SYSTEMIC DISEASES AND THEIR DENTAL IMPLICATIONS FOR THE ELDERLY MEDICALLY COMPLEX PATIENT

Jennifer Hartshorn DDS

CONFLICT OF INTEREST

None

Goals:

• Become a physician of the oral cavity.
• Review new research and recommendations for managing complex health histories

CONTACT INFORMATION

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Department of Preventive and Community Dentistry

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PHYSICIAN OF THE ORAL CAVITY

- Medical consultation - requests specific information from the physician.
- Dentist determines the risks vs benefits for each procedure
- Provide appropriate clinical management

MEDICAL CONSULTATION

- Physicians
  - Don't fully understand what is involved in dental procedures (extractions)
  - Can give medical clearance
    - Not legally responsible for outcomes
- Dentists
  - Legally responsible for what happens during dental procedures.
  - When seeking clearance
    - Ask specific questions (no open ended questions)
    - Gather information to help you make a decision

MEDICAL CONSULTATION

Dear Dr. Smith,

John Doe (DOB 02/04/45) a mutual patient of ours presented with multiple accessed teeth. The plan is to extract 4 lower teeth utilizing local anesthetics only. I anticipate that the surgery will be routine and bleeding and can be controlled by local measures without a drug holiday.

Please fax/send the following information by 2/14:

- Most recent history & physical
- Medication list
- Recent hospitalization(s)
- Target Hb =

Proposed dental surgery plan:

- Cardiac, stress reduction, and bleeding protocols will be in place.
- Blood will be taken in office immediately prior to surgery.
- Anticoagulation (AICCI/Anticoagulation) given 1 hour before surgery.

If you have any concerns with my proposed plan, please contact me directly.

Dr. Sarah Dirks
Geriatric General Dentist
Texas
**Periodontal Disease**

- Incidence
  - 30-45 years old – 11%
  - >50 years – 80%
- Acute
  - Periodontal pathogens → cytokines (inflammatory mediators) production → vasodilation of local blood vessels
  - Gingival bleeding and erythema
  - Vasodilation brings in neutrophils and macrophages to clear the bacteria
- Chronic
  - Neutrophils and Macrophages fail to clear bacteria
  - Continuous cyclic chronic inflammatory process
  - Recurrent bacteremia and inflammatory mediators spill over into the systemic blood flow

**Periodontal Disease and Coronary Artery Disease**

- CRP (inflammatory marker) produced in the acute stage Periodontal disease
  - Can raise the serum concentration a hundredfold or more.
- CRP is an indicator for vascular events
  - Detected in the blood 48 hours before cardiovascular event (MI or ischemic stroke)
  - CRP stimulates the clotting cascade
    - Stimulates the complement cascade → exacerbates inflammation
  - Inflammatory mediators contribute to endothelial and vascular dysfunction
  - Periodontal pathogens could initiate and perpetuate atherosclerosis
PERIODONTAL DISEASE AND MI

- Large Case-Control study Sweden (~1,600 patients)
  - Risk of MI was significantly increased among subjects with moderate to severe periodontitis (OR 1.49)
- Pt with untreated Periodontitis → gram negative bacteria found inside atheroma
- Elevated CRP levels in patients with chronic periodontitis and w/o cardiovascular event history

Ryden et al. 2016

PERIODONTAL DISEASE AND DIABETES

- Bacteremia
  - Stimulates immune system
  - Macrophages sent to eliminate bacteria
  - Hyperglycemia causes an exaggerated macrophage response which leads to further destruction of periodontal tissue
- Inflammatory markers
  - Enter systemic circulation and interfere with the function of insulin receptors
- Treatment
  - Good glycemic control can improve periodontal conditions in the absence of SRP
  - SRP can reduce the HbA1c 0.4-2% for the following 3-9 months
    - HbA1c decreased by 1% is associated with decrease in diabetic complications (ex. death and MI)

Gurav 2016

ORAL SYSTEMIC LINK

- Periodontal Disease and Alzheimer’s Disease
  - No causal relationship
  - Clinical and epidemiological studies all agree prior loss of teeth can lead to poor memory
  - Molecular studies strongly support an association
    - Recurrent bacteremia contributes to systemic circulation infections
    - Bacteria circulating endodontically in periodontal pathogens
    - Increased inflammatory cytokines (proinflammatory)
    - Epithelial cells in the blood brain barrier are prone to circumventricular organs (area postrema, subfornical organs & lamina terminalis)
    - Epitopes reach the brain and prime the immune system to mount a local immune response which impairs memory
    - Amyloid acts as a antimicrobial peptide to combat infections as part of the immune system
    - Even low levels of amyloid can cause toxicity in the brain of healthy but susceptible individuals
    - Amyloid builds up in disease conditions
    - Neuronal inflammation cause patients to exhibit brain inflammation is the same as Alzheimer’s

Singhrao et. al 2014
PERIODONTAL TREATMENT

• Found 3-4 months following SRP inflammatory markers and antibody titer levels decreased
• SRP improves brachial artery endothelial function
• SRP has not shown to impact the incidence of cardiovascular complications
• Failed to show the diagnosis of periodontal disease predicted mortality

Anitha et. al 2015

ANTIBIOTIC PROPHYLAXIS FOR THE PROSTHETIC JOINT

STAGES OF JOINT INFECTION

• Early
  • < 3 months post-surgery—virulent organisms acquired during surgery
  • 6-12 months post-surgery—organisms with low virulence acquired during surgery
• Late
  • > 12 months post-surgery—seeding via blood
    • Creates a biofilm in a area with no autoimmune defense
    • S. aureus, streptococci, and Enterobacteria
ADA 2003 ADVISORY STATEMENT

<table>
<thead>
<tr>
<th>PATIENT TYPE</th>
<th>CONDITION PLACING PATIENT AT RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predisposing factors for rheumatic fever</td>
<td>Rheumatic fever, rheumatic heart disease, congenital heart defects</td>
</tr>
<tr>
<td>History of endocarditis with or without viral infection</td>
<td>Endocarditis, history of rheumatic fever, congenital heart defects</td>
</tr>
<tr>
<td>Predisposing factors for sepsis, endocarditis, and septicemia</td>
<td>Sepsis, endocarditis, septicemia</td>
</tr>
</tbody>
</table>

Antibiotics prior to dental appointments do reduce the risk of bacteremia following dental treatment.

2012 ADA & AAOS PANEL

The practitioner might consider discontinuing the practice of routinely prescribing prophylactic antibiotics.

Recommendations are not intended to be a fixed protocol. Practitioners must rely on their clinical judgement.

2012 GUIDELINE: DATA REVIEW

Antibiotics prior to dental appointments do reduce the risk of bacteremia following dental treatment.
2014 ADA PANEL

Management of patients with prosthetic joints undergoing dental procedures

Clinical recommendation:
In general, for patients with prosthetic joints, prophylactic antibiotics are not recommended prior to dental procedures to prevent prosthetic joint infections.

Clinical reasoning for the recommendation:
- Patients at risk for late joint infection (LJI) with prosthetic joint replacement (PJR) due to dental procedures:
  - Risk factors for LJI:
    - Prosthetic joint replacement
    - History of previous late infection
    - Other underlying medical conditions

Systemic Review
- 4 Case-Control Studies
- Moderate certainty: “No association between dental procedures and the occurrence of PJIs.”
  - 3 studies failed to show an association
  - 1 study showed dental procedures have a protective effect on PJIs.
- Unlikely that the results of additional studies would change the conclusion.

2014 ADA PANEL

Systemic Review
- 4 Case-Control Studies
- Moderate certainty: “No association between dental procedures and the occurrence of PJIs.”
  - 3 studies failed to show an association
  - 1 study showed dental procedures have a protective effect on PJIs.
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SO WHAT IS THE RISK?

Prosthetic joint replacements
- 1-2% risk of a late joint infection (LJI)
  - 95% Staph aureus or Staph epidermidis (skin or respiratory tract)
  - 4 month risk of a patient experiencing a late joint infection after a dental visit without antibiotic prophylaxis
  - (JA/AIDS 2010)
  - (JA/AIDS 2016)
  - If out of 10 LJI related to a dental procedure were in immunocompromised patients
- Diabetes and rheumatoid arthritis
- Extensive dental procedures lasting >75 minutes

Berbari et al 2010
Shkar et al 2015
Jacobsen 2016
Curry 2022
CASE REPORT 2015

- Wisconsin woman developed a LJI
- Culture: Streptococcus gordonii (oral)
- Good Oral and Dental Health
- Vigorous flossing regimen causing bleeding of gums

Klein et. al 2015

FUTURE FOR THE U.S.

- Expecting new recommendations for dental procedures & antibiotic prophylaxis
  - First year following joint surgery
  - Past history of joint infection
  - Immunocompromised
    - Rheumatoid arthritis
    - Systemic lupus erythematosus
    - Other collagen vascular disorders
    - Undergoing radiation therapy
    - Drugs: Glucocorticoids (Prednisone) or anti-neoplastics
  - Diabetes: HbA1c >8
  - White Blood Cell Count < 2,000

WHAT TO DO?

- Stress good oral hygiene
- Can Chlorhexidine reduce the risk of bacteremia?
  - RCT: Prophylaxis Chlorhexidine and Evaluation of Post-Extraction Bacteremia

Barbosa et. al 2015
BACTEREMIA POST EXTRACTION

- **Prophylaxis Test Groups**
  - Control: no prophylaxis regimen
  - 0.2% CHX mouthwash: 10ml for 1 minute
  - 0.2% CHX mouthwash and 1% subgingival irrigation: 1 minute of each
  - 0.2% CHX mouthwash and 1% supragingival irrigation: 1 minute of each
  - CHX prophylaxis was completed prior to injection of local anesthesia.

Barbosa et al. 2015

PREVALENCE OF BACTEREMIA

- 15 minutes post TE
  - Control: 23%
  - CHX MW: 4%
  - CHX MW + Sub IR: 10%
  - CHX MW + Supra IR: 27%
  - S. viridans most identified bacteria: 60-79% of groups
  - 0.2% CHX MW significantly reduced the duration of the bacteremic episode

Barbosa et al. 2015
ENDOCARDITIS

Infection of the inner lining of the heart and heart valves
- Bacteria in the blood land colonizes a diseased, damaged, or prosthetic heart valve
- Incubation period > 6 weeks
- High Morbidity and Mortality
- Oral Streptococci implicated in 35-45% of cases (range 18-65%)

AHA GUIDELINES: 2007
- Prosthetic Heart Valves
- Congenital Heart Disease
  - Unrepaired Cyanotic
  - Repaired defects with prosthetic material during the first 6 months
  - Repaired with medical defects
- Medical and Dental Procedures with risk of causing bacteremia

NICE GUIDELINES: 2008
- National Institute for Health and Clinical Excellence (United Kingdom)
  - “Antibiotic prophylaxis is no longer routinely recommended for infective endocarditis.”
  - Prosthodontics, Orthodontics, oral hygiene, or drug treatment.
- Reasons
  - Clinical effectiveness is not proven
  - Not cost effective compared with no prophylaxis
  - May lead to deaths from amphotericin
  - Emphasis on maintenance of good oral health

INFECTIVE ENDOCARDITIS

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- Incubation period > 6 weeks
- High Morbidity and Mortality
- Oral Streptococci implicated in 35-45% of cases (range 18-65%)
EVALUATION OF NICE 2008 GUIDELINES

- 2011
  - 78.6% reduction in prescribing antibiotic prophylaxis
  - Compared to March 2008
    - Total Cases Higher in 13/25 months
      - Increase by 8.3%
    - Deaths Higher in 13/25 months
      - Increase 12.3%
  - Steadily increasing long term trend of IE cases
  - Numbers appeared to be within the trend
  - Don’t know how many cases were caused by dental procedures

Source: Thornhill et. al 2011

2011 EVALUATION OF NICE 2008 GUIDELINES

If 25-45% of cases of IE were caused by dental procedures and antibiotic prophylaxis was effective, the number of cases and deaths would have expected to rise higher than 9.3% and 12.3% respectively.

Source: Thornhill et. al 2011

2015 EVALUATION OF NICE 2008 GUIDELINES

Source: Dayer et. al. 2015
2015 EVALUATION OF NICE 2008 GUIDELINES

- Temporal Association
- Can’t prove Causal Relation
- Lacks Microbiological Data
- Staph vs Strep?

2008 NICE – guidelines were reviewed
- Professor Mark Baker, Director of the Centre for Clinical Practice at NICE, said:
  - “found no need to change any of the existing guidance. In addition, NICE concludes that the longstanding increase in the incidence of IE in the UK and other countries globally is not well understood and could be due to a number of factors.”

Source: Dayer et. al 2015

What about the United States?
EVALUATION OF 2007 AHA GUIDELINES

• Evaluated Incidence of Infective Endocarditis due to Viridans Group Streptococci

• Geographically isolated
  - 1999-2013
  - 1999-2002: 3.6 cases per 100,000 people/year
  - 2003-2006: 2.7 cases per 100,000 people/year
  - 2007-2010: 0.7 cases per 100,000 people/year
  - 2011-2013: 1.5 cases per 100,000 people/year

• No significant change in incidence from 2003-2013
• Increased for ≥ 80 years old (5.6 cases per 100,000 people/year)
• 2011-2013 IE cases – none of the patients underwent dental procedures in the last 2 years

Source: DeSimone et al. 2015

EVALUATION OF 2007 AHA GUIDELINES

• Evaluated Incidence of Infective Endocarditis due to Viridans Group Streptococci

• National Inpatient Sample
  - 2000-2011
  - Increase in incidence of Infective Endocarditis
  - Staphylococcal organisms only
  - 2000-2011
  - Mean decrease in Strep Viridans
  - 182 fewer discharges/year

Source: DeSimone et al. 2015

PRESCRIBING ANTIBIOTICS

• Antibiotics
  - Amoxicillin 2g
  - Clindamycin 600mg
  - Clarithromycin 500mg
  - Azithromycin 500mg
  - More expensive and no therapeutic advantage over Clarithromycin
  - ADA: Antibiotics can be given up to 2 hours after dental procedure.
  - ADA: Switch antibiotics for multiple doses w/in 2 weeks
CARDIAC CONDITIONS

HYPERTENSION

<table>
<thead>
<tr>
<th>Stage</th>
<th>Blood Pressure</th>
<th>Dental Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>≥ 120/80 mm Hg</td>
<td>Routine Dental Care</td>
</tr>
<tr>
<td>Pre-Hypertension</td>
<td>120-139/80-109 mm Hg</td>
<td>Routine Dental Care</td>
</tr>
<tr>
<td>Stage I</td>
<td>140-159/90-109 mm Hg</td>
<td>Routine Dental Care</td>
</tr>
<tr>
<td>Stage II</td>
<td>160-179/100-119 mm Hg</td>
<td>Emergency or Non-invasive Care or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Safe if treated with medications (AHA)</td>
</tr>
<tr>
<td>Stage III or above</td>
<td>≥ 180/≥110 mm Hg</td>
<td>Contraindicated or Emergency Tx w/o epi – if the benefit outweighs the risk</td>
</tr>
</tbody>
</table>

Napeñas et al. 2015

MYOCARDIAL INFARCTION

- Wait 6 months prior to dental treatment
  - Old recommendation
  - Based on risk of cardiac events under general anesthesia
- Heart attack w/o surgery
  - Wait at least 30 days.
  - Some advocate waiting longer than 30 days but no time frame is given.
- Angioplasty and placement of stent
  - Elective surgery is not recommended in 4-6 weeks
  - Optimal: 3 months

Primarily based on expert opinion. Napeñas et al. 2015
STROKE

- Ischemic Stroke = 87%
  - Cause is atherosclerosis
  - Common in patients with history of MI and atrial fibrillation.
  - Recommendations are similar to MI
    - Wait 6 months old
    - Wait 30 days – 3 months depending on how the stroke was treated.
- Transient ischemic Attack (TIA) –
  - Risk of stroke is highest within the first 30 days.
  - Up to 17% risk of stroke is 90 days.
- Hemorrhagic Stroke = 13%
  - Cause by hypertension
  - Recommendations for dental treatment
    - Monitor blood pressure.
  - Ask follow-up questions to determine how stable the patient is.
    - What medications did your doctor put you on?
    - Did you have any stents placed?
    - When is your next doctor’s appointment?
  - Consult the physician.

INDICATIONS FOR ANTICOAGULANTS

- Atrial Fibrillation
- Artificial Heart Valve
- Coronary Heart Disease
- Peripheral Vascular Disease
- Coronary Stent
- Deep Vein Thrombosis
- Pulmonary Embolism
- Stroke

MEDICATIONS CAUSING BLEEDING

- Antiplatelet
  - NSAIDs:
    - Aspirin
  - Clopidogrel/Pletal
  - Dipyridamole/Persantine
  - Dipyridamole + Aspirin/Ragrupper
  - Prasugrel/Elent
  - Ticagrelor/Brique (Canada)

- Anticoagulants
  - Warfarin/Coumadin
  - Apixaban/Elequis
  - Dabigatran/Pradaxa
  - Enoxaparin/Lovenox
  - Ticagrelor/Brique (Canada)
  - Clopidogrel/Pletal
  - Dipyridamole/Persantine

How worried should we be?
PLAVIX AND/OR ASPIRIN

Safety of Extractions with Uninterrupted Antiplatelet Treatment

- Extractions on 111 patients
- Bite on gauze for 30 minutes
- Still bleeding = prolonged
  - Surgicel and Sutures
  - Bite on gauze for 30 minutes
- Late bleeding complications
  - Over 12 hrs

- Prolonged immediate bleeding
  - Aspirin - 2.4%
  - Plavix - 2.8%
  - Dual - 66.7%
  - All with periodontitis
  - All successfully treated with Surgicel and sutures

- No late bleeding complications

Lillis et al. 2011

COMPARISON OF INR AND POSTOPERATIVE BLEEDING

- 249 patients taking Coumadin undergoing extractions
- 12% risk of post extraction bleeding

<table>
<thead>
<tr>
<th>INR</th>
<th>1.5-1.99</th>
<th>2.0-2.49</th>
<th>2.5-2.99</th>
<th>3.0-3.49</th>
<th>&gt;3.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Bleeding</td>
<td>5%</td>
<td>12.8%</td>
<td>15.2%</td>
<td>16.6%</td>
<td>13%</td>
</tr>
</tbody>
</table>

- No significant difference
- Multiple extraction sites – only one site showed postoperative bleeding
- Association with severe periodontitis

Blinder, et al. 2001

LOCAL HEMOSTASIS WITH COUMADIN

- Continuous Warfarin treatment
- Resorbable gelatin sponge and sutures (119 extractions)
- Resorbable gelatin sponge, sutures, and tranexamic acid mouthwash (117 extractions)
- Fibrin glue, resorbable gelatin sponge, and sutures (123 extractions)

- All cases controlled with local hemostasis

Blinder, et al. 1999
LOVENOX/ENOXAPRIN

- Injectable Low molecular weight heparin (LMWH)
- 2 studies
- Bajkin et al. 2009
  - Maintained dosage for extractions
  - Post-extraction bleeding: 4.26%
  - All controlled with local hemostatic measures
- Hong et al. 2010
  - Maintained dosage for extractions
  - Immediate usage local hemostatic measures
  - Achieved stable hemostasis with all cases

NEW ANTICOAGULANTS

- Advantages
  - Rapid onset
  - Short duration of action
  - Predictable therapeutic efficacy
  - Reduced medication interactions
  - No monitoring
  - Greater safety profile
- Pradaxa/Dabigatran: October 2010
- Xarelto/Rivaroxiban: July 2011
- Eliquis/Apixaban: December 2012

- Indications
  - Reduce risk of stroke
  - Atrial fibrillation with risk of embolism
  - Prevention DVT
  - Short half life = no reversal
  - Pradaxa: 12-14 hours
  - Xarelto: 6-9 hours
  - Eliquis: 8-14 hours

PRADAXA, XARELTO, ELIQUIS

- Based off recommendations for LMWH
  - No Studies
  - Uncomplicated Extractions
    - Would not expect significant bleeding complications
    - Not necessary to discontinue medications
  - Concern for complications resulting in excessive bleeding
    - Discontinue 24 hours prior to elective surgery
    - Restart when stable clot has formed
    - Within 24 hours after extraction

- Scottish Dental Clinical Effectiveness Program
  - National Dental Advisory Committee partnered with NHS Education for Scotland
  - Low Risk of Bleeding: do not discontinue
  - Higher Risk of Bleeding Complication
    - Xarelto: normally takes morning dose
      - Example: evening dose and morning extraction
      - Delay evening dose until 6 hours after clot formation
    - Pradaxa and Eliquis: normally takes morning dose
      - Example: evening dose and morning extraction
      - Delay evening dose until 6 hours after clot formation

Firriolo et al. 2012
PROCEDURES WITH RISK OF BLEEDING

• Scottish Dental Clinical Effectiveness Program
  • Limit initial treatment and assess bleeding before continuing with treatment
  • Stage procedures with higher risk of bleeding
  • Use local hemostatic measures to control hemorrhage
    • Absorbent gauze
    • Hemostatic packing material (collagen sponge/Gelfoam)
    • Ibu/kit
    • Tranexamic acid

ASSESSING THE BLEEDING RISK

• Triple Drug Combinations – Consult physician!!!
  • Chronic renal failure – platelet dysfunction
  • Liver disease – reduced production of coagulation factors and reduced platelet function
  • Advanced liver failure – resulting liver failure
  • Hematologic malignancy – impaired coagulation and platelet function (including in remission)
  • Recent of current chemotherapy – reduced platelet numbers
  • Cytotoxic drugs (bone marrow suppression) – reduced platelet numbers and impaired liver function affecting coagulation factors
  • Selective serotonin reuptake inhibitors – potential to impair platelet aggregation
  • Cytosine arabinoside – affects liver function and bone marrow production of platelets
  • Herbal supplements – Garlic, Ginsing, Ginko, Ginger…etc

SHOULD YOU BE WORRIED?

• Dentists worry about MI, stroke and uncontrollable bleeding event
  • Predictors of increased risk of a cardiac event happening during non-cardiac major surgery (joint replacement)
    • Advanced age…………………………..major or minor predictor
    • Atrial fibrillation………………………..major or minor predictor
    • Low functional capacity…………………major or minor predictor
    • History of stroke………………………major or minor predictor
    • Uncontrolled hypertension……………major or minor predictor
  • Dental procedures have the same cardiovascular risk as…
    • Dermatology, Radiology, Ophthalmology, Rehabilitation, and Psychiatry

Eagle et. al 2002
**DIABETES IN THE ELDERLY**

- No evidence that tight glycemic control in the elderly is beneficial
- Inappropriate to use medications to lower HbA1c >7
- Higher mortality rates
- Increased episodes of hypoglycemia
- Target HbA1c
  - 5.5: Healthy individual with long life expectancy
  - 7.5-8.5: Moderate co-morbidities with life expectancy >10 years
  - 8.0-9.0: Multiple co-morbidities with shorter life expectancy

**DEMENTIA/ALZHEIMER’S DISEASE**

- Most dental considerations relate to behavior
- Prescribing Benzodiazepines (BZDPs) for increased cooperation
  - Increased half life in the elderly.
  - Recommend BZDP with no active metabolites
    - Lorazepam/Ativan: half life 16 hours
    - Triazolam/Halcion: half life 5 hours
    - Oxazepam/Serax: half life 6-11 hours
    - Avoid
      - Diazepam/Valium: half life 40-100 hours in the elderly

**BRONJ/ARONJ/MRONJ**

- Diagnosis
  - History of antiresorptive or antiangiogenic agent
  - Exposed bone that is present for more than eight weeks
- Medications
  - Oral Bisphosphonates – osteoporosis, Paget’s disease, osteogenesis imperfecta
  - Intravenous Bisphosphonates – multiple myeloma, cancer w/ bone metastasis
  - Denosumab (Prolia)
    - Reduce the risk of fractures in patients with osteoporosis
  - Reduce risk of fractures w/ metastatic bone disease
  - Antiangiogenic medications – interfere with the formation of new blood vessels
    - GI tumors, renal cell carcinoma, neuroendocrine tumors

Ruggiero et. al, 2014
OSTEOPOROSIS

- Spontaneous: 0-0.2% Risk of ONJ
- Anti-resorptive medication
  - Risk 0.15%
  - AAGB: Risk 0.5%
- Long term Oral Bisphosphonate use
  - > 4 years: 0.21% Risk of ONJ

Borges et al. 2016
Gaudin et al. 2015

CANCER PATIENTS

- IV anti-resorptive medications
  - Risk 1.6-14.8%
  - Risk 3.2%
  - Range 1.3-4.7% depending on surgical protocol
- Long term dosing:
  - Risk increases yearly
  - Risk plateau’s after 2 years

Borges et al. 2016
Gaudin et al. 2015

MRONJ RISK FACTORS

- 73% of cases occur in the mandible.
- Pre-existing inflammatory disease (periodontal disease) is a well recognized risk factor.
- Corticosteroids (Prednisone) are associated with an increased risk of MRONJ.
- Cancer patients with anemia or diabetes are associated with an increased risk.
- Tobacco has been inconsistently reported as a risk factor.
CANCER

- Questions to ask
  - Where/What kind of cancer?
  - Head and Neck
  - Bone (Multiple Myeloma)
  - Breast
  - Prostate
  - Lung
- What treatment?
  - Radiation in the head and neck?
  - Chemotherapy
    - Bone metastasis?

RADIATION IN HEAD AND NECK

- Infections
  - Systemic immunosuppression
  - Poor nutrition
- Xerostomia
- Permanent damage >5000cGy
- Osteoradionecrosis
  - >5000 cGy
  - More common in mandible than maxilla
  - Avoid bony traumatic procedures
  - Lifetime risk!!
- Taste loss
  - Some resolve in 3mo-1 year
  - Dose dependent

CHEMOTHERAPY

- Chemotherapy
- Risk for MRONJ
- Infections
  - Myelosuppression causes decrease in WBC
  - Increase sources of infection prior to starting chemotherapy
    - WBC count <4,000
- Bleeding
  - Myelosuppression causes a decrease in platelet function.
    - Platelets >50,000
- Nutrition
  - Maintain good oral function
  - Soft or liquid diet
  - Avoid acidic foods, spicy food, hot/cold foods, alcohol
**KIDNEY AND LIVER DISEASE**

- Bleeding
- Increased Risk of Infection or Spread of Infection
- Metabolism and Elimination of Drugs

**CHRONIC KIDNEY DISEASE (CKD)**

- **Cause?**
  - Glomerulonephritis
  - Diabetes
  - Severe Pyelonephritis
  - Hypertension
  - Polycystic Kidney Disease
  - Drugs (NSAIDs)
  - Connective Tissue Diseases (lupus)
  - Renal Stones

Fitzpatrick et al. 2008

**GLOMERULAR FILTRATION RATE**

<table>
<thead>
<tr>
<th>Causes of chronic kidney disease.*</th>
<th>GFR &lt; 30mL/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistent albuminuria with normal GFR</td>
<td>≤ 30</td>
</tr>
<tr>
<td>Persistent albuminuria and mildly decreased GFR</td>
<td>30-59</td>
</tr>
<tr>
<td>Moderately decreased GFR</td>
<td>15-29</td>
</tr>
<tr>
<td>Severely decreased GFR</td>
<td>6-14</td>
</tr>
<tr>
<td>Chronic renal failure</td>
<td>&lt; 6</td>
</tr>
</tbody>
</table>

* Adapted with permission from the National Kidney Foundation. Flechner, MM et al. Clinical Practice Guidelines for Chronic Kidney Disease - Glomerular Filtration Rate.

Table 1

Brockmann et al. 2010

Epocrates Drug Reference
CKD AND BLEEDING

- Platelet Defects
  - High urea levels cause platelet dysfunction
  - Kidney produces erythropoietin to stimulate formation of platelets.

- Hemodialysis
  - Recommendation: Do not see patients on days of dialysis
  - Heparin half-life 4-6 hours
  - Elimination of uremia – reducing platelet dysfunction.

Fitzpatrick et al. 2008

CKD & ODONTOGENIC INFECTION

- Chronic systemic uremia causes altered cellular immunity
- Protein restricted diets cause malnutrition
- Diminished ability to produce antibodies
- More susceptible to bacteria infection
  - No specific recommendations for antibiotic use.

Liver Disease

- Cirrhosis causes:
  - Chronic Hepatitis C
  - Alcoholic Liver Disease
  - Chronic Hepatitis B

- Tests:
  - Only show liver damage
    - AST
    - ALT

Funtiso 2006
LIVER DISEASE AND BLEEDING

- Decreased blood clotting
  - Decreased number of platelets
  - Decrease in synthesis of clotting factors
  - Increased fibrinolysis

- Increased blood clotting
  - Decreased production of inhibitors of clotting

Shah 2015

LIVER DISEASE AND INFECTIONS

- Decrease in Kupffer cell activity
  - Decreased immunoglobins

- Macrophages in the liver
  - Decreased bactericidal capacity.
  - Decreased number of complement components

Firriolo 2006

PRESCRIBING FOR LIVER CIRRHOSIS

- Caution:
  - Anesthetics (Lidocaine)
    - Relative safety
    - Use caution does necessary to achieve adequate anesthesia.
  - Benzodiazepines
    - Decreased metabolism
    - Use benzodiazepines without active metabolites (e.g. lorazepam)
  - Tylenol (ASP): max 3.0 g/day for less than 2 weeks
  - Narcotics
    - Increase dosage intervals
    - Or stop use of ASP

- Avoid
  - Clindamycin – may contribute to liver damage
  - ASA and NSAIDs: clearance is normal
    - Or use non-aspirin ibuprofen
  - Amoxicillin affects increase risk of bleeding
  - Need to avoid GI bleeding
  - Refer to drug reference for specific prescribing instructions.

Firriolo 2006
SYSTEMIC STEROID THERAPY

- Unable to support or refute the use of supplemental steroids during surgery
  - Daily maintenance dose may suffice in the majority of patients w/ adrenal suppression

- General trend from expert opinion
  - Do not provide supplementation for routine dental procedures or minor oral surgery procedure using local anesthesia
  - Reserve steroid supplementation for more stressful procedures
  - General anesthesia
  - Patient's health is poor

Napata et al 2015

QUESTIONS?

AN APPLE A DAY KEEPS THE DOCTOR AWAY

And brushing afterwards can keep the dentist away.

ENDOCARDITIS SOURCES


PROSTHETIC JOINT INFECTION SOURCES


SOURCES