Medicine and Anesthesia for the Oral and Maxillofacial Surgery Patient: A Case Based Discussion

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Introduction

Format
• Sample cases
  – Audience participation = CRITICAL
Purpose
• Discuss medical material as relates to OMFS
Unable to cover every topic in medicine
Not the expert, you may disagree with presentation, speak up
Handout

ASA classification
Risk assessment tool for patients planned for anesthesia
1. Normal, healthy
2. Mild systemic disease
3. Severe systemic disease
4. Severe systemic disease @ end stage, constant threat to life
5. Moribund
6. Brain dead (organ harvest)

Most Common Medical Diagnosis
And getting worse (bigger)!!

Obesity Incidence

UK (2013)
• 24% of men, 25% of women, 3% morbidly obese
• From 2001-2011, 11 fold increase in primary diagnosis of obesity
• Prediction that 50% of UK population obese by 2050

USA (2004)
• 34% of population is considered obese

Most Common Medical Diagnosis
Systemic Diseases of Importance by System
• Cardiovascular
• Respiratory
• Hematopoietic
• Genitourinary
• Gastrointestinal
• Neurologic
• Endocrine
• Other
BMI (modified)

<table>
<thead>
<tr>
<th>Body Mass Index</th>
<th>Classification</th>
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<tbody>
<tr>
<td>&lt;18.5</td>
<td>Underweight</td>
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<tr>
<td>18.5-24.9</td>
<td>Normal</td>
</tr>
<tr>
<td>25.0-29.9</td>
<td>Overweight</td>
</tr>
<tr>
<td>30.0-34.9</td>
<td>Obese 1</td>
</tr>
<tr>
<td>35.0-39.9</td>
<td>Obese 2</td>
</tr>
<tr>
<td>&gt;40.0</td>
<td>Obese 3 (previously morbid obesity)</td>
</tr>
</tbody>
</table>

• Morbid obesity = 100 lbs. over IBW

Pathophysiology of Obesity

- Metabolic syndrome
- Fat distribution (patient shape)
- Respiratory system
- Sleep disordered breathing
- Cardiovascular system
- Thrombosis
- Diabetes

BMI Tidbit

Uses total body weight and not estimates of lean muscle mass and fat. BMI can not determine between the overweight and the more muscular.

- e.g. 6’ 5”, 245lbs. = BMI of 29.05 = upper limit overweight. GUESS WHO?

Metabolic Syndrome

- Central obesity
  - Waist circumference greater than 88 cm in women and 102 cm in men, or waist-to-height ratio greater than 0.55
- Hypertension
- Insulin resistance
- Hypercholesterolemia

Obesity and Morbid Obesity

- Obese patients are more prone to concomitant disease.

Morbid obesity pts. more prone to:

- Diabetes
- HTN
- Sleep apnea
- GERD
- Gallstones
- Osteoarthritis
  - Heart disease
  - Cancer
  - Depression
  - Infertility
  - Urinary stress incontinence

Fat Distribution

- Not all fat is identical (peripheral vs. intra-abdominal/visceral)
- Intra-abdominal fat is highly metabolically active and is a contributor to disease states
- Visceral fat = increased perioperative risk
- Male more often visceral fat distribution (apple shaped). Women more likely peripheral fat distribution (pear shaped).
Respiratory System

- Reduced tidal volume (TV), vital capacity (VC), total lung capacity (LV), functional residual capacity (FRC)
- Significant atelectasis and shunting in dependent lung regions
- Resting metabolic rate, work of breathing and minute oxygen demand are increased
- Increased respiratory rate

Following cessation of breathing, arterial oxygen levels decrease rapidly!
- Wheeze may be due to airway closure rather than from asthma (50% of obese asthma patients improve with weight loss)

Cardiovascular System

- Increased blood pressure, blood volume, cardiac output and cardiac workload, O2 consumption, CO2 production
- If have OSA, may have pulmonary HTN and CHF
- Increased incidence of dysrhythmias (sino-atrial node dysfunction and fatty infiltration of the conducting system
  - increased relative risk of A-fib (1.5x) and sudden cardiac death.
  - Increased incidence of prolonged QT interval = increased risk with drugs like ondansetron
- Ischemic heart disease and heart failure more prevalent. Heart failure predominant risk factor for post-op comps.

Sleep Disordered Breathing

OSA
- OSA = Obstructive Sleep Apnea
  - Occurs in 10-20% of BMI > 35, often undiagnosed
  - 2 fold incidence of post-op desaturation, respiratory failure, post-op cardiac events, ICU admissions.
  - Treat with CPAP intra-op.
  - Worse with age, CV disease and LV dysfunction

Thrombosis

Obesity is a prothrombotic state!
- Increased thrombotic disorders
  - MI
  - Stroke
  - VTE (venous thromboembolism), 10x higher in obese women than healthy weight counterparts
- Previous VTE is an independent risk factor for patients having gastric bypass
- Hypercoagulable state may extend beyond two weeks post-op.

Sleep Disordered Breathing

OHS
- OHS = Obesity Hypoventilation Syndrome
  - Obesity (BMI > 35)
  - Sleep disordered breathing
  - Daytime hypercapnia (pCO2 > 6 Kpa)
- Caused by untreated OSA
- Particularly susceptible to anesthetic agents and opioids, precipitate acute and chronic hypoventilation and respiratory arrest in early postoperative period

Diabetes

Obesity strongly associated with increased insulin resistance.
- Poor glycemic control in peri-operative period is associated with increased morbidity.
- Gastric bypass causes a rapid, dramatic reduction in insulin requirement starting immediately after surgery. Be careful with reintroduction of diabetic medications, monitor blood glucose frequently.
Metabolic Syndrome of Obesity

- Abdominal obesity
- Dyslipidemia
- HTN
- Insulin resistance
- Proinflammatory state
- Prothrombotic state

Pharmacology

Body Weight

- Total body weight (TBW)
- Ideal body weight (IBW)
  - normal ratio of lean muscle to fat
  - IBW (kg) = height (cm) – x (x = 105 females, 100 males)
- Lean body weight (LBW)
  - Weight excluding fat
  - Rarely exceeds 100 kg men and 70 kg women
- Adjusted body weight (ABW)
  - ABW = IBW + 0.4(TBW - IBW)

Drug Dosing

- Excess weight is mostly fat with low blood flow
- Lipophilic drugs will have a larger volume of distribution than hydrophilic ones
- Generalizations are difficult

Rec. = Initial doses should be on lean or adjusted body weights and dose to affect

- Because of redistribution, obese patients increased rate of awareness under anesthesia when neuromuscular blockade used

Perioperative Considerations

- The vast majority of obese patients presenting for surgery are relatively healthy and therefore their risk is similar to that of patients of normal weight
- High risk patients are those with central obesity and metabolic syndrome rather than those with isolated extreme obesity
- Consider treatment in hospital

Obesity Surgery Mortality Risk Stratification Score

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI &gt; 50</td>
<td>1</td>
</tr>
<tr>
<td>Male</td>
<td>1</td>
</tr>
<tr>
<td>Age &gt; 45 yrs.</td>
<td>1</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td>Risk factors for PE</td>
<td>1</td>
</tr>
<tr>
<td>Previous VTE</td>
<td></td>
</tr>
<tr>
<td>Vena Cava filter</td>
<td></td>
</tr>
<tr>
<td>Hypoventilation (sleep disordered breathing)</td>
<td></td>
</tr>
<tr>
<td>Pulmonary HTN</td>
<td></td>
</tr>
</tbody>
</table>

Class A: 0-1 points | Risk of Mortality: 0.2- 0.3%
Class B: 2-3 points | Risk of Mortality: 1.1- 1.5%
Class C: 4-5 points or more | Risk of Mortality: 2.4- 3.0%
Pre-operative Considerations

- Record height, weight and calculate BMI
- Calculate LBW and ABW
- Smoking cessation
- Thromboprophylaxis
- Hosp. cases, bring own CPAP to hospital
- Assess respiratory status
- Airway assessment
- Cardiovascular assessment

Respiratory Assessment

STOP- BANG

<table>
<thead>
<tr>
<th>Snoring</th>
<th>Snore loudly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tired</td>
<td>Daytime somnolence</td>
</tr>
<tr>
<td>Observed</td>
<td>Observed obstruction</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>Have HTN</td>
</tr>
<tr>
<td>BMI</td>
<td>≥35</td>
</tr>
<tr>
<td>Age</td>
<td>≥50</td>
</tr>
<tr>
<td>Neck</td>
<td>≥43cm males, 41 female</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
</tr>
<tr>
<td>Score ≥5</td>
<td>= significant sleep disordered breathing</td>
</tr>
</tbody>
</table>

Class 0: Can see any part of the epiglottis upon mouth opening and tongue protrusion
Class I: Soft palate, fauces, uvula, pillars visible
Class II: Soft palate, fauces, uvula visible
Class III: Soft palate, base of uvula
Class IV: Soft palate not visible at all

Modified Mellampati Classification

- Class 0
- Class I
- Class II
- Class III
- Class IV

Airway Assessment

Obesity = >30% greater chance of difficult/failed intubation.
Neck circumference > 60 cm = 35% probability of difficult laryngoscopy
Bag-mask ventilation is more difficult

Modified Mellampati Classification

- Good predictor of difficult laryngoscopy
- Good predictor of difficult intubation
- Should not be used as only predictor of airway difficulty

Cardiovascular Assessment

Same as for regular patient
- HTN
- CHF
- Metabolic syndrome
- Evaluate exercise tolerance

NPO Instructions

- Clear liquids 2h
- Breast milk 4h
- Infant formula 6h
- Non-human milk 6h
- Light meal 6h

Applies to all ages, healthy patients, not women in labor, does not guarantee complete gastric emptying
Light meal = toast and clear liquids, consider type and amount
Operative (Anesthesia) Care

- Request anesthetists with more experience
- Regional anesthesia is preferred to general anesthesia
- Preplan for airway problems
- Antacid and analgesic premedication
- Patient positioning, more upright
- Consider reversible drugs
- Use shorter acting anesthetic agents
- Adjust drug doses using LBW or AWB and titrate to effect
- Remember obese patients desaturate more quickly
- Increased failure rate of emergency airways (crich.)

Surgical Options (Gastric)

- Roux-en-Y Gastric Bypass Procedure
- Duodenal Switch Procedure
- Gastric Sleeve Surgery
- Gastric Banding (LAP-BAND) Surgery

The post bariatric surgery patient presents with a whole host of other issues for the surgeon.

Operative (Anesthesia) Care

- Tracheal intubation is preferred airway, consider PEEP
- Use non-depolarizing muscle relaxants
- Use ideal body weight to size tracheal tubes and tidal volumes
- IV access more difficult. Consider 2 IVs
- Use fat insoluble volatile agents (desfluane, sevoflurane)
- Extubate with difficult airway protocol
- Maintain upright posture throughout recovery
- Full monitoring in recovery
- Monitor oxygen saturation until mobile post-op.
- Consider stepdown or ICU with CPAP for prolonged recovery

Discussion of Risk for the Obese OMS patient: OMSNIC perspective

Dr. Richard Robert

Thromboprophylaxis

Obesity is a risk factor for VTE
Thromboprophylaxis is recommended for all non-mobile patients
- Low molecular weight heparins
- Early ambulation
- Mechanical compression devices
- TED stockings

Cardiovascular
Update on Management of the Hypertensive Patient

Hypertension

Goals
- Define limits of abnormal blood pressure.
- Understand common medications used to treat hypertension.
- State how to manage hypertensive patients who present for surgery.

Definitions
Hypertension – abnormally elevated blood pressure.
Systolic blood pressure – the pressure at the peak of left ventricular contraction
Diastolic blood pressure- resting resistance of the arterial system

Epidemiology
- Affects 20-30% of all adults in America (> 50 million people)
- 30% are unaware of condition
- Up to 40% are not being treated
- Approximately 2/3 are not controlled
- People who are normotensive at 55 have a 90 percent lifetime risk of developing hypertension
- African Americans have twice the rate of hypertension compared to Whites

Pathophysiology
- Multi-factorial, complex, and poorly understood
- Likely related to multiple factors
  - Genetic factors
  - Impaired regulation of vascular tone
  - Impaired renin-angiotensin system
  - Excess dietary salt intake
  - Action of local hormones (prostaglandins, kinins, etc.)

Pathophysiology
- Primary (Essential) Hypertension
  - Comprises 90-95% of patients with HTN
  - Precise etiology unknown
  - Older patients
- Secondary Hypertension
  - Other 5-10% of patients
  - Some underlying condition explains HTH
  - Often younger patients (< 50 years old)
Secondary Hypertension

- Renal
  - Renal artery stenosis
  - Renal failure
- Medications
  - Oral contraceptives, steroids
- Endocrine
  - Hyperthyroidism, hyperaldosteronism
- Neurologic diseases
- Other

Benefits of Treatment

- Reduce incidence of stroke by 35-40%
- Decrease myocardial infarction by 20-25%
- Decrease heart failure by more than 50%
- A reduction of 12 mm Hg in SBP for people in stage I HTN results over a 10 year period in prevention of one death in 11 patients treated

Pathophysiology

- Hypertension most often asymptomatic
- Leads to end-organ damage of multiple organs:
  - Heart (ischemia, heart failure, etc.)
  - Kidneys (renal failure, etc.)
  - Brain
  - Eyes

Goals of Treatment

- Goal is to limit end-organ damage
- Most adults: < 140/90 mmHg
- Diabetes or renal disease: < 130/80 mmHg

Classification of Hypertension in Adults

JNC 7 Report

<table>
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<th>Diastolic BP (mm Hg)</th>
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</tr>
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<td>Stage II Hypertension</td>
<td>≥ 160</td>
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Treatment of HTN

- Always starts with lifestyle modification
- Multiple risk factors to modify
  - weight loss
  - restriction of dietary sodium
  - regular aerobic exercise
  - moderation of alcohol intake
  - increased dietary calcium intake
  - smoking cessation
  - others
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Treatment of HTN

- Most common agents used:
  - Hydrochlorothiazide (HCTZ)
  - ACE inhibitors (lisinopril, benazepril, etc.)
  - Beta-blockers (metoprolol, atenolol, etc.)
  - Calcium channel blockers (amlodipine, nifedipine, etc.)

Treatment of HTN

- Most patients require pharmacologic treatment
- Most patients require more than one agent to achieve blood pressure goals

Dental Patients with HTN

1) Patient with known hypertension presenting for surgery
2) Patient presents for surgery with acute hypertension
3) Specific recommendations for surgical management of patients with hypertension

Hypertension in Practice

- Identification
  - Take blood pressure in all patients
  - If abnormal, repeat measurement
    - Sitting upright, arm at side
    - Proper cuff size (cover 80% of the upper arm)
Other Definitions

- Hypertensive Urgency
  - Systolic blood pressure > 180 mmHg
  - Diastolic blood pressure > 120 mmHg

- Hypertensive Emergency
  - Elevated blood pressures as above AND evidence of end-organ damage
    - Confusion
    - Chest pain
    - Renal failure

Management

- Decrease exposure to epinephrine
  - Exogenous (limit to 0.04 mg= 2.2 carpules 1:100,000)
  - Endogenous
    - POTENTIALLY A MUCH BIGGER PROBLEM
      - stress-adrenal medulla can produce 0.28 mg of epi./min.

- Avoid topical vasoconstrictors
- Adverse drug reactions
  - epinephrine and beta blockers,
    - rarely a problem if small doses of epi. used

Dental Treatment and Hypertension

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<th>Management</th>
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<td>No treatment w/o medical consult, refer for prompt medical consult</td>
</tr>
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<td>≥ 210, ≥ 120</td>
<td>No treatment, refer for emergency medical treatment</td>
</tr>
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Management

- Avoid stimulation of the gag reflex
- Surgical hemostasis, observe for post-op bleeding
- Antihypertensive (diuretics) - dry mouth
- CA++ channel blockers - gingival overgrowth
- ACE inhibitors - cough, loss of taste, burning mouth

Management of a Dental Patient with Hypertension

- Identification
- Monitoring
- Stress and anxiety reduction
- Avoidance of orthostatic hypotension
- Avoidance of vasoressors
- Avoidance of drug interactions
- Avoid gag reflex
- Hemostasis
- Management of drug effects on the oral tissues

Hypertension Take-Home Points

- Goal treatment of HTN is < 140/90mmHg for most patients.
- It is unsafe to treat a patient if their blood pressure is > 180/110mmHg.
- It is unsafe to treat a patient if they have an elevated blood pressure (>160/100mmHg) AND have symptoms of organ damage (chest pain, confusion, etc.)
- Can take specific steps to limit risks in managing hypertensive patients.
Patient is a 63 year old male who presents to your office for full mouth extractions and alveoplasty prior to planned placement of immediate dentures. Past medical history is negative except that he used to take a “pressure medication” which he did not refill 2 months ago. Pre-operative blood pressure readings were 200/105. A second reading was 205/103.

Which of the following would be appropriate?
A. Do nothing and schedule surgery
B. Treat with hydrochlorothiazide in your office
C. Call 9-1-1 so he can be taken to the Emergency Department.
D. Schedule follow-up with his primary care doctor for the same day.

Dental Treatment and Hypertension

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<th>Treatment Recommendations</th>
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Medications

Plavix: anti-platelet agent, can increase bleeding time. Prevents fibrinogen binding and decreases platelet aggregation and adhesion. Given following angioplasty with stent placement.
Nitrostat: Nitroglycerine- peripheral vasodilator. Decreases workload of the heart.

Additional Information

Primary Care MD
- Recent History and Physical?
- BP control
Cardiologist
- ECG/ CXR
- CBC with lipid profile (cholesterol)
- Bleeding time
- SBE prophylaxis
  - stent placement
  - MVP with regurgitation
- Safe to treat (MI 3 years ago)
Need for SBE Prophylaxis

Coronary artery stent placement
• No, only necessary during immediate post stent placement period, until mucosalization of stent (4 weeks to 3 months).
• New drug-eluting stents
• Confirm with cardiologist

Mitral Valve prolapse with regurgitation
• No, most recent AHA recs.

Importance of PTCA with Stent Placement

Indicative of progressive CAD, no special precautions are needed
SBE prophylaxis is recommended only immediately post- stent placement, until mucosalization complete
Postpone elective procedures to allow completion of mandatory anti-platelet regimen and decrease concerns over stent thrombosis and post-op bleeding (drug-eluting stents)

Treatment Following MI

• “Coronary revascularization before non-cardiac surgery to enable the patient to “get through” the non-cardiac procedure is appropriate for only a small subset of patients at very high risk.”
• “. . . it appears reasonable to wait 4 to 6 weeks after MI to perform elective surgery.”
• “In this way, the separation of MI into the traditional 3- and 6-month intervals has been avoided.”

Discussion of Drug-Eluting Stents and Impact upon Surgical Patients

Percutaneous Coronary Intervention (PCI)
• Also known as stenting
• Standard of care for atherosclerotic disease (acute MI or symptomatic narrowing)
• Do coronary artery bypass grafting for Left Main or Triple-vessel disease
• Major concern is stent re-stenosis

Treatment Following MI

Major Clinical Predictors of increased perioperative cardiovascular risk
• Acute MI (less than 7 days pre-op)
• Recent MI (more than 7 days but less than 1 month pre-op)
• Unstable or severe angina
• Large ischemic burden
• Decompensated HF
• Significant dysrhythmias
• Severe valvular disease
Minor procedures under local anesthesia may not carry the same risk
Percutaneous Coronary Intervention (PCI)

- Bare metal stent
- Drug-eluting stent
  - Stent with a drug to block cell proliferation
  - Possibly decreases stent re-stenosis

Preventing In-stent Stenosis

- Treat with two anti-platelet agents
  - Aspirin
  - Clopidogrel (Plavix®)
- Duration of treatment depends on the type of stent
- Predicts surgical risks related to stent placement

Surgical Management after MI

- Ideally defer all surgery for at least 6 weeks after MI with stenting
- If bleeding risk is low, continue dual-platelet therapy (after 6 weeks)
- For BMS and high-risk surgery, wait at least 6 weeks and continue aspirin
  - If you can’t continue aspirin, better to wait > 6 months if possible
Surgical Management after MI

- For DES, should probably defer all high-risk procedures for 12 months
- May be unsafe to perform off clopidogrel
- If considering stopping the clopidogrel, should only do in consultation with cardiologist or internist

Patient is a 59 year old male with a history of angina who was cleared for surgery by anesthesia. In the recovery room s/p iliac crest graft to the mandible the patient complains of chest pain, dyspnea, nausea and is diaphoretic with palpitations

Stents and Surgery Take-Home

- Coronary stents are used commonly to treat acute myocardial infarction.
- Both BMS and DES need dual antiplatelet therapy to prevent re-stenosis.
- For BMS, wait at least 6 weeks and continue the aspirin.
- For DES, ideally wait 12 months for higher risk procedures.

Management

Take blood pressure
Consider nitrous oxide
- anxiolysis
- decreased endogenous catecholamine release
- increased oxygen delivery

Limit use of LA with vasoconstrictor
- AHA recs. 0.04mg epi. per appointment
  - = 2.2 carpules of 1:100,000 epi.

Local measures to control bleeding
- remove all granulation tissue
- topical agents and suturing

Angina

Angina
- Mismatch between oxygen needs of the heart and delivery of oxygen to the heart.
- Relieved by oxygen, rest and vasodilators
Treatment of Angina

- Terminate therapy and position patient
  - upright 45 deg.
  - Trendelenburg if SBP < 100 mm Hg
- Calm patient
- 100% O2
- Sublingual Nitroglycerin 0.4 mg
  - should relieve pain in 3-5 mins
  - can repeat twice at 5 min. intervals
  - failure to relieve pain- suspect MI
    - Aspirin (anti-platelet activity)
    - Morphine (for pain relief and anxiolysis)

Differential Diagnosis

- MI
- CHF
- PE
- Pneumothorax
- Cholecystitis
- Pancreatitis
- Pericarditis
- Perforated peptic ulcer
- Ruptured esophagus
- Aortic dissection

Critical Dysrhythmias

Associated with MI

- PVC: Premature Ventricular Contractions
- VT: Ventricular Tachycardia
- VF: Ventricular Fibrillation
- Asystole

Treatment of ACS

Drugs

- Oxygen (ABG’s)
- Aspirin (ASA)
- Nitrates (nitroglycerin)
- Opiates
- Prompt diagnosis and therapy. **TIMING IS IMPORTANT FOR REPERFUSION THERAPY**
  - Fibrinolytic therapy, heparin
  - Angioplasty with or without stent placement

Myocardial Infarction

Myocardial Infarction

- ischemia leading to death of myocardial muscle tissue
- Not relieved by oxygen, rest and vasodilators

Treatment of MI cont.

- Beta blockers (be careful)
- ADP antagonists (clopidogrel, prasugrel, ticagrelor)
- Ace inhibitors

Other

- ECG (12 lead), ST segment elevation or depression
- CXR
- CCU with invasive monitoring (enzymes)
Rule out MI

- Clinical history and examination
- Serial enzymes
  - CPK/ MB- early
  - Troponin- early
  - LDH isoenzymes- late
- Serial ECGs
- CXR
- Stress Test
- ECHO cardiogram
- Thallium scan

Stress Test

A 19 y.o. black female third molar patient presents to your office three weeks following surgery. She was feeling well until seven days ago. Since then she has a history of anorexia, malaise, myalgia, weight loss and low grade fever.

Physical Exam and Labs

- Lungs clear
- Abdomen soft, bowel sounds decreased
- Heart: NSR with grade II/VI late systolic murmur at left sternal border
- CXR normal
- H/H= 10.2/31, MCV= 85 (84-96), MCHC= 30 (30-35)
- WBC= 11,000. P 65, L 20, M 10, B 3, E 2
- Chem. = WNL except BUN = 24
- UA= 1.018, 3+ protein, 4+ RBC
- Sed rate= 85

Fever of Unknown Origin

FUO = Illness of 3 weeks duration w/ documented 101 degree fever (several)
- Infections - 40-50% (TB, SBE, CMV, Fungal, local abscesses)
- Neoplasm - 30% (lymphoma, leukemia, myeloma, hypernephroma)
- Connective tissue diseases - 15-20% (RA, Acute RF, Lupus, Temporal Arteritis)
Fever of Unknown Origin

- Drug Fever
- Inflammatory bowel disease
- (CNS)

Heart Murmurs

Evaluate for
- timing
- location
- pattern
- pitch
- quality
- radiation
- effect of position
- change with Valsalva

Heart Sounds

- S1 = closing of the mitral and tricuspid valves
- S2 = closing of the aortic and pulmonary valves
  - may have physiologic splitting of S2 upon inspiration
- S3 = blood hitting the wall of a non-compliant ventricle
  - occurs during rapid ventricular filling
- S4 = Pre-systolic sound

Heart Murmurs

- Grade 1 - very faint, heard only when paying close attention (cardiologist)
- Grade 2 - faint but unmistakably present
- Grade 3 - clearly louder than faint, no thrill
- Grade 4 - loud, thrill
- Grade 5 - loud, need stethoscope, thrill
- Grade 6 - no stethoscope needed, thrill

Heart Valves

Systolic Murmurs

Aortic and pulmonary stenosis
- early, crescendo- decrescendo
Mitral and tricuspid regurgitation, Ventricular Septal Defect
- holosystolic, blowing
Mitral valve prolapse
- late
Diastolic Murmurs

Aortic and pulmonary regurgitation
  • early, decrescendo
Mitral and tricuspid stenosis
  • mid to late, low pitched

Microcytic Hypochromic Anemia

Iron deficiency
Thalassemia

Murmur

Mitral valve prolapse
IS THIS MURMUR NEW??
YES

Normocytic Normochromic Anemia

Blood loss (LOOK FOR BLOOD LOSS)
Chronic disease
Renal failure
Hemolytic
Sickle cell

Types of Anemia

• Iron deficiency
• Chronic blood loss (LOOK FOR BLOOD LOSS)
• Chronic renal failure
• Chronic disease
• Megaloblastic, Vitamin B12 deficiency (pernicious)
• Hemolytic
• Thalassemia
• Sickle cell
• Aplastic

Other Info.

Left Shift
  • more than 20% bands
  • chronic bacterial infection, toxemia, hemorrhage
  • degree of nuclear lobulation of PMN’s an indication of age
Other Info.

Elevated BUN
- kidney disease
- dehydration

Elevated sed. Rate
- chronic inflammation
- rheumatoid diseases

Symptoms of SBE
- Low grade fever
- New cardiac murmur
- Arthralgias
- Splenomegaly
- Splinter hemorrhages
- Roth’s spots, Osler’s nodes, Janeway lesions
- CHF
- Neurologic changes
- Embolic episodes

What are you to Do?

Physical Examination
Blood culture
- before put on antibiotics
ECHO
- look for vegetation
- document murmur

Causes of SBE
- Any flow disturbance
- Rheumatic heart disease
- Congenital heart disease
- Mitral valve prolapse
- Degenerative heart disease
- IVDA

Test Results

Blood culture = Alpha hemolytic strep.
- What if was Staph Aureus?
If put patient on antibiotics before obtaining blood culture, then culture will be negative
ECHO = mitral vegetation
Diagnosis = SBE (Subacute bacterial endocarditis)

Treatment of SBE

PCN G 2 million units IVPB q6h
Streptomycin 7.5 mg/kg q 12 h
LONG TERM HOSPITALIZATION AND ANTIBIOTIC THERAPY
Poor Prognosis
Staph infection
CHF
Aortic valve involvement
Prosthetic valve
Old age

AHA Guidelines NOT Standards
“This statement represents recommended guidelines to supplement practitioners in the exercise of their clinical judgment and is not intended as a standard of care for all cases.
“This statement provides guidelines for prevention of bacterial endocarditis. It is not intended as the standard of care or as a substitute for clinical judgement.”
– Dajani, 1997

Antibiotic Update: Evidence-based Usage and Clinical Controversies
Antibiotic Prophylaxis in Cardiac and Prosthetic Joint Patients; Where is the evidence?
AAOMS 95th Annual Meeting
Orlando, FL
Wednesday, 9 October 2013
Norman J. Betts, DDS, MS
Private Practice, Chelsea & Ann Arbor, MI
Adjunct Associate Professor, University of Michigan

Effectiveness of Antibiotic Prophylaxis
Bacterial endocarditis can develop even when appropriate antibiotic prophylaxis is administered.
“. . . Endocarditis may occur in spite of appropriate antibiotic prophylaxis, . . .

AHA Recommendations
First Recommendation for BE prophylaxis by the AHA issued in 1955.
8 Modifications, Most recent in 2007.
Trends: Simplified, Shortened List of indications and Reduced Dose.

Estimate of Risk
If dental treatment causes 1 percent of all cases of viridans group streptococcal IE annually in the United States, the overall risk in the general population is estimated to be as low as one case of IE per 14 million dental procedures.
– Pallasch 2003, Stechelberg 1993
Why not just give antibiotics?

“Against low incidence and questionable efficacy one must balance the rare but real risk for adverse reactions, including anaphylaxis and the possible occurrence of drug-resistant organisms.”

-Straut, 1998

“The risk of inappropriate use of antibiotics and widespread antibiotic resistance appear to be far more important than any possible perceived benefit.”

- Tong, 2000

Most Recent AHA recs.


JADA, Vol. 139, Jan.2008, 3S-24S (= Supplement)

How many of you have actually read this paper?

Reasons for revision of the infective endocarditis prophylaxis guidelines

“The Committee believes that recommendations for IE prophylaxis must be evidence-based.

“There are currently no randomized and carefully controlled human trials in patients with underlying structural heart disease to definitively establish that antibiotic prophylaxis provides protection against development of endocarditis during bacteremia-inducing procedures.”

– Dajani 1990

“A placebo-controlled, multicenter, randomized, double-blinded study to evaluate the effectiveness of IE prophylaxis in patients who undergo a dental procedure has not been done.”

– Wilson 2007

Recent AHA Recs.

Previous infective endocarditis

Prosthetic cardiac valve or prosthetic material used for cardiac valve repair

Congenital heart disease

- Unpaired cyanotic CHD, including palliative shunts and conduits
- Completely repaired congenital heart defect with prosthetic device, whether placed by surgery or by catheter intervention, during the first six months after the procedure
- Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibit endothelialization)

Cardiac transplantation recipients who develop cardiac valvulopathy
Patients Already Receiving Antibiotics

“If a patient is already receiving chronic antibiotic therapy with an antibiotic that is also recommended for IE prophylaxis for a dental procedure, it is prudent to select an antibiotic from a different class rather than to increase the dosage of the current antibiotic.”

– Wilson 2007

Antibiotic Prophylaxis in General


• 8 medical conditions and devices associated with risk of infection resulting from dental procedures
• Systematic review of the literature
• GREAT PAPER, GET IT AND READ IT!!

Preventing Bacterial Endocarditis

Improve the oral hygiene of individuals at risk

“Patients at risk for bacterial endocarditis should maintain the best possible oral health to reduce potential sources of bacterial seeding, because poor dental hygiene, or periodontal or periapical infections may induce bacteremia even in the absence of dental procedures.”

– Shalman 1984

“The AHA guidelines for prevention of IE have resulted in an overemphasis on antibiotic prophylaxis and an underemphasis on maintenance of good oral hygiene and access to routine dental care, which are likely more important in reducing the lifetime risk of IE than is the administration of antibiotic prophylaxis for a dental procedure.”

– Wilson 2007

Topical Antiseptic Rinses

“Topical antiseptic rinses do not penetrate beyond 3mm into the periodontal pocket and, therefore, do not reach areas of ulcerated tissue where bacteria most often gain entrance to the circulation. . . It is unlikely that topical antiseptics are effective to significantly reduce the frequency, magnitude and duration of bacteremia associated with a dental procedure.”

– Wilson 2007

Table 5. Regimens for a Dental Procedure

<table>
<thead>
<tr>
<th>Situation</th>
<th>Agent</th>
<th>Adults</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to take oral medication</td>
<td>Amoxicillin</td>
<td>2 g Or IV</td>
<td>50 mg/kg Or IV</td>
</tr>
<tr>
<td>Carotid or cerebrovascular</td>
<td>1 g Or IV</td>
<td>50 mg/kg Or IV</td>
<td></td>
</tr>
<tr>
<td>Allergic to penicillin or amoxicillin</td>
<td>Cephalexin</td>
<td>750 mg PO</td>
<td>20 mg/kg PO</td>
</tr>
<tr>
<td>Allergic to penicillin and unable to take oral medication</td>
<td>Cefazolin</td>
<td>1 g Or IV</td>
<td>50 mg/kg Or IV</td>
</tr>
</tbody>
</table>

* Alternatives in parentheses: K, intravenous.

* Of other first or second-generation oral cephalosporins in equivalent adult or pediatric dosage.

* Alternatives should not be used in individuals with a history of anaphylaxis, angioneurotic, or urticaria with penicillins or amoxicillin.
8 Medical Conditions and Devices

- Cardiac: heart valve disease, prosthetic heart valves, pacemakers
- Hip, knee and shoulder prosthetic devices
- Renal dialysis shunts
- CSF shunts
- Vascular grafts
- Immunosuppression due to cancer and chemotherapy
- SLE
- IDDM (type I)

AAOM Response

(American Academy of Oral Medicine)

Given that the 2009 information statement of the AAOS is more of a statement than an official guideline; the AAOM believes that it should not replace the 2003 joint consensus statement prepared by the relevant organizations: ADA, the AAOS and the IDSA

Orthopedic Prosthetic Joints

1997 ADA and AAOS, Antibiotic prophylaxis
(Revised in 2003)

- w/in two years of joint replacement
- Malignancy
- IDDM
- Previous joint infection
- Malnourishment
- Hemophilia
- Rheumatoid arthritis
- SLE
- Disease or drug induced immunosuppression

Orthopedic Prosthetic Joints

2009 AAOS statement

- “Given the potential adverse outcomes and cost of treating an infected joint replacement, the AAOS recommends that clinicians consider antibiotic prophylaxis for all total joint replacement patients prior to any invasive procedure that may cause bacteremia.”
- This is a recommendation and not a standard of care.
- AAOS website, www.aaos.org. Dental work after joint replacement
- ADA and AAOS have not agreed on this recommendation
- OMSNIC rec. consider contacting the patient’s orthopedic surgeon to determine their recommendation and document it.

The evidence base for the efficacy of antibiotic prophylaxis in dental practice


Enrollment, 339 pts. (cases) with prosthetic hip or knee infections, 339 pts. with hip and knee arthroplasties without infections (controls)

Compared
- Differences in dental visits (exposure) in terms of high and low risk
- Differences in use of antibiotic prophylaxis

Results (odds ratio w/ 95% confidence interval)
- No statistically significant difference between groups
- Neither dental procedures or antibiotic prophylaxis prior to dental procedures were associated with risk of prosthetic hip or knee infections
Recent Joint Statement of AAOS and ADA

Evidence based analysis

There is insufficient evidence to recommend the routine use of antibiotics for patients with orthopedic implants to prevent infections prior to having dental procedures because there is no direct evidence that routine dental procedures cause prosthetic joint infections.

- Rec. 1. Based upon limited evidence, practitioners consider changing their longstanding practice of prescribing prophylactic antibiotics for patients who undergo dental procedures. Dental procedures are unrelated to PJI.
- Rec. 2. There is no direct evidence that the use of topical antimicrobials before dental procedures will prevent PJI.
- Rec. 3. Consensus recommendation (weakest evidence), supports the maintenance of good oral hygiene.
- www.aaos.org/guidelines; www.ada.org/2583.aspx?currentTab=2#replace

Other Evidence

Multiple high strength studies link oral procedures to bacteremia (surrogate risk for orthopedic implant infection).

Multiple moderate strength studies suggest that prophylaxis decreases the incidence of post-dental procedure bacteremia.

No studies explain the microbiological relationship between bacteremia and orthopedic implant infection.

The majority of the organisms found in implant infections are *Staphylococcus* and the majority of the organisms found as the cause of bacteremia are *Streptococcus*.

Conclusion

- Antibiotic prophylaxis is highly controversial
- Practice is driven by long-standing dogma and habit, medicolegal concerns and potentially devastating consequences

The weight of evidence suggests that the practice should be stopped in most, if not all, of these eight patient groups.

Physician wants IE prophylaxis when not indicated

ADA recommendation that a dentist exercise independent clinical judgment in antibiotic prophylaxis guidelines.

- Consult with the physician, try to reach a consensus among professionals
  - Basis for physician's recommendation
  - Why dentist disagrees
- If no consensus, answer lies with informed consent.
  - Present all treatment options with benefits and risks
  - Document well in record

Dentist, not patient is ultimately responsible for patient treatment. Therefore, the dentist is not obligated to perform a treatment he or she does not believe is in the best interests of the patient.

- JADA, Vol. 139, Jan.2008, 10S (= Supplement)

CVA (Stroke)

Signs and symptoms:

- Sudden weakness or numbness of face, arm, leg, especially on one side of body
- Sudden confusion
- Difficulty speaking or understanding
- Vision changes in one or both eyes
- Trouble ambulating, dizziness, loss of balance or coordination
- Severe headache

J.G. is a 82 y.o. male with a history of poorly controlled hypertension. He is in pain and has been up all night due to abscess tooth #14 which is causing some slight buccal space involvement. His pre-op. BP is 182/102. You administer nitrous oxide at 50% and his BP falls slightly to 172/98. You administer local anesthesia and he becomes confused, has difficulty speaking and develops facial droop on the side of your injection.
Cincinnati Prehospital Stroke Scale

Facial droop
- Have patient show teeth or smile
  - Have facial droop

Arm drift
- Close both eyes and extend both arms straight out with palms up for 10 secs.
  - One arm does not move or drifts downward

Abnormal speech
- Have patient say “you can’t teach an old dog new tricks”
  - Slurs words, uses wrong words or is unable to speak

Treatment

- Stop treatment
- Activate EMS ASAP, minimize time to hosp.

GIVE SUPPLEMENTARY OXYGEN, turn off nitrous oxide and 100% O2
- Make sure EMS takes patient to a “stroke center.” (Administers fibrinolytics or endovascular therapy)

In Hospital Care

- Provide O2
- IV access and obtain blood samples
- Check glucose and treat hypoglycemia
- Stroke scale (NIHSS)
- Activate stroke team
- EMERGENT CT scan and read promptly to see if is embolic or hemorrhagic stroke. DO NOT DELAY CT for IV, blood draw or stroke assessment
- Fibrinolytic or endovascular therapy ASAP if not hemorrhagic stroke
- If hemorrhagic admission to NICU with blood pressure control

Respiratory

A 60 y.o. obese female had a left iliac crest graft to the anterior mandible three days ago. She has refused to ambulate since her surgery because of pain. You are called to the floor because she has developed dyspnea, pleuritic chest pain, cough and tachycardia
Differential Diagnosis

- PE
- Angina
- MI
- CHF
- Pneumothorax
- Bronchospasm
- Pneumonia
- ARDS

Pathophysiology

Pulmonary Embolism

- Thrombus that blocks a portion of the pulmonary circulation
- Originate most commonly in pelvis or right heart
- No real effects until 25% of pulmonary circulation affected
- 50% occlusion, decrease in cardiac output, release of vasoactive amines

Treatment

- 100% O2
- VS, pulse= 120, BP= 90/60, pulse ox= 85
- Clinical examination
  - neck veins, auscultate chest, percuss chest
- ABG, pO2 <80, pCO2= normal
- ECG
- Spiral CT with contrast
- V/Q scanning
- Pulmonary angiography

Risk Factors for PE

- DVT
- Immobilization
- Lower extremity trauma
- Thoraco-abdominal surgery
- Hypercoaguable state (splenectomy)
- Pregnancy
- Obesity
- Age > 60 years
- CHF
- Recent MI
- Low cardiac output (shock)
- Malignant disease
- BCP

Treatment of PE

- Oxygen- ABG
- Symptomatic treatment
- Anticoagulation with Heparin
  - 10,000-15,000 units Heparin, 1,000-1,200 units/hr. monitor
  PTT to 55-85 secs.
  - or Lovenox, 1mg/kg q 12h
  - Start Coumadin (at least 3 mos.), INR of 2.5-3.5, or non-Vit.
    K oral agent like Eliquis
- Examine for DVTs
- Thrombolytic therapy
  - rPA
- Pulmonary embolectomy (life threatening)
- Venous interruption = filters
Lovenox (Enoxaparin Sodium)

Prevention of DVT and PE
• Abdominal surgery
• Joint (hip and knee) replacement
• Unstable angina
• Non-Q wave MI (w/ ASA)
• Pts. @ risk for thromboembolic comps.
• Restricted mobility during acute illness

D.B. is a 17 year old female referred for the extraction of her maxillary and mandibular third molars. Her mother states that she has a history of asthma.

Lovenox (Enoxaparin Sodium)

Dose for prevention of DVT/ PE
• 40 mg Sub Q, or 30 mg q 12h

Dose for treatment of DVT/ PE
• 1 mg/kg q 12h

Works on factor Xa (preferentially) and factor IIa with onset 3-5 hours after Sub Q injection.

Questions to Ask an Asthmatic Patient

How often?
How severe?
• Require medication?
• Ever been hospitalized?
• Ever require intubation?

Getting better or worse over time?
Initiating factors?
Treatment?
Currently symptomatic?
Compliant with medication/ take today?
Have medication with you?

Lovenox (Enoxaparin Sodium)

• Difficult/ impossible to monitor. Factor Xa (takes a long time to get results back, expensive)
• Increased risk of bleeding (4%) over heparin (3%)
• Slightly decreased risk of HIT (Heparin Induced Thrombocytopenia)
• NO Lumbar punctures, or spinal or epidural anesthetic technique
• Incomplete reversal with Protamine sulfate, 90% IIa reversal, only 60% reversal Xa
• Half life = 4.5-7 hours (longer than heparin)
Singulair (Montelukast Sodium)

Leukotriene receptor antagonist

Uses

• Chronic asthma
• Exercise induced asthma
• Seasonal allergic rhinitis
• Perennial allergic rhinitis

Not an acute medication- prophylaxis

Extrinsic Asthma

Allergen induced

• IgE, mast cells, histamine, SRS-A, prostaglandins

Children

Often regresses at puberty

Good prognosis

Singulair (Montelukast Sodium)

Adds to the effects of inhaled corticosteroids, can gradually taper off

Decreases use of Beta agonist inhalers by > 25%

Mechanism of action and metabolism

• Blocks cysteinyl leukotrienes
• 99% bound to plasma proteins
• Metabolized by cytochrome p450 enzyme system in liver

Extrinsic, Intrinsic Asthma

Asthma

Obstructive lung disease

• Normal lung volumes
• Air in, but difficulty getting air out

Types

• Extrinsic
• Intrinsic
• Exercise induced
• Drug induced

Intrinsic Asthma

Upper respiratory irritants or infection

Adults (> 35 years of age)

Chronic cough

Worse prognosis
### Exercise and Drug Induced Asthma

**Exercise induced**
- exercise
- cold weather

**Drug induced**
- Aspirin, NSAIDs
- association with nasal polyps

### Pathophysiology of Asthma

- **Initiating factor(s)**
  - stress
  - irritants
- Allergic- IgE (mast cells), Histamines, SRS-A, prostaglandins
- Constriction of bronchial smooth muscle
- Mucosal edema
- Mucus plugging of the bronchi

### Obstructive Lung Diseases (COPD)

- **Asthma**
- **Bronchitis**
  - blue bloater
- **Emphysema**
  - pink puffer

### Restrictive Lung Diseases

- Lung volumes are NOT normal
  - Space occupying lesions (TB, tumors)
  - Interstitial fibrosis (asbestosis, etc.)
  - Myasthenia Gravis
  - Severe scoliosis

### Lab Studies

- **Match test**
- **PFTs (spirometry)**
  - FEV1
  - FVC
  - VC
  - FEV1/FVC
  - w/o and with bronchodilators
- **ABGs**
- **Aminophylline level (historic)**
Lung Volumes

Vital capacity- maximum volume exhaled following full inspiration
Tidal volume- air inspired and exhaled in a single breath during normal breathing
Inspiratory reserve volume- air that can be inspired after a normal inspiration
Expiratory reserve volume- air that can be expelled after a normal expiration
Residual volume- air remaining in the lungs after maximal expiratory effort

Complication

Following the delivery of local anesthesia, the patient begins to wheeze and complains of shortness of breath. You note she is taking shallower breaths and is breathing more frequently. She begins to cough, becomes anxious and confused.

Lung Volumes

PFTs

FVC= Maximum volume expelled. Normal in obstructive disease (volumes are the same, decreased rate of expiration)
FEV1 (normal = 80% of predicted), asthma = 50%
FEV1/ FVC = > 70% in restrictive dx.
< 70% in obstructive dx.
< 40% in severe dx.

Differential Diagnosis

Asthma
Bronchospasm
Laryngospasm
Foreign body obstruction
Congestive heart failure

Sounds of Respiratory Difficulty

- Wheezing- Asthma, bronchospasm, partial tracheal obstruction
- No sound, deep movements (rocking boat)- total airway obstruction, laryngospasm
- Crowing sound- partial upper airway obstruction
- Moist wet- congestive heart failure, acute pulmonary edema
- Normal but rapid and deep- hyperventilation
Signs and Symptoms of Asthma

• Paroxysms of dyspnea
• Productive cough and wheezing
• Tachypnea with prolonged expiration
• Cyanosis
• Mental confusion, fatigue, anxiety
• Normal to increased BP, rapid and full pulse

Treatment of Asthma

• Eliminate precipitating factor(s)
• Position patient (often will sit upright)
• Oxygen
• Beta 2 specific inhalers (e.g. Albuterol)
  – bronchodilation
  – decreased mucous secretion
• Call emergency services
• Epinephrine - 0.3 mg sub Q q10- 15 mins x 3
  – IM and IV doses not equivalent

Medications to Avoid, Asthma

Narcotics
• Histamine release
• Some (Demerol) worse than others (Fentanyl)

Barbiturates
• Histamine release

Aspirin, NSAIDs
• Drug induced asthma

Management of Asthma Attack

Laryngospasm

Do you use Succinyl Choline or not?
Dr. Richard Robert
Advair Diskus

Combined medication
- Fluticasone propionate (Flonase) = inhaled corticosteroid & Salmeterol (Serevent) = long acting beta adrenergic agonist
- Used after failure of inhaled corticosteroids
Not indicated for acute bronchospasm
3 doses= 100/50, 250/50, 500/50

Clinical Manifestations of Chronic Bronchitis
- Fibrosis and mucous plugging = severe V-Q mismatch
- Can have cyanosis
- Cough with copious sputum, often purulent
- Chest percussion normal with rales and rhonchi
- Arterial PO2 may be severely decreased, increased RBC
- Cor pulmonale early in course, recurrent infections

Clinical Manifestations of Emphysema
- Caused by smoking, air pollution, occupational exposure to toxic gasses and recurrent pulmonary infections
- Loss of air spaces and vascular structures in lungs
- Minimal V-Q mismatch
- Thin body habitus, rosy-cheeked, typically acyanotic

Clinical Manifestations of Emphysema
- Dyspnea with scant sputum production
- Chest percussion hyperresonant with decreased breath sounds
- Slightly decreased arterial PO2, RBC normal
- Terminal Cor pulmonale and pulmonary hypertension

Lab Values
- WBC = 8000/mm (5-10,000)
- RBC = 7.0 mil/mm (4.2- 5.9)
- Retic. = 1.9% (0.5-1.5)
- HCT = 52% (40-54%)
- Hgb = 16 mg/dl (14-18)
Secondary polycythemia

Preoperative evaluation
History and Physical examination -baseline best
Pulmonary function tests (PFT)
Arterial blood gasses (ABG)
Chest X-ray (CXR)
Complete blood count (CBC)
Hematopoietic

Atrial Fibrillation
- Embolic stroke that happens during cessation of anticoagulation is fatal or associated with severe neurologic deficit in over 60% of cases.

Anticoagulant Therapy
- Atrial fibrillation
- Prosthetic heart valve
- Venous thrombosis/ DVT
- Arterial occlusion (CVA)
- Pulmonary embolism
- Hypercoagulable state
- Dialysis
- Mitral valve disease with left atrial enlargement

Mechanical Heart Valve
- Risk of a thromboembolism is 10-20% per year if not anticoagulated.

Atrial Fibrillation
- Risk of ischemic stroke
  - in patients with non-valvular atrial fibrillation is 5% without anticoagulation.
    - You, 2012
  - Thromboembolic stroke from atrial fibrillation
    - has a 20% mortality rate and 40% of strokes cause permanent disability.

Clotting Factors Affected by Coumadin
- II
- VII
- IX
- X
- Vitamin K dependent factors
INR

International Normalized Ratio
- Accounts for differences in reagents used to perform PT
- Does not correlate directly with PT (INR of 4.0 approx. = PT of 2.2)
- Related to clotting factors II, VII, IX and X
- Elevated with Coumadin therapy
- Most indications INR 2.0 - 3.0
- Prosthetic heart valves INR 2.5 - 3.5

Local Measures to Control Bleeding
- Pressure
  - Biting on gauze
  - Biting on tea bag (tannic acid)
- Suturing, primary closure
- Oxidized cellulose
- Topical thrombin
- Tranexamic acid mouth rinse

Wahl MJ: Myths of Dental Surgery in Patients Receiving Anticoagulant Therapy. JADA 131:77, 2000

Myth #1. There are many documented cases of serious bleeding problems resulting from dental surgery in patients receiving therapeutic levels of continuous anticoagulation.
- 2,400 dental surgical procedures (extractions, alveolar surgery, gingival surgeries) on 950 patients receiving continuous anticoagulant therapy
- Only 12 experienced bleeding that was uncontrolled by local measures and in 7 of 12 the levels of anticoagulation was above currently recommended therapeutic levels. NONE OF 12 EXPERIENCED HARM
- Dental surgery can be performed safely on patients receiving anticoagulant therapy.

Wahl MJ: Myths of Dental Surgery in Patients Receiving Anticoagulant Therapy. JADA 131:77, 2000

Myth #2. No serious embolic complications have been documented in patients who have been withdrawn from anticoagulant therapy.
- 4 out of 500 patients experienced fatal embolic complications soon after anticoagulant therapy had been withdrawn, and 1 patient experienced two nonfatal embolic complications
- Small percentage of patients (1%) but the outcomes were serious
- Bleeding following dental surgery is rarely life threatening

Wahl MJ: Myths of Dental Surgery in Patients Receiving Anticoagulant Therapy. JADA 131:77, 2000

Myth #3. No authorities have suggested that dental extractions can be performed on patients receiving anticoagulant therapy at or above therapeutic levels.
- It is unlikely that major vessels will be encountered and bleeding can usually be controlled with local measures
- Several authors have stated that dental surgery can be performed with minimal risk of postoperative bleeding at or even above currently recommended therapeutic levels of continuous anticoagulation.
Myth #4. Patients receiving continuous anticoagulant therapy and have dental surgery experience more postoperative bleeding problems than patients with normal anticoagulation.

- Patients with normal coagulation can have postoperative bleeding problems
- Several studies have shown little or no difference in blood loss after dental surgery between patients receiving anticoagulant therapy and patients whose coagulation is normal.

Summary

- Serious embolic complications, including death, were three times more likely to occur in patients whose anticoagulant therapy was interrupted than were bleeding complications in patients whose anticoagulant therapy was continued.
- The patient’s physician should be consulted. Determine the patient’s most recent INR and retest if necessary.
- INR should not exceed 4.0

Complication

Following extraction of tooth #14 the patient complains of continued bleeding. Local measures are employed and are temporarily successful. The patient calls you the next day and states that bleeding started again last night and has been on and off since the procedure. He did not want to disturb you last night, but he has lost a lot of blood.
Management

- Patient immediately to the office
- Examine site for bleeding
- Local anesthesia/local measures
- Laboratory evaluation of hemoglobin and hematocrit (Hgb = 9.2, Hct = 27)? Symptomatic, CVD
- Transfuse 2 units of PRBC’s
- Observe patient for an extended period of time.
- Consider reversing Coumadin therapy with primary care physician’s help

Reversing the Effects of Coumadin

Emergent
- Factor IX complex (Proplex, Konyne)

Severe
- Fresh frozen plasma (FFP)

Moderate
- Vitamin K injection (20-50 mg sub Q) works in approx. 24 hours

Rationale for New Anticoagulants

- Multiple problems with warfarin (vitamin K antagonist)
  - Variable dose-response
  - Takes days for full effect (or withdrawal)
  - Impacted by other factors (diet = green leafy veggies, infection, etc.)
  - Narrow therapeutic window
  - Needs monitoring of INR levels

Clotting Cascade

Extrinsic pathway

Intrinsic pathway

Thrombin

Common pathway

Targets for New Anticoagulants

- Direct thrombin inhibitor
- Factor Xa inhibitors

New Anticoagulants

- Dabigatran (thrombin inhibitor) – FDA approved
- Rivaroxaban (factor Xa inhibitor) – FDA approved
- Apixaban (factor Xa inhibitor) – FDA approved
Dabigatran (Pradaxa®)

- **Mechanism:** direct thrombin inhibitor
- **Dosing:** orally, 150 mg, twice daily
- **Kinetics:** onset 0.5-3 hrs., ½ life of 14-17 hours, renally cleared (avoid in severe renal disease)
- **Monitoring:** None, no specific antidote
- **Cost:** $6.75/day vs. $0.03/day (warfarin)

### Renal Function

<table>
<thead>
<tr>
<th>Renal Function</th>
<th>Standard* bleeding risk</th>
<th>High** bleeding risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Hold 24 hours</td>
<td>Hold 2-4 days</td>
</tr>
<tr>
<td>Moderate (CrCl 30-50ml/min)</td>
<td>Hold 2 days</td>
<td>Hold 4 days</td>
</tr>
<tr>
<td>Poor (CrCl &lt;30ml/min)</td>
<td>Hold 2-5 days</td>
<td>Greater than 5 days</td>
</tr>
</tbody>
</table>

* Colonoscopy, pacemaker insertion
** Neurosurgery, Ortho, Abdominal, etc.

Dabigatran (Pradaxa®)

- **Indications:**
  - Stroke prevention in non-valvular atrial fibrillation
  - DVT prophylaxis in orthopedic surgery
  - Treatment of DVT
- **Side Effects:**
  - GI (dyspepsia, GERD, etc.)
  - Bleeding (3% per year = warfarin)

Rivaroxaban (Xarelto®)

- **Mechanism:** factor Xa inhibitor
- **Dosing:** orally, 20 mg, once daily
- **Kinetics:** onset 2-3 hrs., ½ life of 7-11 hrs., renally cleared & hepatic metabolism (avoid in severe renal disease and severe liver disease)
- **Monitoring:** None, no specific antidote

Dabigatran (Pradaxa®)

- **Surgical Management:**
  - If low-risk procedure, continue
  - If needs to be stopped, timing of holding the dose depends on renal function and the procedure
  - Emergent have Praxbind (idarucizumab), recombinant antibody

Rivaroxaban (Xarelto®)

- **Indications:**
  - Stroke prevention in atrial fibrillation
  - DVT prophylaxis in orthopedic surgery
- **Side Effects:**
  - Minimal
  - Highly protein bound in plasma, therefore, Not dialyzable
  - Bleeding (3% per year = warfarin)
Rivaroxaban (Xarelto®)

- **Surgical Management:**
  - If low-risk procedure, continue
  - If needs to be stopped, timing of holding the dose depends on renal function and the procedure

<table>
<thead>
<tr>
<th>Renal Function</th>
<th>Standard* bleeding risk</th>
<th>High** bleeding risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Hold 1-2 days</td>
<td>Hold 3-4 days</td>
</tr>
<tr>
<td>Moderate (CrCl 30-50ml/min)</td>
<td>Unclear</td>
<td>Unclear</td>
</tr>
<tr>
<td>Poor (CrCl &lt; 30ml/min)</td>
<td>Not used</td>
<td>Not used</td>
</tr>
</tbody>
</table>

* Colonoscopy, pacemaker insertion
** Neurosurgery, Ortho, Abdominal, etc.

Apixaban (Eliquis®)

- **Indications (if approved):**
  - Stroke prevention in atrial fibrillation
  - DVT prophylaxis in orthopedic surgery

- **Side Effects:**
  - Minimal
  - Bleeding (3% per year = warfarin)

K.P. is a 58 y.o. female with negative medical history. Her health history form indicates that she takes no medications. She has severe bone resorption of the anterior mandible. She is planned for cranial bone harvest and onlay bone grafting the anterior mandible in preparation for future implant placement.

Apixaban (Eliquis®)

- **Mechanism:** factor Xa inhibitor
- **Dosing:** orally, twice daily
- **Kinetics:** onset 1-3 hrs., ½ life = 9-14 hrs.
- **Monitoring:** None, no specific antidote
- **FDA approved**
During the procedure, she bleeds excessively to the point of needing 2 units PRBC’s following the completion of the procedure. Upon further questioning she states that she takes Gingko and Garlic but “they should not have any effects because they are not really medicines.”

**Failure to Disclose Use**

70% of patients failed to disclose herbal medication used during routine preoperative assessment  – Kaye 2000

Reasons

• Belief doctors are not knowledgeable
• Doctors are prejudiced about their use
• Fear of admitting use
• Not considered to be medications
• Not considered to be part of medical care

MUST QUESTION PATIENTS CAREFULLY

**Herbal Medicines:**

Pharmacological Effects, Side Effects and Treatment Concerns

Norman J. Betts, DDS, MS

**Classified as Dietary Supplements**

Dietary Supplement and Education Act of 1994

• Exempts herbal medications from efficacy and safety requirements, and regulations that over-the-counter medications must fulfill (no scientific scrutiny)
• Burden shifts to US Food and Drug Administration to show the product is unsafe before it can be removed from the market (can intervene once marketed)
• No predictable pharmacological effects
• No product label accuracy

**Safety of Herbal Medications**

Empirical evidence supports the notion that most herbal preparations are safe

Can cause serious harm

• reports to FDA, Jan. 1993- Oct. 1998
• 2621 adverse events
• 101 deaths
• likely these events are underreported

**Herbal Medication Use**

1997- 42% Americans unconventional therapy including herbal products
(≈ 12% herbals: 380% increase from 1990)

Current estimate: 1:3 Americans use herbal medications -some surgeries (ortho, plastics, cancer) use higher

• JAMA Ang-Lee et al. 2001;286:206-216
Eight Commonly Used Herbal Medications

- Echinacea
- Ephedra (not available anymore)
- Garlic
- Ginkgo
- Ginseng
- Kava
- St. John’s Wort
- Valerian

Top 10 selling 2004
Echinacea, garlic, goldenseal, ginseng, gingko, saw palmetto, aloe, ma huang, siberian ginseng, cranberry

Herbs That Decrease Platelet Aggregation
Bilberry, Bromelain, Don qui
Feverfew, Fish oil, Flax seed oil
Garlic, Ginger, Ginkgo biloba, Grape seed extract


Herbs That Inhibit Clotting
Chamomile
Dandelion root
Dong qui
Horse chestnut

Echinacea
Uses
- prophylaxis and treatment of viral, bacterial and fungal infections of the upper respiratory tract
- internal stimulation of the immune system
  - Stimulating phagocytosis
  - increasing cellular respiratory activity
  - increasing the mobility of leukocytes
- topical wound healing

Side or toxic effects
- repeated daily dose (> 8 weeks) may suppress immune response
- possible hepatotoxicity
- allergic reactions

Avoid
- patients requiring immunosuppression (transplant)
- asthma
- pre-existing liver dysfunction

Discontinue before surgery (14 days)
Ephedra (ma huang)

Uses
- Weight loss
- Increase energy
- Treat asthma and bronchitis

Contains Ephedrine, pseudoephedrine, etc., which are noncatecholamine sympathomimetic agents
- FDA PROHIBITED SALE 2004

Ginseng (root)

Uses
- lower cholesterol and blood sugar
- increased strength, endurance and mental acuity

Side effects
- Hypoglycemia may be 2/2 hormone receptor action
- Inhibit platelet aggregation
- Decrease in warfarin anticoagulation

Avoid
- Diabetics
- Patients on warfarin or at risk for bleeding

Discontinue 14 days prior to surgery

Garlic

Uses (1999 WHO recommended use in monograph)
- Modify risk of developing atherosclerosis
- Lower serum lipid and cholesterol levels
- Reduce blood pressure and thrombus formation

Actions
- Inhibits platelet aggregation ? Platelet activating factor

Side effects
- Prolonged bleeding

Avoid- use with other platelet inhibitors

Discontinue 14 days prior to surgery

Kava

Uses
- Anxiolysis
- Sedation
- Antiepileptic

Side effects
- Increase sedative effects of anesthetics
- Tolerance, ? addiction & withdrawal, hepatotoxicity

Discontinue 14d prior to surgery

Ginkgo biloba

Uses
- Positive effects on cerebral blood flow, cerebral insufficiency, and memory, may improve cognitive performance in Alzheimer Disease
- Flavonoids- free radical scavengers
- Terpenes- inhibit platelet activating factor

Side effects
- prolonged bleeding
- headache, dizziness, heart palpitations, and GI and dermatological reactions

Discontinue 14d prior to surgery

St. John’s Wort

Uses
- Short-term treatment of mild to moderate depression
- JAMA: no difference from placebo

Actions
- Inhibiting serotonin, norepinephrine and dopamine reuptake

Side effects
- increased metabolism of cyclosporine, warfarin, steroids, benzodiazepines, calcium channel blockers, digoxin through induction of the cytochrome P450 enzymes
St. John’s Wort

Avoid
- Patients on the following medications
  - cyclosporin
  - alfentanil
  - midazolam
  - lidocaine
  - calcium channel blockers
  - serotonin receptor antagonists
  - warfarin

Discontinue 14 days prior to surgery

12 year old male who presents for the removal of a radiolucent lesion of his left mandible that will require hospitalization and OR for treatment. Adopted at birth, no previous hospitalizations, bruises easily, otherwise healthy.

Valerian

Uses
- Sedative, insomnia, in virtually all herbal sleep aids

Actions
- Acts at the GABA receptor (gamma aminobutyric acid)
- Sites thought similar to benzodiazepine sites

Side effects
- additive to sedatives
- patients can become dependent
- acute benzodiazepine withdrawal but little evidence for valerian- can taper to stop 14d prior to surgery

Summary
- Most patients will not disclose herbal medication use
  - therefore must question carefully
- 1 in 5 patients is unable to identify the preparation they are taking
  - bring herbal medications to appointment
- More likely to avoid conventional diagnosis and therapy
  - suspect presence of undiagnosed disorders
- Should discontinue herbal medications prior to invasive procedures most often 14 days recommended

Labs
- Hgb = 12
- Hct = 38
- Plts = 150 K
- INR = 1.1
- PTT = 60 secs (30- 45secs)
- Isolated elevated PTT
Evaluation for a Bleeding Disorder

History
- bruising
- nose bleeds
- heavy menstrual bleeding
- bleeding following trauma or surgery
- family history

Medical status
- drugs
- alcohol use

Physical examination
- petechiae and ecchymosis

Lab tests
- INR/PTT
- Platelet count
- Bleeding time (not really useful now)
- Others
  - specific factor assays
  - fibrinogen levels
  - platelet adhesion and platelet aggregation tests

Clotting Cascade

Elevation of PTT
- Heparin therapy
- Hemophilia A and B
- Von Willibrands Disease
- Liver Disease

If PT is normal but PTT is prolonged are limited to VIII, IX, XI, XII

PT-INR/PTT
INR = International Normalized Ratio
- differences in reagents
- does not correlate directly with PT
- II, VII, IX, X
- Coumadin therapy

PTT = Partial Thromboplastin Time
- Intrinsic pathway prior to activation of factor X
- Heparin therapy

Platelets
Platelet function
- platelet adhesion
- platelet aggregation

Bleeding time
- Not sensitive or specific
- Replaced by functional assays (e.g. PFQ-100)
Hemophilia A, B and Von Willibrands Disease

Hemophilia A
• Factor VIII deficiency, X-linked recessive

Hemophilia B
• Factor IX deficiency

Von Willibrands Disease
• Factor VIII deficiency and deficiency in Von Willibrands factor

Treatment of Hemophilia A and Von Willibrands Disease

(mild) DDAVP (synthetic antidiuretic hormone) increases release of Von Willibrands factor
(moderate) Cryoprecipitate (VIII + Fibrinogen)
(severe) Factor VIII concentrate (may not help with Von Willibrands disease)
(post-op) Amicar - inhibitor of fibrinolysis

Calculation of Allowable Blood Loss

Pre-op HCT - 30 x EBV = Allowable Blood Loss
Pre-op HCT

EBV = 40 kg x 80 ml/kg = 3200 ml

38 - 30 x 3200 = 673 ml
38

Normal Blood Volume (cc) per Kg

Female = 60
Male = 70
Child = 80
Infant = 100

Differences Child and Adult

Hemodynamic
• Increased intravascular volume
• TBW age 1 yr. = adult 60%
• Infants (1-12 months): cardiac output more rate dependent (bradycardia leads to hypotension). Myocardial contractility improves during infancy
• Parasympathetic influence in the myocardium is stronger with increased incidence of bradycardia in the child less than 2-3 years of age.

Treatment of Hemophilia B

Factor IX deficiency

(mild) FFP
(severe) Proplex, Konyne (II, VII, IX, X)
Differences Child vs Adult

Airway child vs teenagers/adults:
- Smaller diameter airways, increased airflow resistance
- Large adenoids, tonsils and tongue
- Tongue larger
- Epiglottis is short, stubby & angled
- Trachea more compliant
- Vocal cords are angled and endotracheal tube may lodge in anterior commissure

Other
- desaturate more quickly
- anything that interferes with oxygen exchange or delivery can become life threatening
- Increased resp rate and CI lead to uptake of inhaled anesthetics
- Large body surface area to weight ratio thus children more prone to heat loss

Differences Child vs Adult

Anatomic
- Larynx at C2-C4 (Adult @ C4- C6)
- Airway is funnel shaped with narrowest point at cricoid cartilage (Adult @ glottic opening)

Gastrointestinal

You complete maxillary and mandibular orthognathic surgical procedures on a 19 year old female without complications. On the fourth post-op. Day she experiences abdominal cramps and non-bloody diarrhea. Post-operatively she was placed on a cephalosporin antibiotic.
Pre-op

Differential Diagnosis

- Change in diet to liquids
- Viral
- Pseudomembranous colitis
- Laxative abuse
- Inflammatory bowel disease

Lab and Other Tests

Lab
- Fecal leukocytes
- Culture (aerobic and anaerobic)- C. Diff.
- C. Diff. toxin- positive
- Ova and parasites- negative
- Blood- negative
- K+

Guiac stools- positive
Abdominal CT/ plain films = flat plate
Proctoscopic examination- yellow-white, raised, plaque-like pseudomembrane lining bowel.

Diagnosis

Pseudomembranous Colitis

Pathophysiology

Exotoxin produced by C. Difficile
- Anaerobe, indigenous to the bowel
- Proliferates when antimicrobials and other factors alter bowel flora.
- Particularly with extended spectrum PCN’s (Augmentin, Amoxicillin) and Clindamycin, has occurred with most antibiotics

Symptoms and Progression of Disease

Fever
Cramps
Voluminous non-bloody diarrhea (5% bloody)
Develops 4-9 days after initiation of antibiotic therapy. Can take as long as 2 months to develop.
In bowel- edema and mucosal ulceration with white pseudomembrane
Treatment

Stop antibiotic
- Vancomycin 250-500 mg PO, qid or
- Flagyl 250-500 mg PO, tid or
- Bacitracin 25,000 units PO qid

IV hydration
Watch K+

Refractory cases - Cholestyramine 4gms PO, qid x 5 days
Antidiarrheal medications are contraindicated (retain toxin in bowel)

RELAPSE AS HIGH AS 30%
Best Treatment now fecal transplant = Above 95% cure rate

Neurologic

Differential Diagnosis for Unconsciousness

A = alcohol  T = trauma
E = epilepsy   I = infection
I = insulin  P = psychotic
O = opiates  P = poison
U = uremia  S = shock

C-spine Fracture

65 year old street person, brought into ER semiconscious, looks ill with a mandibular fracture. You are called to the ER to manage him. As you are examining him he loses consciousness.

C4- loss of spontaneous respiration
C5- quadriplegia
C6- paraplegia
C7- flexion, but poor extension
T1- good flexion and extension but weak
Initial Actions
ABCs
Oxygen
VS
Cervical collar
Exam
ECG
IV/ Blood draw

Update on Management of the Diabetic Patient
Norman J. Betts, DDS, MS

Labs
Na = 142 (135-145)
K = 3.3 (3.5-5.0)
Cl = 99 (100-106)
HCO3 = 18 (24-30)
Glucose = 463 (70-110 fasting)
U/A = 4+ sugar, 2+ keytones

Definitions/Types
• Type I (IDDM) - Juvenile onset, insulin and diet
• Type II (NIDDM) - Adult onset, diet and oral hypoglycemic agents
• Secondary diabetes - tumor or pancreatic resection
• Gestational diabetes
• Impaired glucose tolerance

Endocrine

Pathophysiology Type I DM
• Overall, not clear
• Likely combination of genetics (HLA-D region) + environmental exposure
• Autoimmune destruction of the exocrine pancreatic cells (beta-cells) which produce insulin
Etiology of Type II Diabetes

Strong genetic component
- Increased insulin resistance (precursor)
  - decreased post-receptor activity (major)
  - decreased receptors (minor)
- Decreased insulin secretion (later)
- Increased in alpha/beta cell ratio = excess glucagon secretion over insulin
- Strong relationship to obesity

Complications of Diabetes

• Microvascular
  - Retinopathy (vision loss)
  - Nephropathy (renal failure)
  - Neuropathy (peripheral neuropathy)
  - Impaired wound healing (neutrophil function, blood flow, bacterial growth)

• Macrovascular
  - Coronary artery disease
  - Stroke
  - Peripheral arterial disease

• Oral
  - Xerostomia
  - Infection
  - Poor healing
  - Increased incidence and severity of periodontal disease
  - Burning mouth syndrome
  - Oral fungal infections (Candida, mucormycosis)
  - Enamel hypoplasia (mother diabetic)

Complications of Diabetes

• Acute

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  - Poor healing
  - Increased incidence and severity of periodontal disease
  - Burning mouth syndrome
  - Oral fungal infections (Candida, mucormycosis)
  - Enamel hypoplasia (mother diabetic)
Complications of Diabetes

Hypoglycemia (from treatment)
- Mild (blood sugar 60-80mg/dl)
  - Hunger, sweating, weakness, tremor
- Severe (< 60mg/dl)
  - Confusion, seizure, coma

Diagnosis, Lab Tests

1) Fasting venous blood glucose
   - ≥ 140 mg/dl on two occasions
2) Oral glucose tolerance test (blood before, 1/2, 1, 2, 3 hrs., basically same above)
3) Random blood glucose (> 200 mg/dl) once
4) Glycosylated hemoglobin (Hemoglobin A1c) – may see this (HgA1c > 6.5% is concerning)

Clinical Presentation

Cardinal symptoms, Common
- Polydipsia
- Polyuria
- Polyphagia
- Weight loss
- Loss of strength

Other symptoms
- Recurrence of bed wetting
- Repeated skin infections
- Marked irritability
- Headache
- Drowsiness
- Malaise
- Dry mouth

Management of Diabetes

Not a curable disease (especially type I DM)
Therapy is individualized and lifelong
Therapeutic goals
- Maintain blood glucose as close to normal as possible
- Avoid repeated episodes of hypoglycemia
- Treat micro- and macrovascular complications
- Strive to maintain normal body weight

Clinical Presentation

- Diabetic ketoacidosis
  - Abdominal pain, nausea, vomiting, weakness
- Hyperglycemic hyperosmolar state (HHS)
  - Weakness, confusion, orthostasis

Management of Diabetes

- Diet and physical exercise
  - Most patients get limited benefit
- Oral hypoglycemic agents
  - Metformin
  - Sulfonylureas (glipizide, glyburide)
  - Thiazolidinediones (pioglitazone, etc.)
  - Alpha-glucosidase inhibitors (Acarbose)
- Insulin + oral hypoglycemic agents
- Insulin
Oral Agents

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Trade Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metformin</td>
<td>Glucophage</td>
</tr>
<tr>
<td>Glyburide</td>
<td>Diabeta, Micronase</td>
</tr>
<tr>
<td>Glipizide</td>
<td>Glucotrol</td>
</tr>
<tr>
<td>Pioglitazone</td>
<td>Actos</td>
</tr>
<tr>
<td>Acarbose</td>
<td>Precose</td>
</tr>
</tbody>
</table>

New Agents for Tx of DM

SGLT 2 inhibitors (sodium-glucose transporters)
- Your body tries to keep glucose, SGLT 2 inhibitors (Invokana) allow glucose to escape into the urine.
- Also weight loss and decreased blood pressure (lose sodium too)
- Comp. = Increased yeast infections, dehydration with diuretics, increased risk of ketoacidosis

Insulin

<table>
<thead>
<tr>
<th>Description</th>
<th>Names</th>
<th>Onset</th>
<th>Lasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra short-</td>
<td>Lispro, Aspart, Humalog</td>
<td>10 min</td>
<td>2-4 hrs</td>
</tr>
<tr>
<td>acting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-</td>
<td>Humulin, Novolin</td>
<td>30 min</td>
<td>5-8 hrs</td>
</tr>
<tr>
<td>acting/regular</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NPH</td>
<td>Humulin N, etc.</td>
<td>2 hrs</td>
<td>18-24 hrs</td>
</tr>
<tr>
<td>Long-</td>
<td>Glargine, Lantus</td>
<td>2 hrs</td>
<td>20-24 hrs (no peak)</td>
</tr>
</tbody>
</table>

Management of Diabetes

1) Step 1: Counsel on diet and exercise AND start metformin (new recommendation)
2) Step 2: Add insulin or add sulfonylurea (glipizide)
3) Step 3: Continue metformin and add intensive insulin regimen

New Agents for Tx. of DM

Inhaled insulin (Afrezza)
- Fast acting, take only at meal times

Ultra-long acting insulin (Tresiba)
- Injectable form which lasts up to 42 hours

GLP-1 Receptor Agonists (Victoza)
- Hormone GLP-1 tells body to make insulin, but lasts only a few minutes, GLP-1 receptor agonists work up to 10 hours.
- Some are once a day (Adlyxin)
- Others work for up to 7 days (Trulicity)

Dpp-4 inhibitors (Januvia)
- Allow body to keep making insulin
- Block enzyme that breaks down hormones including GLP-1

Delayed release Metformin
475 drugs in different stages of development, so more coming soon!
Practical Implications

1) Patient with DM presents for surgery/procedure.
2) Patient with DM presents for surgery/procedure with symptoms concerning for elevated blood sugar.
3) Peri-operative management of a patient with underlying DM.

Diabetic Patient with an Infection

• If on oral agents only, may require insulin
• If on insulin, may require increased insulin dose
• If feasible, can check blood sugar in clinic, refer if needed

Dental Management of DM

• All dental procedures can be performed in patients with diabetes
• No special precautions unless acute complications present
  • Ketoacidosis (abd. pain, nausea/vomiting), Type I
  • HHS (thirst, confusion, weakness), Type II
• If concerning symptoms present, check blood sugar (if possible) AND refer for urgent evaluation (same day)

Pre-op Management of Type I DM

• Ensure glucose is reasonably controlled (< 300mg/dl)
• Early to mid-morning procedure
• NPO
• Start infusion of D5 ½ Normal Saline
• Give 1/2 of usual insulin dose

Medication Management

• In general, no major changes needed around the time of a procedure
• Type II, if NPO (sedation), hold oral agent on the morning of the procedure
• Type I, if NPO, give ½ of usual insulin dose on the morning of the procedure

Post-op Management of IDDM

• Infuse D5 ½ normal saline
• Frequent blood sugar checks
• Manage with continuous infusion or sliding scale insulin
• Initiate diet and then restart their usual oral agent or insulin regimen
Diabetes Take-Home Points

- Diabetes leads to organ damage and can predispose to oral complications.
- Patients with severely elevated blood sugars will present with: abdominal pain & nausea/vomiting (type I) or confusion/weakness (type II)
- Most procedures require no change in oral or insulin regimen
- Patients with an active infection may have elevated blood sugars and need medication changes.

Diagnosis

Diabetic Ketoacidosis (DKA)

Management of DKA

- Fluid replacement
  - Isotonic fluids (0.9% or LR) at 1 liter/hr.
  - 0.45% at 150-250 cc/hr.
  - D5.45 when glucose falls below 400 mg/dl, try to maintain at 200-300
- Insulin
  - Continuous infusion with frequent monitoring
- Potassium
  - initially K+ is high but drops with insulin treatment
- Bicarbonate
  - acidotic, as raise pH, then K+ decreases
- Physical exam to find underlying cause

Common Complications of Management of DKA

- Hypoglycemia
- Lactic acidosis
- Cerebral edema
- Arterial thrombosis
- Hypokalemia

Causes of Hypokalemia

- GI losses (diarrhea, vomiting, NG suctioning)
- Renal loss (organic disease)
- Inadequate intake
- Potassium driven into cells (Insulin)
- Correction of acidosis
- Use of non-potassium sparing diuretics

ECG Changes with Hypokalemia

- Sagging ST segment
- Low voltage
- Inverted T
- Long QT interval
Other Cardiovascular Changes in a Pregnant Female
- 30-40% increase in maternal circulating blood volume
- 20% increase in red blood cell volume
- Relative anemia
- Increased extracellular fluid (6-8 liters)
- Sodium retention
- 30-40% increase in cardiac output
- Slight increase in heart rate

OR Positioning
- Left lateral position or supine with left lateral displacement (bump under right hip)
- Purpose is to move the uterus off of the inferior vena cava and aorta
- Supine hypotensive syndrome - results from aortic and inferior vena cava obstruction by the gravid uterus
  - Dizziness, vertigo, sweating, tachycardia, apprehension and altered mentation

Pre-operative Workup
- OB consult
- Ultrasound/ fetal monitor
- ECG
- CBC, electrolytes

Anesthetic Technique
Pregnancy
- Volatile anesthetic
- Oxygen
- Narcotic (Fentanyl, Morphine)
- Non-depolarizing muscle relaxant
Most common complication
- Pre-term delivery

Other Modifications of Anesthesia Technique
- Rapid sequence induction and pre-op non-particulate antacids, H2 blockers and Metaclopramide. Propensity for GI reflux due to gravid uterus and circulating progesterone.
- Fetal monitoring - fetal heart rate and uterine tone, to avoid uteroplacental insufficiency due to hypotension.
- Strictly avoid hypotension, hypoxia, and hypercarbia
Other Modifications of Anesthesia Technique

- Benzodiazepines are not contraindicated
- Controversy concerning Nitrous oxide, but most agree that it can be used in later term procedures
- Potential increased toxicity with local anesthesia (fetus)
- Avoid drugs not normally given during pregnancy

OSA

- Obstruction of the upper airway
- Apnea during sleep (> 10s w/ desat.)
- Repetitive
- Often associated w/ desaturation
- *Loud snoring
- *XS daytime somnolence

*most common presenting symptoms

28 y.o. male with mandibular retrognathia, retrogenia and anterior open bite. During the initial orthognathic work-up the patient complains of being tired all of the time and lack of attention/ poor performance at work. He falls asleep when inactive for a short period of time.

OSA

Adults: 26% (2-26%) 7/10 bariatric surgery pts plateau ages 55-65
Risk factors:
- obesity
- craniofacial abnormalities
- current TOB
- nasal congestion
Pediatrics: tonsil and/or adenoid enlargement

Physical Examination

- 104 kg, 170 cm, BMI 36
- BP = 165/93
- HR = 83
- O2 SAT = 95% (Room air)
- Neck 42 cm

OSA

7/10 pts undergoing bariatric surgery
80% men & 93% women w/ moderate to severe sleep apnea = undiagnosed
Diagnosis

“Gold standard” polysomnography can have false negative results
apnea-hypopnea index
In-lab and $$$$$

Polysomnography Results
AHI = 32 (severe)
Several desaturations, SaO2 < 60%
Associated with cardiac dysrhythmias (PVC’s)

Components of Polysomnography

• EEG
• Electro-oculography (eye movement)
• Chin and leg electromyography
• ECG
• Nasal and oral air flow
• Thoracic and abdominal respiratory efforts
• Pulse oximetry

Importance of O2 Saturation Data

• Cardiac dysrhythmias with saturation below 60%, patient at risk for sudden cardiac events
• Significant component to excessive daytime sleepiness and fatigue
• Usually reported as a percentage of time at each 10% increment (100%, 90%, 80%, 70%, etc.)

OSA

AHI
Mild: 5-15/hr.
*Mod: 15-30/hr.
*Severe: > 30/hr.
SaO2 < 90%, 20% of sleep time
assoc. with significant morbidity
80% men & 93% women w/ mod to severe sleep apnea = undiagnosed, increased postop M&M

Severe OSA

Polycythemia
HTN
Angina
Pulmonary HTN
“Cor pulmonale”
Mortality
STOP-BANG Scoring

Snoring (louder than talking, heard through closed doors)
Tired (during daytime)
Observed (stop breathing during sleep)
Pressure (high BP)

Anesthesiology 2008;108:812-21 Chung et al.

Confirm Diagnosis of OSA

Refer to multidisciplinary team

- Physical examination (emphasizing head and neck)
  - Obesity is a common feature of OSA
- Nocturnal polysomnography
- CXR
- ECG

Attempt to determine the site of obstruction

- Lateral cephalogram with analysis
- Fiberoptic pharyngoscopy with Mueller maneuver (inspiratory effort against a closed nose and mouth)

PATIENT MANAGEMENT

- Weight loss
- Mandibular positioning device
- CPAP/ BIPAP
- Pre-op anesthesia evaluation, difficult airway
- Endoscopic AW evaluation (if no diseased nasal passages, no coagulopathy, no aspiration)

*Rosenblatt et al. A&A 2011;112:602-7 [26% diff AW plan]

Risk reduction

ASA: preoperative use of continuous positive airway pressure or noninvasive positive pressure ventilation may improve the condition of patients at increased perioperative risk from OSA (3mo. course may reverse OSA-induced CV dysfunction)

Patient Management

- Orthognathic procedure (likely maxillary posterior impaction and advancement, mandibular advancement, advancement genioplasty)
- Other options LAUP, UPPP, hyoid suspension
- Post-op CPAP and monitoring in ICU
- Post-op sleep study (6 months)