surgical complications
  - Patency of OMC
  - Assess horizontal and vertical dimensions
  - Septa
  - Pathology
    - Polyps, membrane thickness
Sinus Augmentation in Implant Dentistry Assessment

Step I Preventive-Diagnostic

- The **ostio-meatal complex**, is a common channel that links the frontal sinus, anterior and middle ethmoid sinuses and the maxillary sinus to the middle meatus that allows air flow and mucociliary drainage
- Blockage leads to accumulation of mucin and increase antral pressure
- Post operative symptoms of overpacking
  - Headache, sinus congestion, discharge
  - Radiographic evidence
Maxillary Sinus Lift Contraindications

- **Irreversible (Absolute Contraindication)**
  - Permanent anatomical impairments of the nasal walls and/or naso-sinus mucosa
    - Post traumatic or post surgical scars
  - Inflammatory-infective processes that cannot be resolved because associated with congenitally impaired muco-ciliar clearance
    - Cystic fibrosis
  - Systemic granulomatosis diseases
    - Sarcoidosis
  - Benign and malignant neoplasms that interfere homeostasis before and after treatment

- **Reversible (proceed if reversed by appropriate medical or surgical treatment)**
  - Limited impairments of the maxillary sinus drainage pathways
    - Septal deviation
  - Acute viral or bacterial sinusitis
  - Oro-antral fistula not associated with a wide bone gap and after surgical closure
  - Benign sinus neoplasms that impair drainage pathways, removal of which can restor sinus homeostasis
    - Mucous cysts, polyps
Sinus Augmentation in Implant Dentistry Assessment
Step II Medical Therapy and Endoscopic surgery

• Functional Endoscopic Sinus Surgery (FESS)
  – Gold standard for many naso-sinus conditions amenable to surgery
  – Procedure to restore physiological maxillary sinus clearance and ventilation

• Septal Surgery
  – Correct septal deviations
  – Can be performed at same time as FESS

• Medical therapy
  – Management of acute sinusitis
    • NSAIDS
    • Short term decongestants
    • Antibiotics if patient condition fails to improve within 7 days
      – Cephalosporins drug of choice
        » Systemic steroids not supported by evidence
Management of Maxillary Polyps

- It is considered mandatory to respect the natural homeostasis of the maxillary sinus and to perform surgery in the presence of an efficient ciliary movement, a normal sinus mucosa and a patent sinus ostium
  

- In the absence of one or more of these natural defense mechanisms, the risk for developing complications after a sinus lift procedure becomes much more consistent

CT scan shows bilateral mucous cysts in maxillary sinuses (in particular on right side) and a concha bullosa of the right middle turbinate, which represent contraindications to the sinus grafting procedure needed for implant placement, due to risk of ostium obstruction and secondary sinusitis.
Management of Maxillary Polyps

- FESS allows enlargement of ostium and removal of cyst (left side)
- In the same surgical session, it is now possible to proceed with a sinus grafting procedure
  - Delayed grafting is recommended in many cases
Sinus Augmentation in Implant Dentistry Assessment
Step II Oral-antral Fistula (OA)

- Incidence of OA fistula after extraction of maxillary teeth reported as 5-25%
- OA fistulas must be surgical repaired prior to sinus lift surgery to obtain a disease-free sinus environment
- Successful closure of OA fistula depends on the histological status of the maxillary sinus

- Sinus lift can be considered after OA fistula closed and healed depending on the local situation and residual bone gap
Sinus Augmentation in Implant Dentistry Assessment
Step III Diagnosis and Therapy: Management of Complications

• Early complications
  – Tearing of Sinus membrane
    • Small better than large
  – Intra-surgical displacement of implants into maxillary sinus
  – Dehiscence of the oral surgical wound with AO fistula formation
  – Hematomas
  – Maxillary sinusitis
    • Most frequent
  – Bone sequestration

• Post-operative maxillary sinusitis
  – Lack of asepsis during surgery
  – Dysventilation of the maxillary sinus, (OMC obstruction, as a result of mucosal edema
  – Infection of non-vital bone fragments floating into the sinus
  – Previous undetected disease
Sinus Augmentation in Implant Dentistry Assessment
Step III Diagnosis and Therapy: Management of Complications

• General guidelines to prevent post operative sinusitis
  – Peri-operative antibiotic prophylaxis
  – Consider topical corticosteroids to ensure OMC patency

• In presence of post-operative infection
  – Early intervention to avoid loss of graft or major complication such as septic thrombosis
  – Post operative CT also useful (radiolucency associated with graft)
Sinus Augmentation in Implant Dentistry Assessment
Step III Diagnosis and Therapy: Management of Complications

- If medical therapy fails to control post operative sinus infection
  - Trans-nasal endoscopy to establish maxillary drains for sinus irrigation
  - Surgical curettage by FESS, intraoral, or both to remove all graft material and implants
  - Some have successfully used alternative treatments such as partial resection of the grafts
Management of Post-operative Complications

- Post-operative complications relatively rare (2%)

- Swelling and hematoma formation
  - Cheek and under eye
  - NSAID recommended
  - Steroid may be used

- Infection
  - Use of antibiotics before and after procedure are standard
  - Amoxicillin/Glavulanic acid (Augmentin 875/125 BID)

https://www.youtube.com/watch?v=Gu4vtVUomBs#action=share
Sinus Augmentation in Implant Dentistry

Complications
Sinus Migration of Dental Implant

• Non-surgical Etiology
  – Incorrect prosthesis design
  – Overload
    • Extended cantilever
  – Ill-fitting prosthesis
    • Misfit between abutments/implant platform
  – Para-function
  – Graft resorption
    • Subclinical infection
      – Retrograde sinusitis
Sinus Augmentation in Implant Dentistry

• Residual bone height (RBH) measurement is a key determinant when choosing the most appropriate approach for sinus elevation. (Sinus Consensus Conference of 1996)

• Class A (SA-1)
  – > 10 mm, for which the classic implant protocol could be followed.

• Class B (SA-2)
  – 7 mm to 9 mm, for which a crestal technique could be performed with simultaneous implant placement.

• Class C (SA-3)
  – 4 mm to 6 mm, which would require a lateral approach with delayed or immediate implant placement.

• Class D (SA-4)
  – When there is only 1 mm to 3 mm of bone, a lateral approach with delayed implant placement is recommended
Sinus Augmentation in Implant Dentistry

Class A (≥ 10 mm) and Class B (7-9 mm)

• Class A (SA-1)
  – ≥ 10 mm, for which the classic implant protocol could be followed.

• Class B (SA-2)
  – 7 mm to 9 mm, for which a crestal technique could be performed with simultaneous implant placement.

• Initial osteotomy 1 – 2 mm below sinus floor
Sinus Augmentation in Implant Dentistry

Class A (> 10 mm) and Class B (7-9 mm)

- Small increments of graft material into osteotomy
- Advance osteotome to same position to displace graft material and expand apical area of sinus floor
Sinus Augmentation in Implant Dentistry

Class A (> 10 mm) and Class B (7-9 mm)
Crestal

- Treatment Plan
  - Extraction tooth #4
  - Osteotome Assisted Sinus Floor Elevation Graft
Sinus Augmentation in Implant Dentistry
Class A (> 10 mm) and Class B (7-9 mm)
Crestal

Shilpa Kolhatkar, DDS, MDS; Leyvee Cabanilla, DDS, MSD; and Monish Bholia, DDS, MSD
Sinus Augmentation in Implant Dentistry

Class A (> 10 mm) and Class B (7-9 mm)

Crestal
Sinus Augmentation in Implant Dentistry

Class A (> 10 mm) and Class B (7-9 mm)
Sinus Augmentation in Implant Dentistry

- **Class C (SA-3)**
  - 4 mm to 6 mm, which would require a lateral approach with delayed or immediate implant placement.

- **Class D (SA-4)**
  - When there is only 1 mm to 3 mm of bone, a lateral approach with delayed implant placement is recommended.
Sinus Augmentation in Implant Dentistry
Class C (4-6 mm) and Class D (1-3 mm)
Sinus Augmentation in Implant Dentistry

Class C (4-6 mm) and Class D (1-3 mm)
Sinus Augmentation in Implant Dentistry

**Anatomy**

Mean width of maxillary sinus = 15.2 mm at 10 mm height

<table>
<thead>
<tr>
<th>Table 1. Proposed Maxillary Sinus Classification Based on Buccopalatal Distance as Measured on CAT Scan Images</th>
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</thead>
<tbody>
<tr>
<td><strong>Narrow Sinus</strong></td>
</tr>
<tr>
<td>Quicker bone regeneration</td>
</tr>
<tr>
<td>Narrow sinus width &lt;15.2 mm</td>
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<tr>
<td>More blood supply area</td>
</tr>
<tr>
<td>Short healing time</td>
</tr>
<tr>
<td>Simultaneous implant placement</td>
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</table>
Sinus Augmentation in Implant Dentistry

Blood Supply

• Maxillary Artery Branches
  – Posterior Superior
  – Infraorbital
  – Posterior Lateral Nasal
    • Medial Wall Supply

Vital Bone Formation

• Sinus Anatomy
  • Medial wall Important role in vital bone formation
  • Closer the medial and lateral wall the better the blood supply

• Schneiderian membrane
  – Important to elevate off medial wall to increase blood supply
Sinus Augmentation in Implant Dentistry

Blood Supply (External Carotid)
Sinus Augmentation in Implant Dentistry

Blood Supply (Maxillary)

FIGURE 6-9 Pathway of the maxillary artery (except those branches to nasal cavity and palate).
Sinus Augmentation in Implant Dentistry

Blood Supply (Maxillary)

(a) Lateral wall of cavity

(b) Nasal septum
Sinus Augmentation in Implant Dentistry

Complications

Bleeding

- Bleeding
  - 20% of lateral window osteotomy sites
  - Location usually 11 mm – 18 mm from alveolar crest
  - Infra- orbital and PSA artery anastomosis
  - intra-osseous or partially intra-osseous
    - < 1 mm diameter 50%
    - 1 – 2 mm 40%
    - 2 – 3 mm 4%
    - > 3 mm 6%
Sinus Augmentation in Implant Dentistry

Complications
Bleeding

- Elevate membrane without disturbing vessel
- Inject bone at bleeding site
- Crush bone
- Electrocautery
- Bone Wax
- Packing
Complications
Sinus Membrane Perforation

• Relatively common due to thin lateral walls, thin membranes, irregular boney anatomy
  – Occurs in 7-10% to 35% of sinus floor elevation procedures (Khoury 1999; Nkenke et al. 2002; Stricker et al. 2003; Schwartz-Arad et al. 2004; Shlomi et al. 2004)

• Membrane perforations are strongly associated with postoperative complications
  – Acute or chronic sinus infection
  – Bacterial invasion, wound dehiscence and loss of graft material
  – Disruption of normal sinus physiologic function
Management of Sinus Perforation

- Repair techniques include use of resorbable collagen membranes over peroration before placement of graft
- Important to elevate membrane around perforation
- Larger repairs more difficult and might include extension of membrane outside of site to superior aspect of osteotomy window

Graft is dome shaped indicated successful repair of membrane perforation
Sinus Augmentation in Implant Dentistry

Complications

Paroxysmal Positional Vertigo

- (BPPV) is a common vestibular disorder resulting in temporary vertigo associated with head movement
- The symptoms can be produced by rolling the head while the patient lies in a supine position.
- Most likely caused by dislodging otoliths in the inner ear by force trauma.
- When a patient is in a supine position, these “ear stones” float around the cochlear cilia and give the impression that the patient is moving.
- Benign Paroxysmal Positional Vertigo (BPPV) usually resolves within a few weeks and is often managed by and ENT with sedatives and positional exercises.
- If symptoms persist, it is prudent to check the patient for Battle’s sign, CSF otorrhea, or radiographic detection of linear midface fractures.

- Osteotome on a patient can cause vertigo or concussion
- Whenever possible, try to mitigate the effects of mallet pressure on the sinus floor and make sure you are at mid-sinus, not angled towards the medial or lateral wall.
- Other crestal approach techniques might be less traumatic
  - Motorized
  - Hydraulic
Thank You!