ASA Classification

Oral medicine focuses on how to identify and respond to a patient's medical history since it may affect their elective dental treatment. This includes recognizing medications, diseases, symptoms, and much more.

1 ASA Classification

The American Society of Anesthesiologists (ASA) developed a classification system to better administer the type of general anesthesia for patients that have comorbidities.

There are six statuses in the classification

- Higher status = more likely to experience an adverse medical event during general anesthesia

ASA 1

- Healthy patient
- No special treatment

ASA 2

- Mild systemic disease, well controlled
- No restricted function

ASA 3

- Severe systemic disease
- Restricted function

ASA 4

- Severe systemic disease
- Threatening condition to life

ASA 5

- Moribund patient
  - Not expected to survive in 24 hours
- Only palliative care advised

ASA 6

- Brain-dead patient
- Organs removed for donation

INBDE Pro Tip: The following are examples of patients that fall into each ASA classification

ASA	Example
1	Healthy, non-smoker, infrequent drinker
2	Smokers, social drinker, obese, asthma, mild lung disease, pregnant Controlled -diabetes, -hypertension, -epilepsy
3	Induced asthma, morbid obesity, COPD, End stage renal disease under dialysis Alcohol abuse/dependence Poorly controlled systemic disease Stable Angina pectoris History (>3 months) of MI, CVA, TIA
4	Hypertensive emergency End stage renal disease (not under dialysis) Uncontrolled seizures, septic shock Unstable angina pectoris History (<3 months) of MI, CVA, TIA
5	Terminal cancer, end-stage organ dysfunction, severe trauma
6	Dead

Pain & Analgesics

1 Levels of Pain

Generally, different dental procedures result in different levels of acute pain. The following are lists of procedures that fall under different levels of pain along with their appropriate analgesic interventions.

Mild

- **Procedures**
  - Scaling and root planning
  - Subgingival restorations
  - Endodontics
  - Extraction(s)
  - Frenectomy and gingivectomy
- **Analgesic**
  - Ibuprofen 400mg (every 6h for 1 day) then/ or,
  - Ibuprofen 400mg (every 6h as needed)

Moderate

- **Procedures**
  - Simple implants
  - Periodontal flap surgery with bony recontouring
  - Surgical extraction (involves removal of bone)
  - Surgical endodontics (apicoectomy)
- **Analgesic**
  - Ibuprofen 400mg + acetaminophen 500mg (every 6h for 1day)
  - Followed by,
  - Ibuprofen 400mg + acetaminophen 500mg (every 6h as needed)

INBDE Pro Tip: Ibuprofen and acetaminophen have been shown to have a synergistic effect when used together.

Severe

- **Procedures**
  - Complex periodontal surgery
  - Bony impaction surgery
    - Bony impacted third molar
  - Complex implant surgery
- **Analgesic**
  - Ibuprofen 600mg + acetaminophen 650mg + hydrocodone 10mg (every 6h for 1-2 days)
  - Followed by Ibuprofen 600mg + acetaminophen 500mg (every 6h as needed)

2 Alternative Analgesic Use

There are several situations where an alternative analgesic to NSAIDS should be considered. **Acetaminophen** should be the alternative in the following scenarios:

- Asthma
  - Opioids contraindicated
- Heart disease
  - NSAIDs can interfere with different heart medications
- Stomach disease
  - NSAIDs increase risk of gastric ulcers
- Kidney disease
- Liver disease
  - Use low-dose acetaminophen
- Pregnancy
  - Can use NSAIDs in 1st and 2nd trimester, but not the 3rd
  - Opioids contraindicated
- Allergy to analgesia

Antibiotics

1 Antibiotics for Dental Conditions

Due to concern over antibiotic resistance and antibiotic side effects, most pulpal and periapical conditions don't recommend the use of antibiotics. Considerations for their use can be categorized in the following manner:

- Fever, tiredness
  - Antibiotics recommended
    - Amoxicillin 500mg/8h for 1 week
    - Azithromycin 500mg on day 1, 250mg on days 2-5
- Swelling
  - Antibiotics possibly recommended
    - Severe swelling
    - Urgent care not available
    - Immunocompromised
- Sensitivity to temperature and/or chewing and pain
  - Antibiotics not recommended
    - Dental treatment + analgesics

2 Antibiotic Prophylaxis

Antibiotic prophylaxis (AP) is a proactive measure to prevent serious infection from certain dental procedures.

- Bacteria from mouth → enters bloodstream → reaches the heart
- At-risk patients are indicated for antibiotic prophylaxis when the benefit of preventing potential infection outweighs the risk antibiotic resistance
- If a patient forgets to take the antibiotic before treatment, they can still take it up to 2 hours after the procedure

Indications for Antibiotics Prophylaxis

Antibiotic Prophylaxis indications

- Cardiac transplant with valvular regurgitation
  - Valvular regurgitation = leaking heart valve
- Congenital Heart Diseases (CHD)
  - Unrepaired cyanotic heart diseases
  - Any repaired congenital heart defect with residual shunt or valvular regurgitation
    - Antibiotics recommended for 6 months after repair procedure in pediatric patients
- Joint replacement with history of complications associated with surgery
  - Antibiotics considered after consultation with orthopedic surgeon and dentist
  - Extreme cases have orthopedic surgeon writing the prescription
- Previous infective endocarditis (IE)

No Need for Antibiotic Prophylaxis

- Mitral valve prolapse
  - Extremely low incidence of IE
- Bicuspid valve disease
- Calcific aortic stenosis
- Rheumatic heart disease
- Congenital Heart diseases (CHD)
  - All others not indicated for antibiotic prophylaxis in the indications list
- Most joint replacements
  - Exceptions written in above section

Congenital Heart Defects

Congenital heart defects may lead to the development of **shunts** (pathways) that connect the left and right heart chambers, allowing blood to flow between them.

- **Cyanotic** (right → left shunt)
  - **Cyanosis** = deoxygenated blood enters systemic circulation
  - Tetralogy of Fallot

- Transposition of great vessels
- Tricuspid atresia
- Total anomalous pulmonary vascular
- Truncus arteriosus

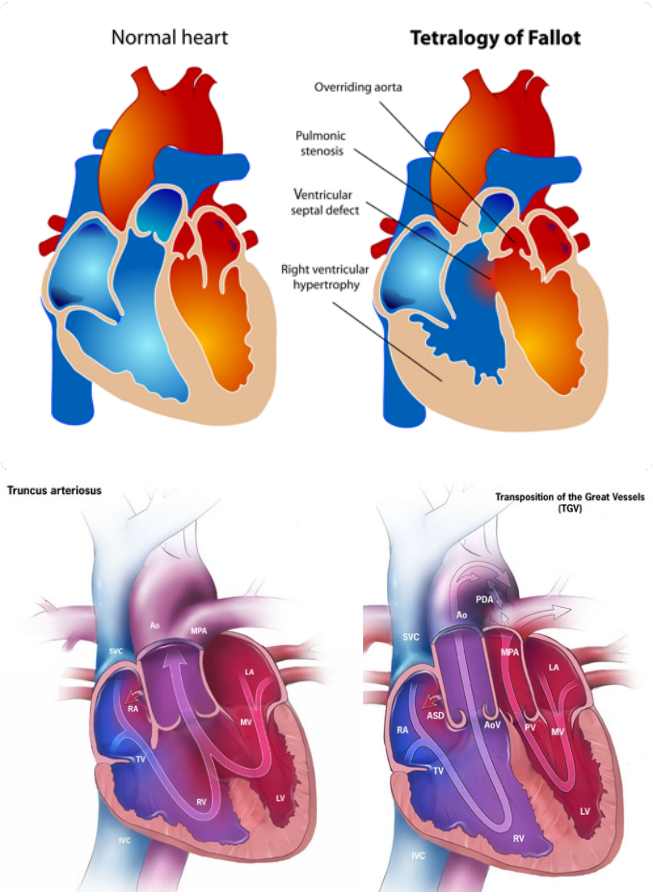

Figure 1.01 Cyanotic heart defects

- **Acyanotic (left → right shunt)**
  - Does not cause cyanosis
    - Hence, does not need premedication
    - Less severe defect
  - Atrial septal defect (ASD)
  - Coarctation of aorta (COA)
  - Hypertrophic cardiomyopathy (HCM)
  - Patent ductus arteriosus (PDA)
  - Ventricular septal defect (VSD)

INBDE Pro Tip: Cyanotic heart defects all begin with the letter T. Memorize Cyanotic defect by "the five Ts."

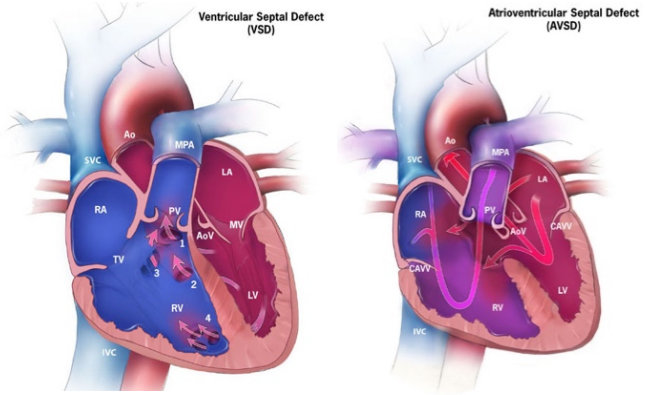

Figure 1.02 Acyanotic heart defects

Dental Procedures considered for AP

Only certain dental procedures require antibiotic prophylaxis for at-risk patients. The following procedures include:

- Perforation of oral mucosa
  - Extractions
  - Placing orthodontic bands, TADs
  - Sutures
  - Cleaning, SRP
  - Biopsy
- Involvement with gingiva or tissue in periapical region

Other Indications for AP

- Hyperglycemia
  - Random blood glucose > 200mg/dL
  - HbA1c > 8%
- Severely Immunocompromised Patient
  - CD4<200 (HIV)
  - AIDS related opportunistic infection
  - Autoimmune disease
  - Chemotherapy, head and neck radiation
  - Bone marrow/solid organ transplants
  - Neutropenia
  - Severe combined immunodeficiency
  - Rheumatoid arthritis treated with biological response modifiers or prednisone > 10mg/day

Infective Endocarditis Prophylaxis

Condition	Prescription	Time before Tx
1st choice	Amoxicillin 2g	1h
Children's 1st choice	Amoxicillin 50mg/kg	1h
Penicillin allergy	Azithromycin 500mg or Doxycycline 100mg	1h
Children + Penicillin allergy	Azithromycin 15mg/kg	1h
IV or IM	Ampicillin 2g	30 min
Children + IV or IM	Ampicillin 50mg/kg	30 min

INBDE Pro Tip: You can memorize the children's dosage by dividing the adult dosage by 30 or 40.

Ex. 2000 ÷ 40 = 50mg/kg for children taking Amoxicillin

Note: If a patient is already taking antibiotics for another condition, dentists should select antibiotics of a different class for prophylaxis of dental procedures.

Emergency First Aid & CPR

1 First Aid

Basic Steps

When first recognizing an emergency, there are five basic steps to perform before CPR:

1. Appraise the scene
   - Check the area for any hazards and safety
2. Responsiveness
   - Check consciousness
   - Tap victim on the shoulder and ask if they're okay
3. Alert
   - Gather extra people and delegate tasks
4. Breathing + pulse
   - Check both at the same time within 10 seconds
5. Emergency Medical Service (EMS)
   - Call 911
   - Retrieve an AED

Figure 1.03 AED

Unresponsive Victims

When checking an unresponsive victim, there are three main ways to act depending on their pulse and breathing.

- Pulse + Normal Breathing
  - Monitoring person + wait for emergency responders to arrive
- Pulse + Abnormal Breathing
  - Maintain open airway
  - **Rescue breathing**
    - Child: 1 breath/3s
    - Adult: 1 breath/5s
- No Pulse and Abnormal Breathing = CPR
- No Pulse + No Breathing = CPR

2 CPR

CPR stands for cardiopulmonary resuscitation. It is performed by repeated cycles of compressions, airway and breathing

Compressions

- 30 chest compressions
  - 100-120 compressions/minute
  - Use 2 hands places at lower half sternum, between the nipples
  - Keep arms straight, hands interlocked
  - Compress 2" into chest
  - Allow the chest to fully recoil between compressions
- Victim facing up on a firm surface while person is kneeling beside them

Airway

- **Head tilt-chin lift** during each breath
  - Bring chin up using two fingers under chin
  - If there's trauma, use Jaw thrust

Figure 1.04 Head tilt-chin lift

Breathing

- Two breaths
  - Each 1 second long
  - Blow until you see the chest rise

Figure 1.05 Blowing in air

AED

- During the process of CPR, the AED should be set up
- Stops an abnormally beating heart
- Place pads on clean dry skin on upper right and left chest
- Adult pads for people ages 8+ years, use smaller pads if younger
- If rescuer witnessed the cardiac arrest on the scene of emergency, then use AED on arrival
- If cardiac arrest was unwitnessed, then use AED after 5 cycles//2 minutes of CPR

3 Special Considerations

Child & Infant CPR

- Artery to check pulse differs
  - Child (or Adult): Carotid artery
  - Infant: Brachial artery
- If unwitnessed collapse, start CPR immediately
  - 15 compressions/2 breaths/cycle (if there are 2 rescuers)
  - Small children: 1 hand compressions
  - Infant: 2 finger compressions
    - Compress 1/3 chest depth

Figure 1.06 Infant CPR

Choking

- First try to encourage coughing
- If victim is conscious and cannot cough, then rescue uses abdominal thrusts
  - Use **Heimlich maneuver**
    - Rescuer facing the victims back, placing arms around the victim with fists thrusting upward between the xiphoid process and navel
- Infants: 5 backslaps then 5 chest thrusts
- If victim in unconscious: CPR and check mouth before delivering breaths

Figure 1.07 Heimlich maneuver

INBDE Pro Tip: The brain can survive 6 minutes without oxygen (high yield question).

Bisphosphonates

1 Bisphosponates

Bisphosphonates induce apoptosis in osteoclasts, thereby decreasing bone resorption. Outcomes include the following

- Slowed tooth movement
- ↑ bone density
- Impaired bone healing and possible osteonecrosis

Indications for Use

- Fibrous dysplasia
- Gaucher's disease
- Hyperparathyroidism
- Osteogenesis imperfecta
- Osteopenia
- Osteoporosis
- Multiple Myeloma
- Metastatic bone lesion
- Paget's disease
- Rett's syndrome

Prescriptions

The following chart lists the most prescribed bisphosphonates.

Name	Admin	Use	Rel P
Etidronate	Oral	Paget's	1
Tiludronate	Oral	Paget's	10
Clodronate	Oral/IV	Osteoporosis	10
Pamidronate	IV	Bone metastases, Multiple myeloma	100
Alendronate	Oral	Osteoporosis	1000
Risedronate	Oral	Osteoporosis	1000
Ibandronate	Oral/IV	Osteoporosis	5000
Zoledronate	IV	Bone metastases, Multiple myeloma	10 000

*Rel P = Relative Potency

INBDE Pro Tip: Bisphosphates end in the suffix –dronate. The ones listed with a potency of 100 and above have a nitrogen side group (hence their potency)

Pharmacodynamics

- ↓ osteoclast function and number
  - By inducing apoptosis
- Nitrogen side groups
  - ↑ potency by inhibiting **farnesyl pyrophosphate synthase**
- Bisphosphonates are synthetic analogue of inorganic pyrophosphate that has a high affinity for calcium
  - Inactivate drug by being integrated and sequestered in bone
- ↓ Osteoblast activity + ↓ bone healing with chronic use

Pharmacokinetics

The body processes bisphosphonates by the following:

- IV bioavailability (100%) much higher than oral bioavailability (2%)
- High binding availability to divalent cations in the intestines
  - Calcium, iron, magnesium
  - Hence the lower absorption into the blood stream

- Binds to hydroxyapatite binding sites on bony surfaces with active turnover
- Higher concentration: trabecular bone > cortical bone
- Variable $T_{1/2}$
    - Ibandronate= 10 hours
    - Alendronate = 10 years

3 MRONJ

MRONJ

MRONJ stands for medication-related osteonecrosis of the jaws.

- Caused partly by certain medications
    - Denosumab
    - Bevacizumab
    - Bisphosphonates (nitrogen containing)
- **Osteonecrosis** = death of bone
    - Due to low blood supply
    - Bone exposure (ex. from tooth extraction) + medication = bone loses blood supply from above + blood from underneath cannot supply the bone = bone dries out and dies
- Jawbone more at risk due to constant microtrauma's caused by mastication
- Maybe asymptomatic at the start
- Progresses to paresthesia or pain
- Higher risk and severity of MRONJ associated with…
    - Higher dose
    - Freq administration
    - Longer duration
    - IV administration
- Risk factors
    - Concomitant use of estrogen or glucocorticoids
    - Over 65 years-old
- Mandible > maxilla
- Posterior > anterior

Figure 1.08 MRONJ

Diagnosis

- Prevalence
    - IV = 1% spontaneous, 10% after extraction
    - Oral = 0.1% spontaneous, 0.5% after extraction
    - Note: Some sources report a prevalence of MRONJ with oral bisphosphonates as 0.001%-0.01%
- Requires no history of radiation therapy to jaws because osteoradionecrosis could be possible
- Current or previous use of causative medication
- Exposed bone in maxillofacial region for 8+ weeks

Dental Considerations for Patients on Bisphosphonates

- At risk for MRONJ
    - Treat active infection
    - Use nonsurgical treatments
    - Conservative surgery if necessary
    - Consider alveolar ostectomy during extractions
    - Antibiotics

- Drug holiday (insufficient evidence)
  - If on IV bisphosphonates for 1± years, or oral bisphosphates for 5± years
  - Started 3 months before surgery, and then recontinue medication using less potent non-nitrogen containing bisphosphonate

- Currently MRONJ Patient
  - 0.12% CHX rinse
  - Aggressive use of systemic antibiotics
  - Considered, although insufficient evidence
    - Local debridement (normally for oral bisphosphonate)
    - Hyperbaric oxygen
    - Irrigation using local antibiotics

Hypertension

1 Blood Pressure

Blood pressure (BP) is the pressure created when blood exerts force on the walls of blood vessels as the heart pumps blood. BP is defined by two types

- **Systolic BP** occurs when the left ventricle contracts
- **Diastolic BP** occurs when the heart relaxes
- Blood pressure is expressed as systolic BP/ diastolic BP

Measuring Blood Pressure

Blood Pressure is read using two methods:

1. **Auscultatory** – manual method
   - Use sphygmomanometer and stethoscope

Figure 1.09 Auscultatory method

2. **Oscillometric** – automated method
   - Arm/wrist cuff and digital read out
   - AHA recommended = more accurate than manual

Technique

1. Let patient rest for 5 minutes
2. Choose appropriate cuff size
   - Length = 80% arm circumference
   - Width = 40% arm circumference
3. Record BP of both arms
   - Use the higher reading

2 Hypertension

Uncontrolled hypertension occurs when blood pressure is higher than normal. Hypertension can occur in different scenarios.

- **Acute**
  - From physical exertion, anxiety, or stress
  - Returns to normal BP once stimulus is stopped
- **Chronic**
  - BP remains high even without stimulus
- **White-coat**
  - BP increased in health care settings, but otherwise completely normal
  - More prevalent in older populations

Risk Factors

- Diet (sodium, alcohol)
- Age
- Smoking
- Obesity
- Lack of physical activity
- Genetic
- Pain
- Mediations
  - Stimulants
  - Immunosuppressants
  - Decongestants
- Diseases
  - Chronic kidney disease
  - Hyperthyroid
  - Sleep apnea
  - Acromegaly

Oral Manifestations: medications used for hypertension can have several side effects in oral manifestations:

- Dry mouth
  - Can also lead to taste changes and ulcerations
- Angioedema

Figure 1.10 Angioedema

- Gingival Hyperplasia
  - RAAS blockers
  - Calcium channel blockers (nifedipine)
- Gingival bleeding
  - Direct vasodilators

Blood Pressure Categories

1. **Normal**
   - Systolic < 120 mmHg
   - Diastolic <80mmHg
2. **Elevated**
   - Systolic = 120-129
   - Diastolic < 80mmHg
3. **Hypertension Stage I**
   - Systolic = 130-139 mmHg
   - or Diastolic = 80-89 mmHg
4. **Hypertensive Stage II**
   - Systolic ≥ 140 mmHg
   - Diastolic ≥ 90 mmHg
5. **Hypertensive Crisis**
   - Systolic > 180 mmHg
   - And/or Diastolic > 120 mmHg
   - Consult physician immediately

	SYSTOLIC	DIASTOLIC
NORMAL	90-129	60-79
STAGE 1	130-139	80-89
STAGE 2	140-179	90-109
CRITICAL	OVER 180	OVER 110

Figure 1.10 Stages of blood pressure

Pharmacotherapy

1. α-adrenergic blocker
2. α-adrenergic agonist (α2)
3. Direct vasodilator
4. Peripheral Adrenergic Inhibitor
5. β-Adrenergic Blocker
6. β- and α-Adrenergic Blocker
7. Calcium Channel Blocker
8. Diuretic
9. Direct Renin Inhibitor (DRI)
10. Angiotensin-Converting Enzyme Inhibitor (ACEI)
11. Angiotensin II Receptor Blocker (ARB)

Patient Management

Although there is a lack of agreement on how to control certain patient consideration, the overall considerations are as follows:

- BP > 120/80 mmHg
  - Book short morning appointments
  - Use slow chair movements
  - Stress management
  - Max epinephrine dose of 0.04mg
  - Avoid retraction cords with epinephrine
- BP > 160/100 mmHg
  - Elective treatment - Repeat BP measurement
    - If lowered or within guidance from GP, continue.
    - If confirmed, no elective treatment, seek physician consult
  - Urgent care - Repeat BP measurement
    - If lowered or within guidance from GP, continue.
    - If between 160-180 systolic and 100-109 diastolic and dental symptoms contribute to hypertension, begin urgent care.
    - If > 180/109 mmHg, refer to physician
- BP > 180/120 mmHg (hypertensive crisis)
  - Elective treatment
    - Defer treatment to a different day
  - Urgent care
    - Asymptomatic – do conservative treatment and refer to ER
    - Symptomatic – immediately refer to ER

Diabetes

1 Diabetes

Diabetes Mellitus is a metabolic disease characterized by hyperglycemia (high blood glucose) due to the body's inability to produce or react to insulin properly. The result is an accumulation of glucose in the blood.

Common signs of diabetes include
- Polydipsia – increased thirst
- Polyphagia – increased eating
- Polyuria – increased urination

Figure 1.11 Symptoms of diabetes

Blood sugar can be measured by
- **Blood glucose concentration** – varies at different times of the day
- **HbA1C** – glycosylated hemoglobin
  - Indicated blood sugar over the last 3 months

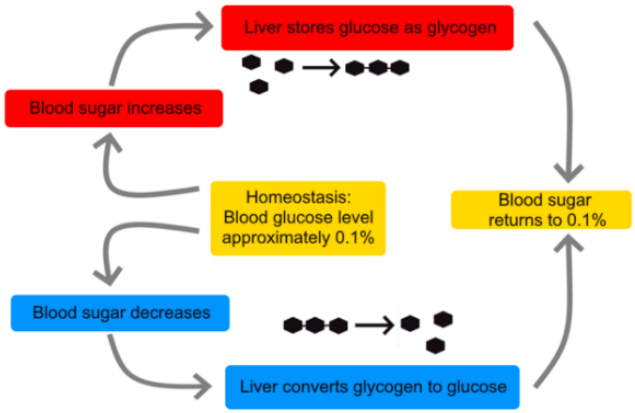

Figure 1.12 Blood sugar homeostasis

Oral Manifestations
- Dry mouth, burning mouth
- Oral candidiasis
- Gingivitis and periodontal disease
- Parotid gland enlargement
- Delayed wound healing
- Increased incidence of severity of infection

Blood Glucose Classification
Blood glucose measurements can be classified in 3 different groups for diagnosis.

	A1C	Fasting blood glucose	Glucose Tolerance Test
Normal	<5.7%	≤99mg/dL	≤139 mg/dL
Prediabetes	5.7-6.4%	100-125 mg/dL	140-199 mg/dL
Diabetes	≥6.5%	≥126 mg/dL	≥200 mg/dL

Note: HbA1C ≥6.5% is used to diagnose diabetes, but once the patient has been diagnosed, ideal HbA1C levels for them can be anything under 7%.

Hypoglycemia

- Low blood sugar < 70mg/dL
- Symptoms – **"TIRED"**
  - Tachycardia
  - Irritability
  - Restlessness
  - Excessive hunger
  - Sweating

INBDE Pro Tip: Signs can be reminded by the saying "cold and clammy need some candy"

Treatment

- Conscious: sugary drink /glucose tab
- Unconscious: call 911 + IV dextrose/IM glucagon

Hyperglycemia

- Fasting Blood sugar ≥126 mg/dL or post-prandial blood sugar ≥200 mg/dL
- Potential for emergency situations
  - Diabetic ketoacidosis
  - Hyperosmolar hyperglycemic state
- Symptoms
  - Sweet breath
  - Increased thirst and urination
  - Nausea & vomiting
  - Loss of clear vision

Other forms of Diabetes

Diabetes Insipidus relates to the kidney's inability to retain water. There is no pathology relating to insulin or blood glucose in this condition.

- Body cannot produce/insensitive to ADH
- Symptoms = Polydipsia and polyuria

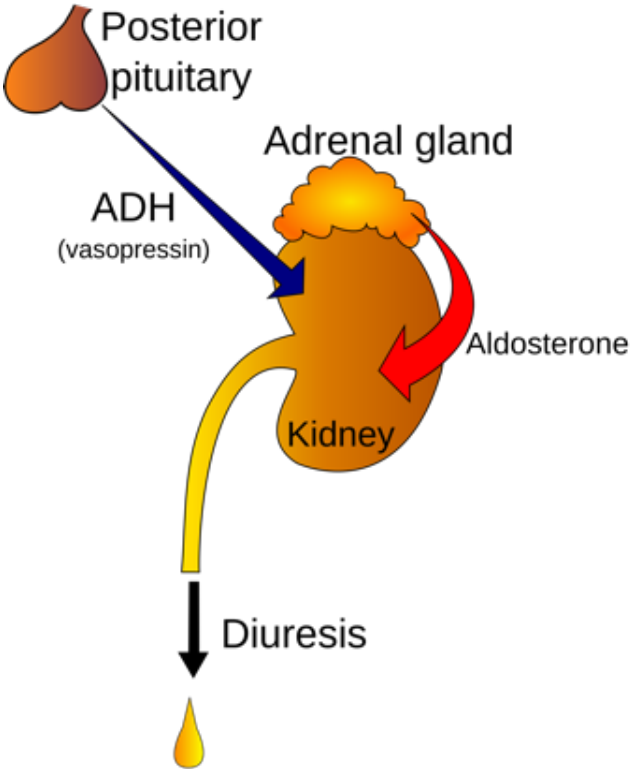

Figure 1.13 Urine production

2 Diabetes Mellitus

There are two main type of diabetes mellitus.

Type I Diabetes Mellitus

Characteristics of T1DM include the following:

- Usually juvenile onset
- Genetic condition, no cure
- Inability to produce insulin
- Insulin dependent
  - All patients require exogenous insulin therapy
- Ketone breath
  - From cells burning lipids instead of sugars

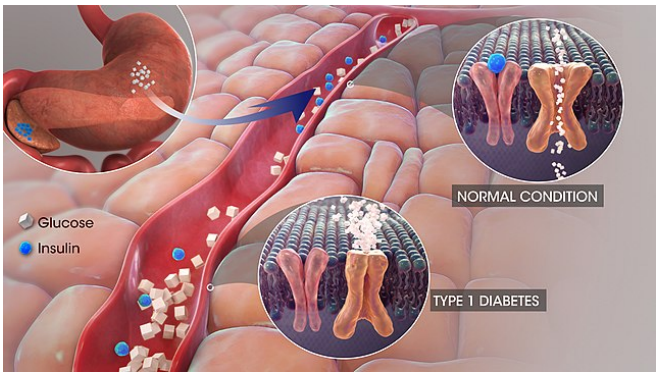

Figure 1.14 Type I Diabetes Mellitus

Type II Diabetes Mellitus

Characteristic of T2DM include the following:

- Common chronic disease, adult onset
- Insulin resistance/insensitivity
- Preventable and treatable (lifestyle modifications)
- Late stages require exogenous insulin

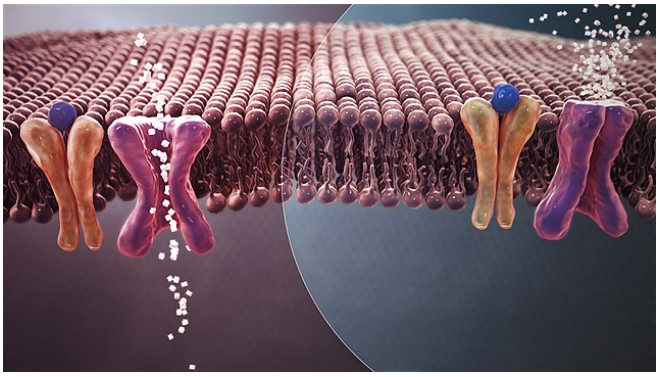

Figure 1.15 Type I Diabetes Mellitus

Gestational Diabetes

- Occurs during pregnancy for those without diabetes prior
- Cause = placental hormones
- insulin deficiency and sensitivity

3 Diabetes Management

Insulin

Self-Administered subcutaneous insulin

- Rapid-acting – lispro
- Short-acting – as potent as human insulin
- Intermediate-acting – NPH
- Long-acting – detemir, glargine

INBDE Pro Tip: The longer the insulin acts, the weaker its effects on the body (rapid acting as strongest, long acting as weakest)

Pharmacotherapy

- **Sulfonylurea**
  - Insulin secretagogue – enhanced β-cell insulin secretion
  - Usually taken 30 minutes before meals
- **Biguanide**
  - Reduce glucose production
    - ↓ gluconeogenesis
    - ↓ glucose uptake in intestines
    - ↓ glucagon production
- **Dipeptidyl Peptidase-4 Inhibitor**
  - Inhibit breakdown of GIP and GLP (natural secretagogues)
  - Take once/daily
- **Thiazolidinedione**
  - Increase insulin transporters
- **Alpha-glucosidase Inhibitor**
  - Delay carbohydrate absorption intestine
  - Taken before meals
  - Side effects of nausea, diarrhea, stomach pain
- **SGLT2 inhibitor**
  - Increase glucose in urine
  - Side effect of urinary tract infections

Antidiabetic	Drug Names
Sulfonylurea	Glipizide Glimepiride Glyburide
Biguanide	Metformin
Dipeptidyl Peptidase-4 Inhibitor	Sitagliptin Saxagliptin Linagliptin
Thiazolidinedione	Pioglitazone Rosiglitazone
Alpha-glucosidase Inhibitor	Acarbose, miglitol
SGLT2 inhibitor	Canagliflozin, dapagliflozin, empagliflozin

Figure 1.16 Glucometer

4 Dental Management

Well Controlled Diabetes

- Book short morning appointments
- Avoid for following medications
  - Glucocorticoids
  - Levofloxacin
  - NSAIDs if taking sulfonylureas
  - Normal insulin and meals
- Have glucometer and glucose source close by

Uncontrolled Diabetes

- Defer treatment if elective
- Urgent care
  - Asymptomatic: eliminate infection + refer to PCP
  - Symptomatic: immediately refer to ER

COPD

1 COPD

Chronic Pulmonary Disease (COPD) is a group of conditions where there is restrictive airflow of the lung resulting in difficulty breathing. The disease is not fully reversible, and the most common cause is smoking. There are two main forms of COPD. Patients can only exhibit one of or both the diseases.

- **Chronic Bronchitis** – daily productive cough for ± 3 months in at least 2 consecutive years
  - Difficulty breathing in & out
  - Inflamed bronchi
  - Mucous production
  - Chronic cough with sputum
  - wheezing
  - Elevated hemoglobin and cyanotic
  - Overweight
  - Normal chest x-ray

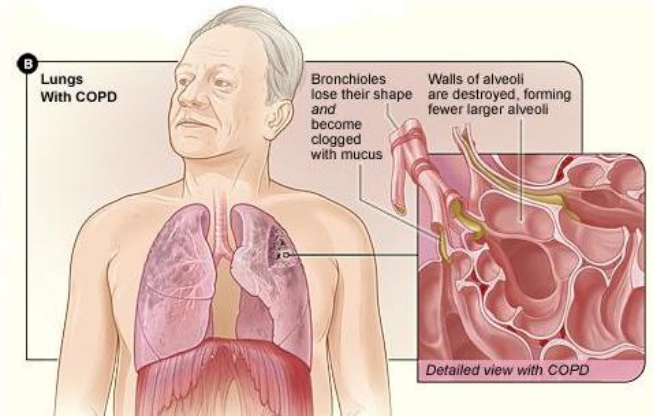

Figure 1.17 Lungs with COPD

- **Emphysema** - enlargement and destruction of air spaces distal to terminal bronchioles
  - Inflammatory mediators and enzymes destroy elasticity of lung tissue
  - Difficulty breathing out
  - Quiet chest, low cough, no sputum
  - Hyperinflated and flatten diaphragm

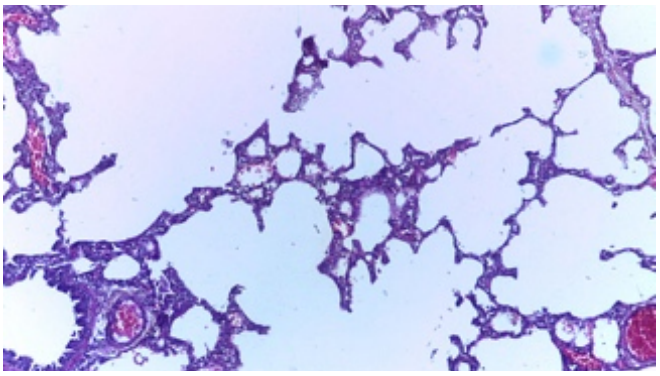

Figure 1.18 Emphysema

Oral Manifestations

- Periodontal disease
- Oral cancer linked to smoking
- Nicotine stomatitis
- Halitosis
- Tooth staining
- Aspirational pneumonia from poor oral hygiene
- Dry mouth from anticholinergics
- Stevens-Johnson syndrome linked to theophylline

2 Diagnosis & Treatment

Breathing Tests

Tests that measure breathing are helpful in the diagnosis or gauge the severity of breathing disorders.

- **Spirometer** – measures amount of expiration/ FEV1
  - Patient blows into tube as much air as possible
  - COPD = FEV1/FVC < 70%
    - **FEV1** - Force expiratory volume of 1 second
    - **FVC** – forced vital capacity (predicted volume)

Figure 1.19 Spirometer

- **Pulse Oximeter** – measures percent oxygen saturation in hemoglobin
  - Normal = 95-100%
  - Not used for diagnosis
  - Helps measure pulmonary function and health status of patient

Figure 1.20 Pulse oximeter

Pharmacotherapy

- **Anticholinergics** - ↑ bronchodilation
  - Ipratropium, tiotropium
- **β-adrenergic agonists** - ↑ bronchodilation (via ↑ cAMP)
  - Isoproterenol, albuterol, indacaterol
  - Epinephrine
- **Corticosteroids** - ↓ inflammation and immune response
  - Fluticasone (inhaled)
  - Prednisone (oral)
- **Phosphodiesterase Inhibitors** – not preferred due to side effects, last resort
  - Theophylline
- Common prescription for different stages of COPD

Stage I	anticholinergic
Stage II	anticholinergic + long-acting **β**-adrenergic agonists
Stage III	anticholinergic + long-acting **β**-adrenergic agonists + corticosteroid
Stage IV	anticholinergic + long-acting **β**-adrenergic agonists + PDE Inhib

3 Dental Management

Well Controlled COPD

- Discussion about smoking cessation
- Semi supine or supine chair position
- Caution with general anesthesia
- Use pulse oximeter
  - If O_2 saturation < 95% ? low flow O_2 (2L/min)
- Avoid the following:
  - Pulmonary irritants
  - Rubber dams
  - Nitrous oxide
  - Narcotics & barbiturates
  - Bilateral blocks
  - Macrolides & ciprofloxacin with theophylline

Uncontrolled COPD

- Defer treatment
- Refer to MD

Asthma

1 Introduction

Asthma is a chronic obstructive respiratory disease that differs in COPD in that its effects are reversible.

- Bronchiole tissue sensitive to certain stimuli that can trigger an asthma attack
  - Allergens (ex. pollen)
  - Exercise
  - Cold air
  - Chemical and smoke
  - NSAIDs
  - Anxiety and stress
  - Know the triggers to avoid them in practise
- Air obstruction
  - Goblet cell hyperplasia and excess mucous production
  - Smooth muscle spasms
  - Bronchiole mucosa inflammation

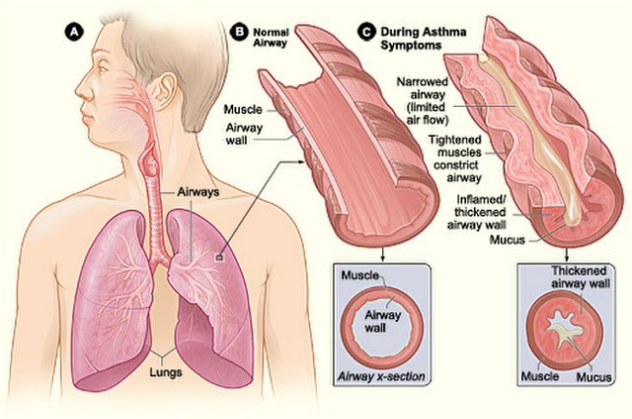

Figure 1.21 Lungs in asthma

Oral Manifestations

- Dry mouth – from inhaler
- Oral candidiasis
- Caries, enamel defects, periodontal disease
- GERD
- Malocclusion from mouth breathing
  - High palatal vault
  - Posterior crossbite
  - Excess overjet

2 Diagnosis & Treatment

Diagnosis can also be obtained by the following tests:

- **Spirometry*** - gold standard
- Allergy test
- Sputum smears

Pharmacotherapy

- **Corticosteroids** – most effective medication for persistent asthma
  - Prednisone, fluticasone
  - Budesonide

Figure 1.22 Corticosteroids for asthma

- **β-adrenergic agonists** – acute forms used as first line for acute asthmatic attack (ex. albuterol)
  - Epinephrine is albuterol does not work
  - Long-acting form (formoterol, salmeterol) often combined with corticosteroid for chronic treatment
- **Antihistamines** – ↓ inflammation and swelling in allergic reaction. Used with asthma is triggered by allergy.
  - Diphenhydramine
  - Fexofenadine

Figure 1.23 Antihistamines for asthma

- **Decongestants** – ↓ nasal congestions
  - Pseudoephedrine (vasoconstrictor)
- **Leukotriene receptor antagonists**
  - Montelukast
  - Zafirlukast

3 Dental Management

Well Controlled Asthma

- Recheck medications
- Have inhaler and EpiPen close by

Figure 1.24 EpiPen

- Use pulse oximeter
  - If O_2 saturation < 95% → low flow O_2 (2L/min)
- Stress management
- Avoid the following:
  - NSAIDS
  - Narcotics & barbiturates

Poorly Controlled Asthma

- Defer treatment
- Refer to MD

4 Nitrous Oxide

Indications

- Anxiety
- Strong gag reflex
- Asthma (not during an attack)

Use not needed

- COPD (absolute for severe)
- Nasal obstruction
- Otitis media
- Difficulty communicating
- Psychiatric disorder
- Multiple sclerosis
- Sickle cell disease
- Pregnancy (especially 1st trimester)
- Bleomycin (due to oxygen)
- Paraquat poisoning (due to oxygen

5 Oxygen

Indications

- COPD – humified and low flow oxygen preferred
- Asthma

Administer with caution/Contraindications

- Bleomycin
- Paraquat poisoning

INBDE Pro Tip: Since nitrous oxide is always administered with oxygen. Contraindications for oxygen are also contraindications for nitrous oxide.

Smoking

1 Tobacco & Nicotine

Tobacco use from smoking or smokeless products is the leading cause of preventable death in the US. On average smokers die 10 years earlier than non-smokers. It is a major healthcare concern and is associated with countless diseases (CVD, asthma, oral cancer etc.).

Nicotine is the main addictive component of tobacco products.

- Harvested from the weeds of nicotiana tabacum plants
- 1-2mg per cigarette
  - distributes to brain within 10 seconds of inhalation and dissipates quickly after
- Activates reward system via dopamine circuits
- Adrenal glands secrete more epinephrine
- **Withdrawal** from nicotine often occurs in the first week of quitting smoking
  - Begins in hours, peaks in days, subsides after weeks
  - Irritability, anxiety, disturbed sleep
  - Craving
  - Depression

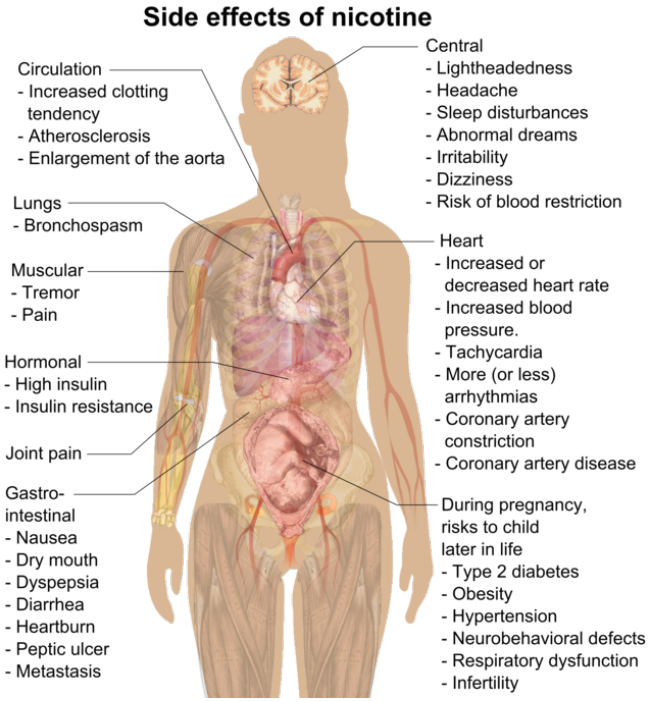

Figure 1.25 Side effects of nicotine

Oral Manifestations

- **Nicotinic stomatitis** – white palate + inflamed salivary glands
- Smoker's melanosis
- **Hairy tongue** – darked stain filiform papilla
- **Smokeless tobacco keratosis** – white patch where chewing tobacco is held
- Periodontal disease
- Leukoplakia
- Squamous cell carcinoma
- Halitosis

2 Tobacco Products

Cigarettes

- Tobacco leaves finely chopped and wrapped in paper
  - **Cigar** – large
  - **Cigarillo** – small
- Contains tar, carbon monoxide, formaldehyde, menthol
- Menthol masks harsh smoke taste
- **Second-hand smoke** has the same adverse effects

Figure 1.26 Cigarettes

Electronic Nicotine Delivery System

- **E-cigarettes**
- **Vape pen** – produces vapor
- Contains propylene glycol, nicotine, glycerin, diacetyl (very harmful to lungs)
- Not recommended for cigarette smoking cessation

Figure 1.27 Vape Pen

Pipes

- **Conventional** – loose tobacco in bowl
- **Hookah** - water pipe, shredded tobacco with different flavors

Smokeless Tobacco

- **Snuff** – fine ground, placed between buccal mucosa and lip
- **Snus** – moist powder tobacco pouch, held in lip
- **Chaw** – coarsely shredded for chewing

3 Tobacco Cessation

Behavioral (counselling)

- Individual or group support
  - **Practical counselling** – problem solving, skills training
  - **Cognitive behavioral therapy** – managing withdrawals, cravings, environment
- Telephone service
- Hypnotherapy
- Acupuncture

Pharmacologic (medication)

- Appropriate for most adult smokers
  - Exceptions: pregnant women, light smokers (<half pack per day), epilepsy
- **Nicotine replacement therapy (NRT)**
  - Patch or spray
  - Nicotinic receptor agonist
- **Bupropion** - norepinephrine-dopamine reuptake inhibitor (NDRI)
- **Varenicline** – nicotinic receptor partial agonist

4 Dental Management

Smokers

Healthcare professionals should ask about the **5As** with patients that are smokers.

- **Ask** – do they smoke? When? How much? etc.
- **Advise** – advise that they should quit
- **Assess** – are they willing to quit? Continue discussion if they are willing
- **Assist** – provide resources to help quitting
- **Arrange** – follow up within 1st week after quit date

5 Betel Nut

Betel nut is stimulant derived from the seed of the areca palm fruit. It is not itself a tobacco product, but is often combined with tobacco, sweeteners and other additives.

- **Quid** – packaged betel leaf for chewing

Figure 1.28 Quid

Oral Manifestations

Whether or not it is used with tobacco, there are many oral side effects of betel nut use.

- **Oral submucous fibrosis** – incurable effects lips, cheeks, soft palate & pharynx
  - Collagen deposited into tissue ⚿ stiffness or loss of movement of mouth
  - Can transform into cancer
- Squamous cell carcinoma
- Reddish-brown extrinsic staining of teeth and gums
- Gingival recession
- Attrition to chewing teeth
- Xerostomia is not a result*

Tuberculosis

1 Introduction

Tuberculosis (TB) is an infection caused by **mycobacterium tuberculosis** (fast-acting bacillus). It is transmitted via droplets/air-borne particles.

- BCG vaccine is available, but not required for dentists
- Co-infection with HIV is common
  - TB is the leading cause of death in HIV patients

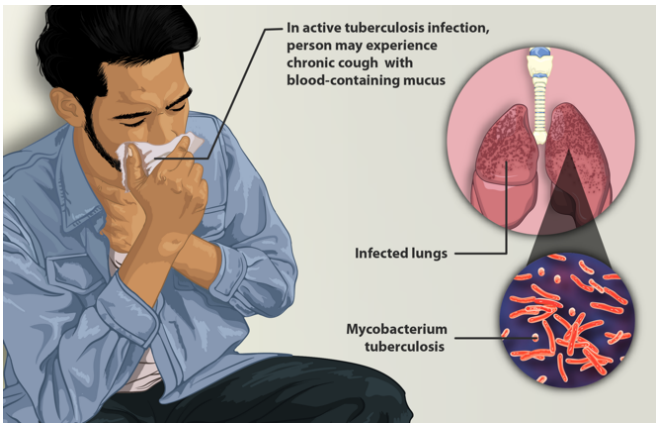

Figure 1.29 Lungs in tuberculosis

Oral Manifestations

- Ulcer – tongue is common
- **Tuberculous osteomyelitis** – spreads to bones (ex. femur and jaw)
- **Scrofula** – seen in inflamed neck lymph nodes

Latent and Active Infection

- **Latent infection**
  - Bacteria not active = no symptoms, not contagious
  - At-risk to progress to active infection
    - Take **Isoniazid** to prevent advancement
- **Active Infection**
  - TB actively multiplying and destroying lung tissue
  - Symptoms – cough, bloody sputum, chest pain, fatigue
  - Contagious through droplet nuclei
  - Treatment
    - Rifampin
    - Isoniazid
    - Pyrazinamide
    - Ethambutol

TB Screening

There are mainly two types of tests using for the screening of TB infection. All dental personnel must be tested for infection by skin or blood test before working, but routine testing is no longer recommended unless there was a known exposure/outbreak in the facility.

1. **Mantoux tuberculin skin test (TST)**
   - Step 1 – inject tuberculin protein (PPD) into arm skin
   - Step 2 – measure size of induration 2-3 days after injection (type IV hypersensitivity)
     - Positive if bigger than a certain size, further testing must be done to determine active of latent infection
     - BCG vaccination might lead to false positive
2. **TB Blood Test**
   - Interferon-gamma release assay
   - Indication if available for only one visit or BCG vaccination

Figure 1.30 Mantoux tuberculin skin test (TST)

2 Dental Management

Infection Control

There are 3 components of infection control

1. **Administrative** – prevention of transmission
   - Infection control plan
   - Instruction to patients
   - TB screening
   - Recognizing signs and symptoms
2. **Environment** – reducing spread of droplets
   - HEPA Air filters
   - Isolated rooms
   - UV germicidal irradiation
3. **Protective** – wearing protective equipment
   - N95 mask (highly suggested)
   - Eye protection

Latent TB Patient

- Treat similarly to a normal patient (because patient is non-infectious)

Active TB Patient

- Elective treatment – postpone and refer to MD until they are non-infectious
- Urgent care
  - Minimize aerosols
  - Treat in isolated operatory
  - PPE with N95 mask

High Cholesterol

1 Introduction

Hyperlipidemia, also known as high cholesterol, occurs when there are high levels of lipids circulating in the blood. These lipids include **cholesterol** and **triglyceride**.

Lipoproteins

- **HDL** – high-density lipoprotein
  - "good cholesterol"
  - Relatively higher protein content and low lipid content
  - Delivers cholesterol to the liver and steroid producing organs
  - HDL > 50mg/dL is ideal
- **LDL** – low-density lipoprotein
  - Higher lipid content and low protein content
  - Transports cholesterol to cells
  - LDL < 130/dL is ideal

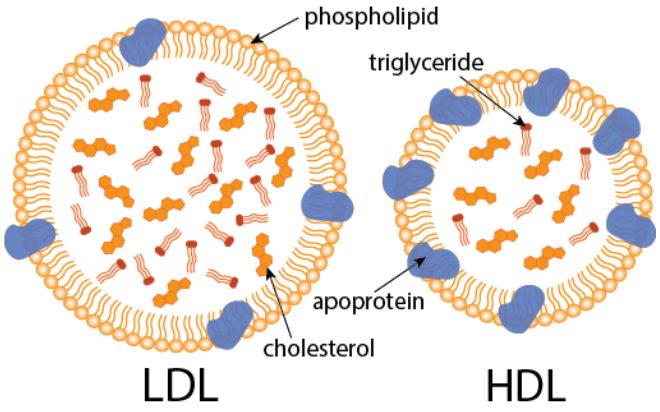

Figure 1.31 LDL and HDL

Atherosclerosis

Atherosclerosis – build up of fatty deposits (plaque) inner lining of the arteries

- Plaque reduces lumen size → reduces blood flow
- Plaque prevents nitric oxide (NO) from reaching smooth muscle cells → prevents vasodilation

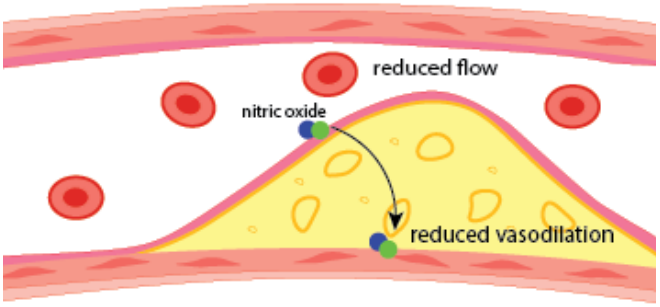

Figure 1.32 Plaque buildup in Atherosclerosis

Oral Manifestations

- Calcified pulp chamber or pulp stones
- Associated with periodontal disease
- Muscle pain and weakness (ex. during breathing and chewing) – most common side effect of **statins**

Pharmacotherapy

Most high cholesterol medications function by inhibiting **HMG-CoA reductase** – an enzyme that helps synthesize cholesterol in the liver.

By decreasing cholesterol, serum LDL decreases, and LDL receptors are downregulated. These medications are otherwise known as **statins** and include the following:

- Rosuvastatin
- Pitavastatin
- Pravastatin
- Simvastatin
- Atorvastatin
- Lovastatin

2 Dental Management

High Cholesterol Patient

- Review hypertension and diabetes guidelines
- Avoid the following medications that increase plasma concentration of statins
  - Macrolide antibiotics
  - Antifungals

Sleep Apnea

1 Sleep

Sleep Cycles

Sleep is an active process that consists of a specific stages and sequence of cycles. The average person has 5 sleep cycles per night, each being around 90 minutes.

	NREM activity
Cycle 1	Dosing off
Cycle 2	↓ body temp, HR, breathing rate Muscle relaxation ↓ Brain activity
Cycle 3	Slow-wave sleep ↓ Muscle tone & brain activity
Cycle 4	Slow-wave sleep ↓ Muscle tone & brain activity

Non-rapid eye movement (NREM)

- Dreamless sleep
- ~80% of total sleep time

Rapid eye movement (REM)

- Dreaming sleep
- ~20% if total sleep time
- Skeletal muscle hypotonia – paralyzed muscles
- Occurs for a short period of time at the end of each cycle after NREM sleep.

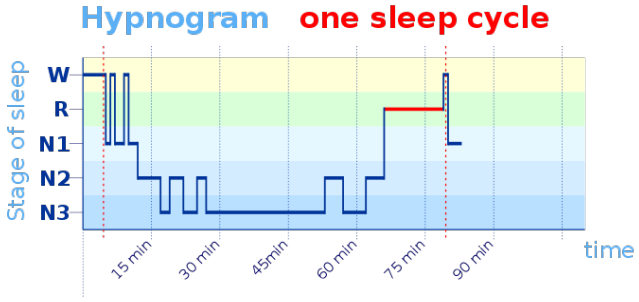

Figure 1.33 Hypnogram of one sleep cycle

Sleep Disorders

Sleep disorders are any conditions that impair one's sleep or prevent one from receiving restful sleep. Generally, more common in females than males (except for obstructive sleep apnea)

- **Snoring** - common amongst adults (40%)
  - Males > Females
  - Due to loose soft tissue vibration from air passing over
  - Enlarged tonsils or adenoids common in snoring children
- **Circadian rhythm sleep-wake disorders** = due to jet lag, shift work etc.
- **Insomnia** – trouble falling or staying asleep
- **Parasomnia** – sleepwalking & night terrors
- **Sleep-related breathing disorders** -includes snoring, CSA, OSA etc.
- **Sleep-related movement disorders** - restless leg syndrome, nocturnal bruxism etc.
- **Narcolepsy** – falling asleep during the daytime

2 Sleep Apnea

Types of Sleep Apnea

- **Obstructive Sleep Apnea (OSA).** –physical obstruction of airflow during sleep
  - Blockage in the nasopharyngeal, oropharyngeal or hypopharyngeal area
  - Obstructive events in children mainly occur in REM sleep

- **Central Sleep Apnea (CSA) –** altered brain activity causes temporary lack of inspiration during sleep
  - Central nervous system issue
  - Common in poliomyelitis, spinal cord injury and encephalitis patients

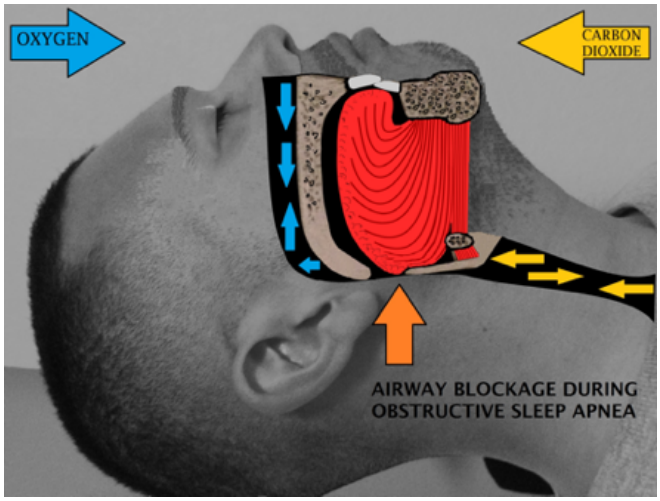

Figure 1.34 Airway blockage in OSA

Apneic Episodes

Apnea	Complete cessation of airflow for at least 10s
Hypopnea	↓ airflow for at least 10s
Respiratory effort-related arousal (RERA)	↑ respiratory effort ±10s, leads to arousal

Arousal results from when hypoxia or hypercarbia occurs after partial or complete breathing obstruction. Consequently, the person often receives poor quality fragmented sleep.

Severity

The Apnea-Hypopnea Index (AHI) is used to determine the severity of sleep apnea.

AHI = (# of apneas+ # hypopneas)/ hours of sleep

Children and adults have different criteria for the classification of severity.

	Adults	Children
Mild	5-15 episodes/ hour	1-5 episodes/ hour
Moderate	15-30 episodes/ hour	5-10 episodes/ hour
Severe	± 30 episodes/ hour	± 10 episodes/ hour

Signs & Symptoms

- GERD
- Nocturnal bruxism
- CV symptoms (hypertension, arrythmia, stroke)
- Fragmented light sleep
- Poor memory
- Headaches in the morning
- Intermittent snoring
- Nocturnal sweating
- Nocturia
- Intermittent snoring
- Somnolence - drowsiness

Risk Factors

- Older age
- Males > females
- High BMI (kg/m^2)
  - Obese ≥ 30, increased sleep apnea risk
- Supine sleeping position
- Family history
- Alcohol or using sedatives
- Smoking
- Breathing disorders
- Menopause
- Down syndrome
- Sickle cell anemia
- **Mucopolysaccharidosis** – accumulation of glycosaminoglycans in upper airway
- Anatomic abnormalities
  - Cleft palate – surgery that repairs it thickens and lengthens = ↑ risk for sleep apnea
  - High palatal vault = elongated soft palate

- Large tongue, enlarged uvula, tonsillar hypertrophy
- Narrow dental arch
- Overjet, retrognathic profile
- Increased anterior face height

Screening/Diagnosis

Dentists are not authorized to diagnose OSA but can refer their patient to a specialist for diagnosis. This is important because 76% of physicians that are not sleep specialists do not screen for OSA. The following are different method for screening OSA.

1. **Mallampati Score –** scores size of tongue during rest
   - Newer version – sticking tongue out as far as possible to see how much you can visualize the throat
     - Class I – uvula + pillars
     - Class II – most of uvula and pillars
     - Class III – base of uvula
     - Class IV – only see hard palate
   - Score correlates with OSA and its severity
   - Large tongue = more likely to block posterior pharyngeal space
2. **Brodsky Score** - based on tonsil size
   - Score from 0-4
     - Larger score = larger tonsils
   - Correlates with OSA and severity
3. **Scalloped Tongue** - appearance of wavy indentations on the tongue
   - Occurs when tongue constantly presses up against teeth
   - 70% diagnostic for OSA
4. **STOP-BANG Questionnaire** - assesses risk factors for OSA
   - **S**noring
   - **T**ired
   - **O**bserved apnea
   - **P**ressure of blood (hypertension)
   - **B**MI elevated
   - **A**ge > 50
   - **N**eck has ↑ circumference
   - **G**ender (male)
5. **Polysomnogram (PSG)** – gold standard for diagnosis. Measures several variables while sleeping.
   - **EEG** – brain wave activity
   - **ECG** – heart activity
   - **EMG** – muscle & jaw movement
   - **EOG –** eye movement
   - Nasal airflow
   - Thoracic movement
   - Abdominal movement
   - Oxygen
   - Saturation

Figure 1.35 Polysomnogram

Treatment for OSA

- Behavioral modification
  - Weight loss
  - Sleeping on slide
  - Avoiding alcohol and certain modifications
  - Muscle relaxants and nasal steroids
- Positive airway pressure
  - **CPAP machine** – gold standard treatment for moderate and severe OSA

Cancer, Chemotherapy and Radiation

1 Head and Neck Cancer

Cancer is the 2nd most common cause of death in America and the leading cause of death in those under the age of 85. The most common cancers in men and women are as follows:

- Men: Prostate > Lung > Colorectal > Bladder > Melanoma
- Women: Breast > Lung > Colorectal > Uterine > Thyroid

Head and neck cancer is the most relevant to dentistry so it will be the focus of this chapter.

Head & Neck Cancer

Head and neck cancer includes any cancer of that forms in throat, mouth, nose, lips or anywhere else in the head and neck region.

- Earlier detection linked to better prognosis
- Intra/Extra-oral examination and digital palpation can help detect
  - Looks for **fixed** (moveable) or **matted** (grouped and move as a single unit) lymph nodes
  - Palpation areas
    - Pre-auricular & occipital areas
    - TMJ with opening and closing
    - Submandibular area
    - Sternocleidomastoid area
    - Thyroid gland area

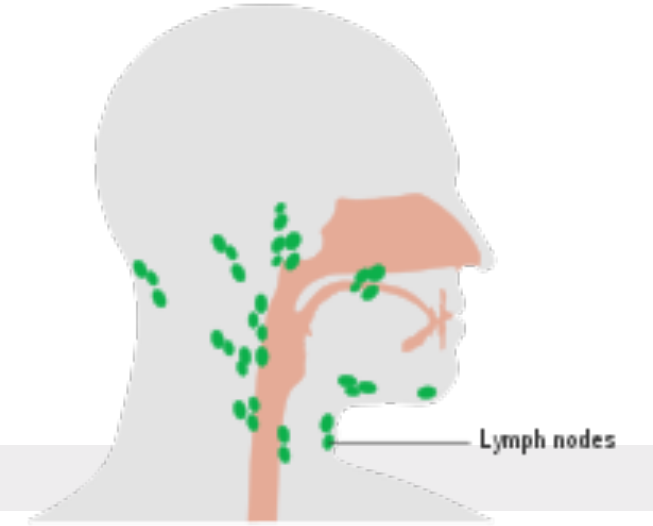

Figure 1.36 Lymph nodes

- **Squamous cell carcinoma** is the most common head and neck cancer
  - Areas (most common to least):
    - Oral cavity > oropharynx > larynx > nasopharynx > hypopharynx

Figure 1.37 Squamous cell carcinoma

- **Oral cancer**
  - Incidence - Tongue > lip > floor of mouth
  - Pink colour is normal
  - Red and white colours are abnormal
  - Smooth is normal except for palatal rugae

Figure 1.38 Oral cancer

Risk factors

- Tobacco > alcohol > HPV > immunocompromised
- Alcohol and tobacco have a synergist effect on cancer risk

Oral Manifestations

- Associated with chemotherapy and radiation
  - Xerostomia
    - Starts ~2nd week of treatment
  - Altered taste
    - Starts ~2nd week of treatment
  - Secondary infections (viral, bacterial, fungal)
    - Candida albicans most common
  - Mucositis
    - In 40% of cancer patients
    - more common on non-keratinized tissue
    - Tend to be near metallic restorations
    - Starts ~2nd week of treatment

Figure 1.39 Mucositis

2 Dental Management

During a patient's dental visit, the dentist should ask the following questions relating to cancer:

1. Have there been any changes in your health since your last visit?
   - Get an idea of overall health from medical history, lifestyle etc.
2. Have you discovered any new lumps or bumps?
3. Have you noticed any spots or lesions that are changing in colour?

Before Cancer Treatment (chemo/radio)

- Conduct comprehensive oral examination
- Extraction of hopeless and questionable teeth
- Oral hygiene maintenance
- Elimination of infections and irritation and their sources

During Cancer Treatment (chemo/radio)

- Control salivary flow and other complications
- Stop using removeable prosthodontic appliances to avoid irritation of mucosa

Post-Treatment (chemo/radio)

- Recall exams to monitor new cancers
- Contact MD for outcome of treatment
- Avoid extractions
- Manage complications

Multiple Myeloma

1 Introduction

Multiple myeloma is a malignancy of plasma cells that results in many tumours distributed over the skeletal system.

- **Plasma cells** – white blood cells that create antibodies
- Different myeloma types based on antibody produced
  - IgG > IgA > IgD
- More common in elderly (average 70 years)
- Leads to bone resorption and need to replace bone marrow
  - Can result in anemia, leukopenia, thrombocytopenia
  - Infection and leukopenia are most common cause of death
  - Renal failure is second most common cause of death

Figure 1.40 Multiple myeloma

INBDE Pro Tip: A very common question on the INDBE asks about the **Bence-Jones protein urine test**. This test is most often used to diagnosis multiple myeloma. The Bence-Jones protein is not found in urine of healthy individuals.

Oral Manifestations

- Amyloidosis of the tongue
- Punched-out radiolucencies in radiograph*
  - Often seen in cranium and posterior mandible
  - Indicative of bone tumour areas

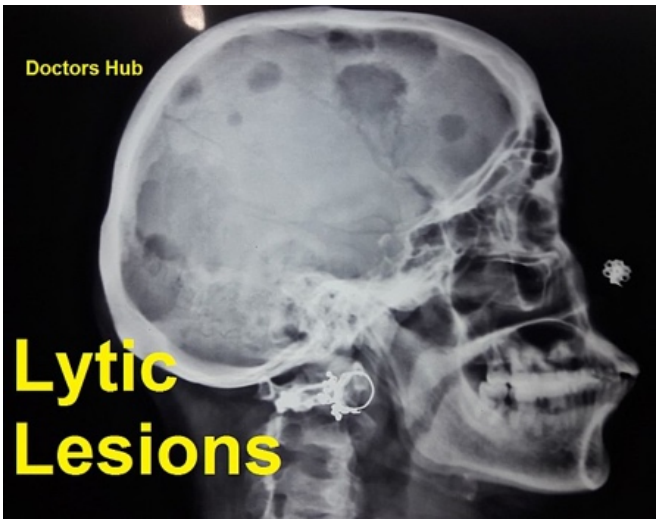

Figure 1.41 Lytic lesions

Pharmacotherapy

- Bortezomib – proteasome inhibitor
- Bisphosphonates – induces apoptosis of osteoclasts
- Thalidomide – inhibits TNF-α & IL6 secretion

2 Dental Management

Often, there are no treatment modifications when treating a multiple myeloma patient. However, there are a few exceptions.

- If patient taking bisphosphates: refer to bisphosphonate section (page 9)
- If patient is in chemotherapy: refer to cancer section (page 32)
- WBC < 2000: antibiotic prophylaxis when indicated
- PC > 50 000: platelet transfusion before surgical procedure

Bleeding and Clotting

1 Introduction

Bleeding and clotting can be influenced by different conditions and drugs, and must be managed when undergoing certain dental procedures.

Blood Clotting

Hemostasis is the process of stopping bleeding, otherwise known as blood clotting. There are 4 phases of hemostasis:

1. Vascular
   - Affected vessels vasoconstrict
2. Platelet (Primary)
   - Platelet plug forms
3. Coagulation (Secondary)
   - Fibrin clot formed that holds platelet plug together
4. Fibrinolytic
   - Plasmin enzyme dissolves fibrin clot after blood vessel has healed

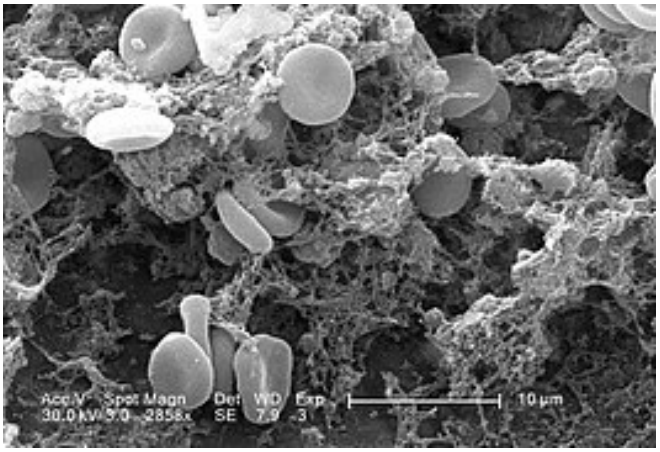

Figure 1.42 Hemostasis

Platelet Pathway

1. **Adhesion**
   - Damage to endothelial walls causes release of **von Willebrand factor (vWF)** on vessel wall, which attaches to platelets via **Glycoprotein 1b (GP1b)**
2. **Activation**
   - Bind of vWF activates platelets to grow extensions and secrete **thromboxane A2 (TXA2)** and **adenosine diphosphate (ADP)**, which activates even more platelets (positive feedback)
3. **Aggregation**
   - Activated platelets express GP11b/IIIa which attaches to fibrinogen in the blood stream
   - Fibrinogen causes platelets to stick to each other
   - Platelets attaching to each other activates

Coagulation Cascade

- Location of coagulation cascade activated where the large plug of platelets are covered by fibrinogen
- There are 2 different pathways (intrinsic & extrinsic) that converge on a common pathway
- **Extrinsic Pathway**
  - Factor III → activates factor VII → activates factor X
- **Intrinsic Pathway**
  - Factor XII activated by trauma or exposed collagen
    - →activate factor XI
    - →activate factor VIII + IX
    - →activate factor X
  - Factor XI can be activated by factor II to skip factor XII activation step if there is no exposed collagen

- **Common pathway**
  - Factor X + factor V
    - →activate factor II
    - →activates factor I + factor XIII
  - Activated Factor II
    - →activate factors V, VII, VIII, XI, XIII (positive feedback)

Coagulation Factors

No.	Name	Synthesis
I	Fibrinogen → Fibrin	Liver
II	Prothrombin → Thrombin	Liver
III	Tissue Factors (Thromboplastin)	Endothelium/ platelets
IV	Calcium	Bone/ diet
V	Labile Factor (Proaccelerin)	Liver
VI	N/A	N/A
VII	Stable Factor (Proconvertin)	Liver
VIII	Antihemophilic Factor A (AHF-A)	Liver
IX	Christmas Factor (AHF-B)	Liver
X	Stuart-Prower Factor	Liver
XI	Plasma Thromboplastin Antecedent (PTA)	Liver
XII	Hageman Factor	Liver
XIII	Fibrin Stabilizing Factor	Liver/placenta/ blood cells

INBDE Pro Tip: Most coagulation factors are synthesized in the liver.

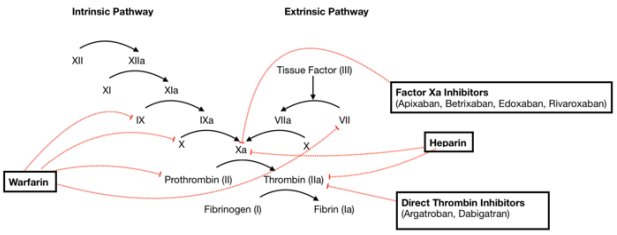

Figure 1.43 Coagulation cascade

2 Bleeding Disorders

Clotting Factor Defects

- **Hemophilia A**= factor VIII deficiency
  - Most common hemophilia
  - Autosomal X-linked recessive
  - 80% hematoma risk with IAN block without prior factor VIII infusion
    - Should use local injections in the mandible instead
- Hemophilia B = factor IX deficiency
- Hemophilia C = factor XI deficiency
- **Vitamin K deficiency** = required for synthesis of factors II, VII, IX, X
  - Most common acquired factor deficiency
  - These factors are made in liver
- **Von Willebrand disease** = vWF deficiency
- Liver disease
  - Impacts factors affected in Vit K deficiency

INBDE Pro Tip: Factors deficient in hemophilia are all within the intrinsic pathway

Figure 1.44 Normal clotting vs. inability to form clots

Vascular Wall Defects

- Rare to have bleeding episodes during tooth extraction
- Impacts first phase of hemostasis
- **Marfan syndrome** - hereditary
- **Ehlers-Danlos syndrome** - hereditary
- **Osler-Weber-Rendu Syndrome**
- Dental management
  - Minimally invasive dentistry
  - Consult with hematologist
  - Avoid NSAIDS
  - Use local hemostatic measures

Platelet Disorders

- **Thrombocytopenia**
  - Low platelet count
  - Can be drug or disease induced
  - Normal = 150 000 – 450 000 platelets/μL
- **Von Willebrand disease**
  - vWF deficiency
  - most common congenital bleeding disorder (1% of population)

Oral Manifestations

- Gingival bleeding (spontaneous)
- Petechiae and ecchymoses
- Hemarthrosis of TMJ

3 Diagnosis and Treatment

Platelet Testing

The following tests are used to help diagnose platelet disorder or if antiplatelet medications are working.

Assess **platelet quantity**

Platelet count	Platelet count in blood sample
Ivy bleeding test (BT)	Measures time to stop bleeding after making a cut in the arm (unreliable)

Assess **platelet quality**

Ivy bleeding test (BT)	Measures time to stop bleeding after making a cut in the arm (unreliable)
Peripheral blood smear	Morphology of blood cells using a microscope
Platelet aggregation test	Assess platelet aggregation to form blood clot
Platelet function analyzer (PFA-100)	Measures platelet coagulation under flow conditions. Not used for mild bleeding disorders

Coagulation Testing

Activated partial thromboplastin tie (aPTT)	Measures seconds needed for clot to form after addition of reagents to blood sample **(normal= 25-35s)** Tests intrinsic and common pathway *Best test for coagulation disorders
Prothrombin time (PT/INR)	Measures seconds needed for clot to form after addition of reagents blood sample **(normal= 11-15s)** Most used with patients on Warfarin Produces an **International normalized ratio (INR)** smaller INR = clotter, larger INR = bleeder

Antiplatelet Medications

- **Aspirin** – COX1 inhibitor → prevents TXA2 synthesis
  - Irreversible
- **Ibuprofen** - COX1 inhibitor → prevents TXA2 synthesis
  - Reversible*
- **Abciximab** – binds to GP11b/IIIa complex → blocks activation
- **Clopidogrel** – competitive inhibitor of ADP → blocks activation

Anticoagulants

- **Apixaban** – factor Xa inhibitor
- **Dabigatran** – binds to thrombin (factor IIa)
- **Heparin** – brings together thrombin and antithrombin [?] blocks factor II
- **Warfarin** – block Vit K reduction cycling = blocking factors II, VII, IX, X

Figure 1.45 Anticoagulant

4 Dental Management

Patients on Warfarin

- Avoid the following
  - NSAIDS & aspirins
  - Barbiturates & steroids
  - Metronidazole & erythromycin
  - Herbal supplements
- Local hemostatic precautions
  - Extra sutures
  - Topical thrombin
  - Compressive packing
  - Tranexamic acid mouthwash (4.8%)
- Use acetaminophen for pain

INR = 2.0-3.0

- Carry on with treatment

INR = 3.0-3.5

- Simple procedure → continue treatment
- Complex procedure → defer treatment, refer to MD

INR > 3.5

- Defer treatment
- Refer to MD

HIV & Aids

1 HIV & Aids

Some facts about HIV & AIDS
- More than 70 million people worldwide have been infected with HIV, of which 35 million have died from AIDS.
- Males > females
- Most common age in 25-29 years
- Black > Hispanic > Asian > White

Oral Manifestations
- Xerostomia
  - In up to 40% of HIV patients
- Caries
- Periodontal disease
  - Necrotising ulcerating gingivitis
  - Necrotising ulcerating periodontitis
  - Linear gingival erythema
- Candidiasis
- Herpes simplex virus
  - HHV1 (predominantly oral) & 2
- Herpes zoster virus
  - HHV3
- HPV
  - Oral warts
- Oral hairy leukoplakia
  - OHL, EBV/HHV4
  - Smooth non-removeable white plaque on lateral tongue
    - Sign of advanced AIDS
- Cytomegalovirus
  - CMV/HHV5
  - Oral ulcers
- Kaposi sarcoma
  - KS, HHV8
  - Brown/purple macule on hard palate, gingiva, or tongue
- Non-Hodgkin lymphoma (NHL)
  - Same oral manifestations as Kaposi sarcoma

Etiology
- **HIV** – human immunodeficiency virus
  - Envelope RNA retrovirus
    - **Glycoprotein** on envelope facilitate binding to host cells
    - Protein **capsid** within the envelope surrounds the RNA, protease, and reverse transcriptase
  - Infects cells with the **CD4 receptor**
    - Macrophages
    - T-helper cells
- ~100nm diameter
- **AIDS** – acquired immunodeficiency syndrome
  - caused by HIV

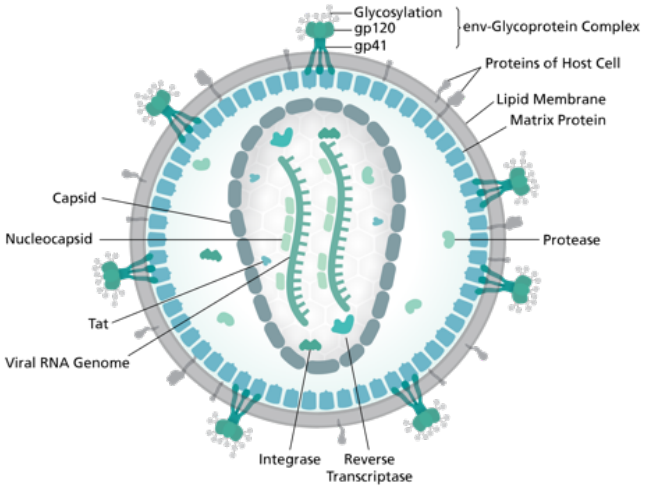

Figure 1.46 Envelope RNA retrovirus

Transmission

- HIV is transmitted through bodily fluids
  - Sexual contact (most common)
  - Needles (2nd most common)
  - Vertical transmission
    - During pregnancy, at birth or by breastfeeding
  - Occupational exposure
    - Most relevant in dentistry
    - Between health care provider and patient
    - Blood has greatest concentration of infectious viral particles
      - 0.3% risk of transmission with needle stick injury

Diagnosis

There are a few methods of detecting HIV in a patient

1. **ELISA**
   - First test for HIV diagnosis
   - Positive test → Do the test again → Positive test → Move on to western blot test
   - Screens for HIV antibodies
2. **Western blot**
   - Detects specific protein molecules
3. **PCR**
   - Amplifies DNA to determine viral load of HIV in blood
   - Helps with staging of HIV

INBDE Pro Tip: ELISA and PCR and diagnosis test cannot stage for HIV. A blood count is required for staging.

Staging

There are 3 stages of HIV

Stage	Description
1	**Acute HIV infection** - T helper/CD4 cells ≥ 500 cells/μL - Antibody positive - No symptoms
2	**Chronic HIV infection** - T helper/CD4 cells = 200-499 cells/μL - Symptoms = lymphadenopathy, weight loss, thrush, fever, diarrhea
3	**AIDS** - T helper/CD4 cells < 200 cells/μL - Symptoms = opportunistic infections, malignancy, wasting, dementia - Usually occurs ~10 years after stage I

Treatment

Antiretroviral therapy (ART) is used to treat HIV patients to improve their quality of life and reduce transmission rates. **Highly active antiretroviral therapy (HAART)** includes at least 3 ART medications.

The following antiretroviral drugs all inhibit HIV replication at different stages of replication, to lower the viral load below detection threshold.

- **Ritonavir** – protease inhibitor
- **Zidovudine** – nucleoside RT inhibitor
- **Efavirenz** – non-nucleoside RT inhibitor
- **Tenofovir** - nucleotide
- **Enfuvirtide** – entry inhibitor

2 Dental Management

HIV Patient

- Continue treatment like normal
- Wear gloves, masks, eyewear, gowns etc.
- Post-exposure prophylaxis
  - Within first 72h of exposure (2-3 antiretrovirals for ~4 weeks)
- Avoid the following:
  - Acetaminophen with zidovudine
  - Meperidine with ritonavir

AIDS Patient

- Non-invasive procedure
  - Follow HIV protocol
- Invasive procedure
  - Contact MD
  - Antibiotic prophylaxis
  - Avoid NSAIDs
  - Platelet replacement therapy

Substance Abuse & Addiction

1 Addictive Substances

Substance abuse refers to a pattern of use of a substance over 2 months that leads to subsequent problems (work, relationships etc.)

- Males > Females
- Most common between 18-25 years-old
- Common in dental staff due to access to addictive drugs
- Alters dopamine circuits = addiction
- 8.7% of US population 12+ years-old use illegal drugs

Dependence, also known as addiction, occurs when there is a physical need for a substance despite adverse effects. Dependence is diagnosed with the following 2 conditions:

- **Tolerance** – requires an increase substance dose to maintain desired effect
- **Withdrawal** – emergence of symptoms when substance abuse stops

Opioids

Opioids are derived from the poppy plant and includes forms such as morphine and codeine.

- **Narcotic** – drug that alters mood
- Oral of IV administration
- Inhibit ascending central nervous system by binding to **mu (μ) opioid receptors**
- Main effects
  - Pain reduction
  - Euphoria
  - Sedation
- Effects from substance abuse
  - Respiratory depression
  - Pupil constriction

Figure 1.47 Poppy plant

- **Naloxone** - reversal agent used for overdose
  - Can be given safely on anyone, cannot overdose this agent
- **Prescription drug monitoring program (PDMP)** recommended
- **DEA number** required for prescription
- Natural opiates
  - **Morphine** and **codeine**
- Semi-synthetic opioid
  - **Heroin, oxycodone, hydrocodone**
- Synthetic opioid
  - **Fentanyl, methadone, tramadol**
- Combination analgesic
  - **Percocet, Vicodin**

Cocaine

Cocaine is a stimulant derived from the coca leaf.

- Inhibits reuptake of dopamine, serotonin, and norepinephrine = euphoric feeling
- Inhalation, oral, intranasal or IV administration
- Effects from substance abuse
  - Pupil dilation
  - Tachycardia, arrhythmias
  - Hypertension
  - Heart attack or stroke

Figure 1.48 Coca plant

Marijuana

Marijuana is extracted from the cannabis plant and is the most used illicit drug.

- **THC** (delta-9-tetrahydrocannabinol) – major psychoactive ingredient
- Inhaled or oral
- Main effects
  - Alleviate pain and seizures
  - Altered perception
- Effects from substance abuse
  - Airway obstruction and chronic bronchitis (from smoking)
  - Orthostatic hypotension

INBDE Pro Tip: THC can be used as a acronym for some of the effects of marijuana

Tachycardia
Hallucinations
Chronic bronchitis

Figure 1.49 Marijuana plant

- **Naloxone** - reversal agent used for overdose
  - Can be given safely on anyone, cannot overdose this agent
- **Prescription drug monitoring program (PDMP)** recommended
- **DEA number** required for prescription
- Natural opiates
  - **Morphine** and **codeine**
- Semi-synthetic opioid
  - **Heroin, oxycodone, hydrocodone**
- Synthetic opioid
  - **Fentanyl, methadone, tramadol**
- Combination analgesic
  - **Percocet, Vicodin**

Amphetamines

Amphetamines are synthetic stimulant drugs made in a lab.

- Cause dopamine release into the synapse
- Inhalation, oral, intranasal or IV
- Longer T1/2 than cocaine
- Main effects
  - Hyperactivity
  - Weight loss
  - Narcolepsy
  - Attention deficit
  - Depression
- Effects from substance abuse
  - Hyperactivity
  - Tachycardia
  - Dysphonia – difficulty speaking
  - Headache
  - Confusion
  - Schizophrenia

Figure 1.50 Amphetamines

Sedative-Hypnotics

Sedatives-hypnotics are CNS depressants commonly used to relieve anxiety and seizures.

- **Benzodiazepines** – most abused
  - Suffix – zepam (except alprazolam)
- **Barbiturates** – 2nd most abused
  - Suffix – barbital
- Dependence more likely from longer use/ higher dosage
  - Should be used with caution in dependence prone individuals
- Withdrawal symptoms
  - Nausea and vomiting
  - Loss of appetite
  - Weakness
  - Tremor
  - Tachycardia
  - Sweating
  - Anxiety
  - Delirium
  - Tinnitus

Alcohol

Alcohol is a depressant that has temporary stimulatory effects.

- Effects of chronic use
  - Cardiac arrhythmia
  - Ascites
  - Cognitive impairment
  - Distress
  - Hepatic encephalopathy
  - Liver cirrhosis
  - GI bleeding
- Withdrawal symptoms
  - Loss of appetite
  - Insomnia
  - Anxiety
  - Tachycardia
  - Delirium tremens
  - Impaired attention and memory
- Management of withdrawal
  - Benzodiazepine/β-blocker in gradual decreasing doses
  - Rest
  - Nutrition

DEA Scheduling

The US Drug Enforcement Administration has a scheduling system that classifies drugs into five categories. Class I = highest abuse potential and class V = lowest abuse potential.

- **Class I** – illegal, high abuse potential
  - LSD, ecstasy, heroin
  - Cannabis – doctors cannot prescribe but can recommend in states where it is legal
  - Cannot prescribe
- **Class II** – high chance of abuse/dependency
  - Meperidine
  - Adderall
  - Ritalin
  - Methamphetamine
  - Cocaine
  - Vicodin (<15mg hydrocodone/unit), methadone, hydromorphone, oxycodone, fentanyl
  - Written prescription, no refills
- **Class III** – moderate-low chance of abuse/ dependence
  - Ketamine
  - Anabolic steroids
  - Testosterone
  - Tylenol #3 (<90 mg hydrocodone/ unit)
- **Class IV** – low chance of abuse/dependence
  - Benzodiazepines
  - Tramadol
  - Ambien
  - Does not need prescription, refills permitted
- **Class V** – very low chance of abuse/ dependence, limited quantities for certain narcotics
  - Robitussin (<200mg codeine per dosage unit)
  - Lomotil, Motofen, Lyrica, Parapectolin
  - Mostly over the counter

2 Dental Management

For all substance abuse patience, treatment should be deferred and referred if intoxicated. In general, those will substance abuse also tend to neglect their oral hygiene, miss dental appointments, and have increased risk for bloodborne infections such as (Hep B, Hep C, HIV)

Opioids

- Patient considerations
  - Have naloxone if overdosed
  - Short-acting benzodiazepines or nitrous oxide for anxiety
- Oral Manifestations
  - Caries
  - Periodontal disease
  - Candidiasis
  - Bruxism
  - Dental phobia
  - No increased risk of xerostomia
    - Unless concomitant use of drugs that cause xerostomia
  - No increased oral cancer risk*
    - Unless concomitant use of alcohol, tobacco, or marijuana

Figure 1.51 Naloxone

Cocaine & Meth

- Patient considerations
  - Monitor BP and pulse
  - Avoid the following:
    - local anesthetic with epinephrine for 24h since last dose of illicit drug
    - retraction cords with epinephrine
  - Wait 6-8h from last use of illicit drug
- Oral Manifestations
  - Intraoral cocaine can lead to gingival recession and facial erosion
    - From rubbing of powder over those surfaces
- **Meth mouth**
  - Xerostomia
  - High sugar diet
  - Bruxism
  - Leads to rampant caries, tooth wear, and periodontal disease

Marijuana

- Patient considerations
  - Oral cancer screening
  - Move chair slowly
- Oral Manifestations
  - Xerostomia
  - Candidiasis
  - Caries
  - Periodontal disease
  - Leukoplakia
  - Leukoedema
  - Oral cancer

Alcohol

- Patient considerations
  - Discuss reducing alcohol consumption
  - Oral cancer screening
  - Avoid acetaminophen
  - Caution with excessive bleeding
- Oral Manifestations
  - Squamous cell carcinoma
  - Spontaneous gingival bleeding
  - Petechiae
  - Ecchymoses
  - Candidiasis
  - Glossitis
  - Sialadenitis

Gastrointestinal Diseases

1 GERD & Peptic Ulcer Disease

GERD

Gastroesophageal reflux disease (GERD), also known as acid reflux, occurs when gastric acid refluxes into the esophagus, throat, or mouth.

- Gastric acid pH = 1.5-3.5
- Stomach lining is protected for low pH conditions, but esophagus and mouth are not
- Saliva can buffer a little gastric acid
  - nighttime = less saliva = less protection
- Can promote heartburn and tooth erosion

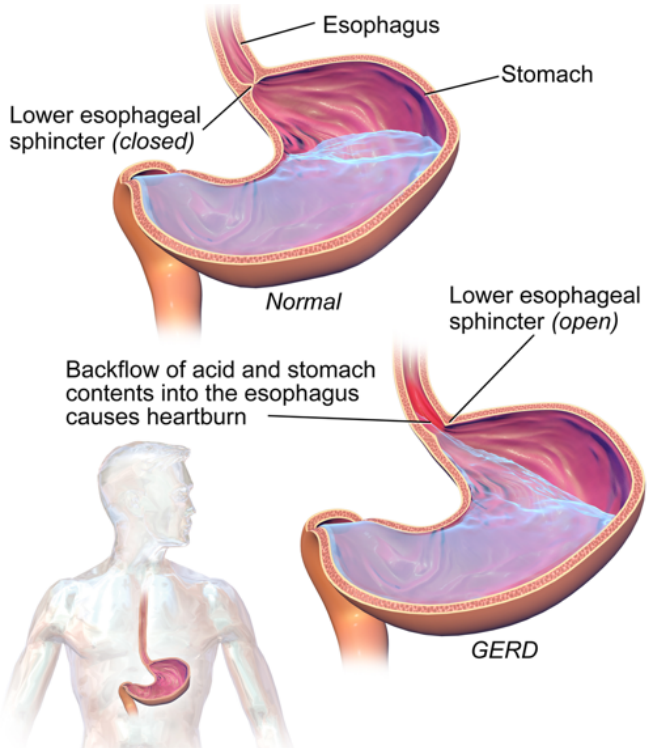

Figure 1.52 Gastroesophageal reflux disease

Peptic Ulcer Disease

Peptic ulcer disease occurs when there is a defect in the protective factors lining the stomach resulting in ulcers in the stomach, esophagus, or duodenum.

- Normally, stomach lining is protected from acid by a thick layer of mucus
- **Helicobacter pylori** – bacterial infection most associated with peptic ulcer disease
- Chronic NSAID use – 2nd most common cause
- Risk factors
  - Smoking, alcohol, stress, old age
  - Anticoagulants, bisphosphonates

Oral Manifestations

- Xerostomia
  - Associated with PPI use
- Candidiasis
  - Due to antibiotic use
- Altered taste
  - Associated with PPI use
- Erythema multiforme
  - Associated with H2 blockers and PPI use
- Tooth erosion
  - **Perimolysis** – erosion due to gastric acid exposure
  - 3 signs of tooth erosion
- **Standing proud** – restoration sticking out from surrounding tooth structure
- **Cupping** – small smooth craters on cusp tips
- **Whipped clay effect** – lack of anatomic detail

Figure 1.53 Tooth Erosion

INBDE Pro Tip: Different age groups are at risk for tooth erosion from varying reasons.
1. Teenagers – bulimia, sugary drinks
2. Middle-aged – GERD, OSA
3. Elderly – drug-induced xerostomia

Pharmacotherapy

- **Antacids** – neutralize gastric acid = increase stomach pH
  - Treats symptoms, but not the cause
  - Can limit absorption of other antibiotics
- **Antibiotics** – eliminate H. pylori bacteria
- **Ranitidine** – H2 receptor antagonist
  - Prevents further acid secretion due to less histamine secretion
- **Omeprazole** – proton pump inhibitor (PPI)
  - Various drug interactions
    - Inhibit absorption of -azoles and ampicillin
    - Increase concentration of benzodiazepines, phenytoin, warfarin

2 Dental Management

GERD Patient

- Discussion about diet
  - Avoid acidic foods
- Salivary function test
  - Assess buffering capacity and flow rate
- OSA, GERD and nocturnal bruxism are all strongly associated with each other

Peptic Ulcer Disease Patient

- Oral hygiene maintenance = ↓H. pylori spread
- Avoid NSAIDs
  - Use acetaminophen
  - Use selective COX2 inhibitor (Celecoxib)
- Re-evaluate antibiotic regimen
- Beware of drug interactions
  - PPI with ketoconazole, itraconazole, benzodiazepines, warfarin, phenytoin and ampicillin
  - Antacids with tetracycline and erythromycin

Thyroid

1 Thyroid Gland

The thyroid gland is located at the base of the neck and is responsible for the production of 3 hormones.

- **T3** (triiodothyronine) & **T4** (thyroxine)
  - Produced in **follicular cells**
  - Regulate metabolism, heart rate and body temperature
  - Promote growth and maturation
- **Calcitonin**
  - Produced in **parafollicular/C-cells**
  - ↓ serum calcium

HPT axis

The hypothalamic-pituitary-thyroid (HPT) axis is as follows.

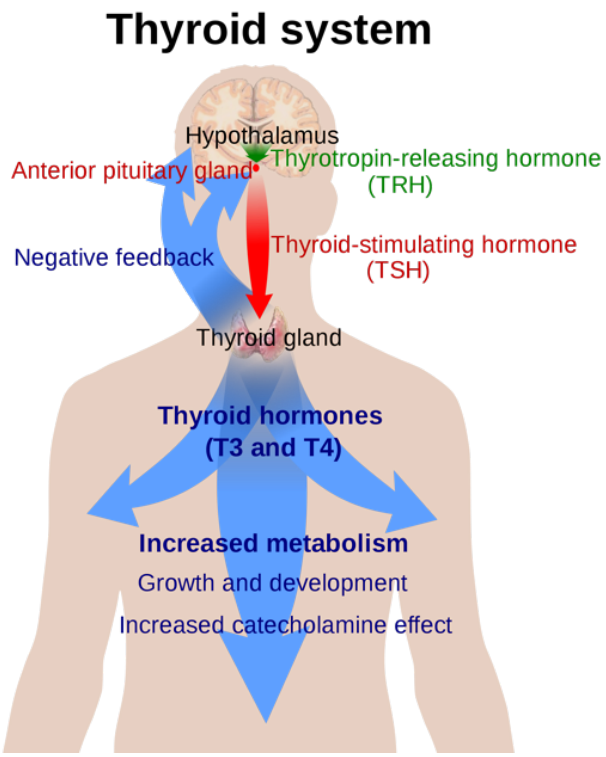

Figure 1.54 Thyroid system

2 Thyroid Diseases

Diseases of the thyroid are present in 12% of the population and can manifest has hyperthyroidism, hypothyroidism, or thyroid cancer.

- Females > Males
- 5-year survival rate = 97%
- Most common in late teens – 40s
- Thyroid nodules = 1-5% cancer incidence

Hyperthyroidism

Hyperthyroidism or **thyrotoxicosis** refers to excess thyroid hormone secretion. There are different aetiologies for hyperthyroidism.

- **Endogenous** – from tumour, immunological diseases etc.
  - 1° = ↑T3 & T4 (thyroid)
  - 2° = ↑TSH (anterior pituitary)
  - 3° = ↑TRH (hypothalamus)
- **Graves' Disease**
  - Most common form of hyperthyroidism
  - **Autoantibodies** target TSH receptor ⚿ thyroid hormone release
  - Signs & symptoms
    - **Exophthalmos** – bulging eyes
    - Fatigue
    - Weight loss
    - Tachycardia
    - Nervousness
    - Heat intolerance
    - **Goiter** – enlargement of thyroid gland
  - Thyrotoxic crisis can be triggered by epinephrine

Figure 1.55 Goiter

- **Thyrotoxic crisis** – "thyroid storm"
  - T3 & T4 critically high = emergency condition
  - Signs and Symptoms
    - Stress can trigger S&S
    - Fever & sweating
    - Tachycardia, atrial fibrillation
    - Loss of consciousness
  - Treatment
    - Wet and ice packs
    - EMS
    - Monitor vital signs
    - IV **hydrocortisone** or oral **dexamethasone**
    - IV glucose
    - **Propylthiouracil** – antithyroid medications

Treatment of hyperthyroidism includes medications that inhibit the synthesis of thyroid hormone. Medications include the following:

- Inhibit **thyroid peroxidase** – enzyme that helps synthesize thyroglobulin.
  - Propylthiouracil
  - Methimazole
  - Carbimazole
- **Radioactive Iodine (RAI)** – destroys thyroid cells through radiation

Hypothyroidism

Hypothyroidism occurs when there is too little thyroid hormone (T3 & T4) in the bloodstream.

- **Iodine deficiency** - most common cause in underdeveloped countries
- **Hashimoto's thyroiditis** – most common cause in developed countries
  - Autoimmune condition
  - Antithyroglobulin antibodies attack the thyroid gland
- **Cretinism** – hypothyroidism in children
  - Results in severely stunted physical and mental growth
- Signs & symptoms
  - Bradycardia
  - Weight gain
  - Goiter
  - Cold intolerance
  - Wormian bones – extra bones between sutures of cranial vault
- **Myxedematous Coma**
  - T3 & T4 critically low
  - Signs and Symptoms
    - Stress can trigger S&S
    - Bradycardia
    - Severe hypotension
    - Low body temp
- Treatment
  - Monitor vital signs
  - Warm patient with blankets
  - Activate EMS
  - IV levothyroxine & hydrocortisone, IV glucose

Thyroid Cancer

- **Multiple endocrine neoplasia type 2 (MEN2)**
  - medullary thyroid carcinoma
  - multiple neuroma
  - pheochromocytoma
- Most common site of origin of metastasis is from the kidney

Treatment includes hormones that are thyroid replacement drugs:

- **Liothyronine** – T3 hormone replacement
- **Levothyroxine** – T4 hormone replacement

Oral Manifestations

- Hyperthyroidism
  - Lingual thyroid – thyroid tissue posterior to foramen cecum of tongue
  - Accelerated tooth eruption
  - Caries
  - Periodontal disease
  - Osteoporosis
  - Propylthiouracil medication can lead to the following:
    - Sialoliths
    - Oral ulcerations
    - Necrotizing gingivostomatitis
- Hypothyroidism
  - Delayed tooth eruption
  - Macroglossia
  - Xerostomia
  - Radiating pain for Hashimoto's
- Thyroid cancer
  - Xerostomia
  - Sialadenitis
  - Loss of taste
  - Pain in mouth
  - Caries
  - Multiple neuromas – for cancer linked to MEN2

2 Dental Management

It is important to note that regardless of thyroid disease or not, palpation of the thyroid gland should be done on all head and neck examinations.

Hyperthyroidism Patient

- Limitations of NSAIDs
- Avoid epinephrine
  - Maximum 2 carpules of local anesthetic
  - No retraction cords with epinephrine

Hypothyroidism Patient

- Avoids the following
  - Sedatives
  - Narcotics
  - Barbiturates

Parathyroid Glands

1 Parathyroid Glands

The **parathyroid glands** are four small glands located on the posterior surface of the thyroid gland (2 on each lobe). They are composed of two types of cells.

- **Chief cells** – creates parathyroid hormone (PTH)
  - PTH functions
    - Bone - ↑RANKL + ↓OPG
    - Intestines – ↑Vitamin D
    - Kidney reabsorption – ↑calcium + ↓phosphate
- **Oxyphil cells** – function unknown

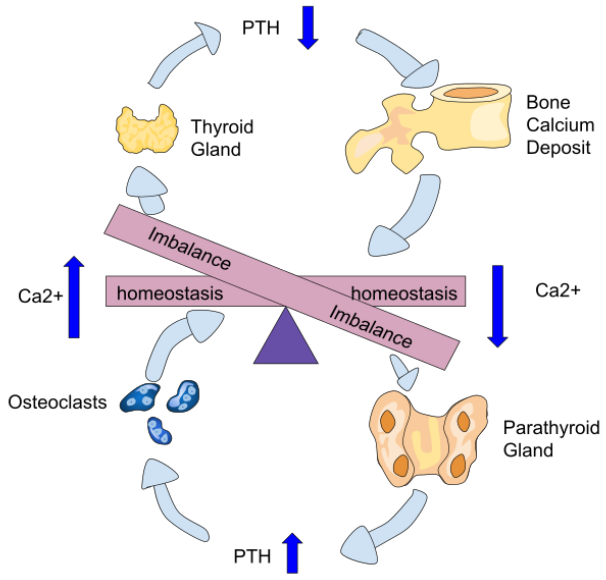

Figure 1.56 Parathyroid homeostasis

2 Parathyroid Diseases

Hyperparathyroidism

Hyperparathyroidism occurs when excess PTH is secreted, often leading to hypercalcemia in the blood.

- 1° – Tumour of parathyroid gland
- 2° – insufficient Vit D intake or chronic renal failure
  - Initial hypocalcaemia ⍰ parathyroid secretes more PTH to compensate ⍰ hypercalcemia
- 3° – chronic secondary hyperparathyroidism
  - Gland becomes hyperplastic and baseline PTH levels become greater
- Signs and Symptoms
  - Kidney stones, painful bones, abdominal groans, psychiatric moans
  - Generalized lamina dura loss
  - Brown tumours – cell lesions seen as radiolucencies in x-ray
    - Pockets in bone filled with blood
  - ↑ alkaline phosphatase levels
  - Radiographic salt and pepper appearance

Hypoparathyroidism

- Often from damage/removal of parathyroid glands from surgery (thyroidectomy)
- Often leads to overaccumulation of calcium in bone
- Signs and Symptoms
  - Paresthesia and tetany – most common
  - Pitted enamel hypoplasia
  - Dilaceration of teeth
  - Delayed tooth eruption
  - Increased radiopacity of jaws
  - Radiopacity in skull by basal ganglia

INBDE Pro Tip: S&S of hyperparathyroidism are commonly memorized by the phrase "**stones, bones moans and groans**."

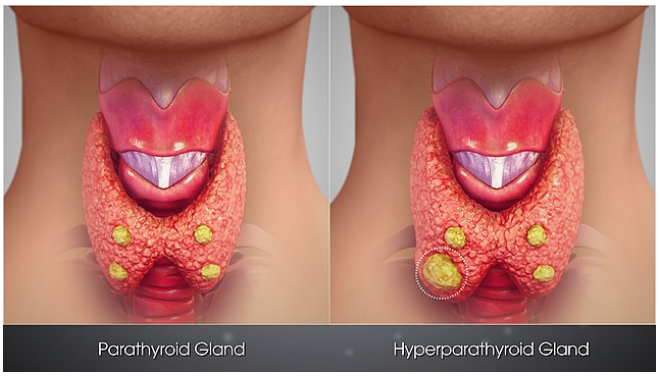

Figure 1.57 Parathyroid gland vs. hyperparathyroid gland

Steroid & Adrenal Insufficiency

1 Introduction

Steroids

Steroids are hormones derived from the cholesterol molecule

- All steroids and cholesterols contain a 4 aromatic rings
- **Steroid glands** located in the following organs
  - Testes & ovaries
  - Placenta
  - Adrenal cortex

Types of Steroids

1. **Corticosteroids** – secreted from adrenal cortex
   - **Glucocorticoids** – cortisol
     - Synthetic forms – cortisone, prednisone (as anti-inflammatories and immune suppressants)
   - **Mineralocorticoids** – aldosterone
     - Regulates ion balance
2. **Sex steroids**
   - Androgens – testosterone
   - Estrogens – estradiol
   - Progestogens - progesterone

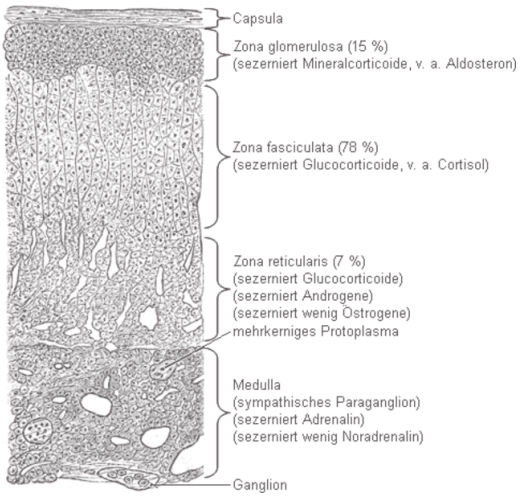

Figure 1.58 Layers of cortex

Cushing's Syndrome

- **Endogenous** – benign tumour
  - 1° – ↑cortisol (adrenal cortex)
  - 2° – ↑ACTH (anterior pituitary)
  - 3° – ↑CRH (hypothalamus)

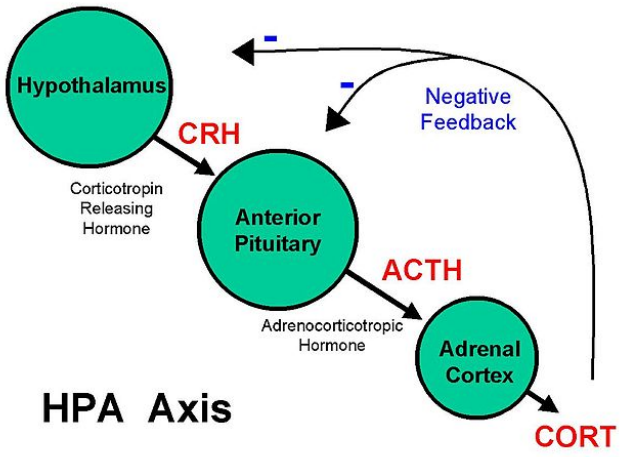

Figure 1.59 HPA Axis

- **Exogenous** – over administration of exogenous glucocorticoids
  - Most common cause of Cushing's syndrome
  - Rule of 2s - could be a concern for those taking **20mg** of exogenous cortisol for at least **2 weeks** within last **2 years**
    - Possibly results in suppression of adrenal cortex function or crisis

INBDE Pro Tip: 20mg hydrocortisone = 5mg prednisone = 0.75mg dexamethasone

- Signs & Symptoms
  - Hypertension & hypercalcemia
  - Central obesity
    - Protruding abdomen and thin extremities
  - **Moon facies** – most common
    - Red, round, and full face
  - **Buffalo hump** – most common
    - excess fat in shoulders
  - Mood changes
  - Chronic fatigue

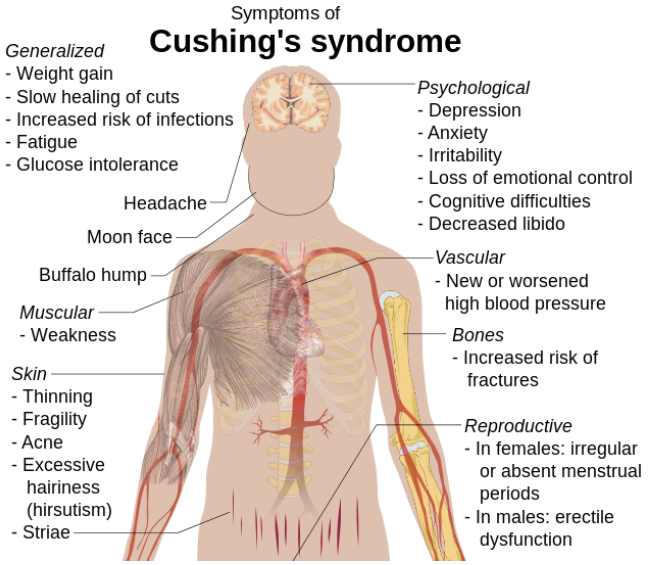

Figure 1.60 Cushing's syndrome

Addison's Disease

- Endogenous – immune-mediated destruction of tissue
  - 1° – ↓cortisol (adrenal cortex)
  - 2° – ↓ACTH (anterior pituitary)
  - 3° – ↓CRH (hypothalamus)
- Signs & Symptoms
  - Weight loss
  - Fatigue
  - Muscle weakness
  - Hyperpigmentation
    - Bronzed skin
    - Brown macules
  - Immunocompromised

Adrenal Crisis/ Addisonian Crisis

- When corticosteroids critically low
  - Uncontrolled Addison's disease or destruction of adrenal gland
  - Atrophy of adrenal cortex
    - Stress can trigger S&S
      - Vomiting
      - Hypotension
      - Lethal hypovolemic shock
- Treatment
  - Monitor vital signs
  - EMS
  - IV saline
  - IV hydrocortisone

2 Dental Management

Well Controlled Condition

- Monitor BP
- Supine chair position for hypotension
- Stress management
- Steroid supplementation
- Caution with general anesthesia
- Avoiding the following:
  - Phenobarbital
  - Phenytoin
  - Rifampicin
  - Etomidate
  - Ketoconazole, fluconazole
  - Imipramine

Poorly Controlled Condition

- Contact MD
- Defer treatment

Pregnancy

1 Introduction

Pregnancy

Pregnant patients need to be treated with caution in the dental office to ensure the safety of both the patient and the developing fetus.

- 3 trimesters
  - 1st = 0-13 weeks pregnant
    - Most vulnerable for malformations
    - Symptoms are the strongest
  - 2nd = 14-26 weeks pregnant
    - safest period to provide routine dental care
  - 3rd = 27-40 weeks pregnant
    - More heartburn and acid reflux
    - Contractions
    - Swelling
- **Premature** babies are born before 37 weeks of gestation (pregnancy)
  - **Viable pregnancy** – baby is born with reasonable chance of survival
    - At least 25 weeks

Effects of Pregnancy

- Common effects of pregnancy
  - ↓Iron
  - ↓Platelets
  - ↑Coagulations factors
    - VIII, IX, X
  - ↑WBCs – due to ↑neutrophils
  - ↓Lung capacity

- Complications
  - Gestational diabetes
  - Frequent urination
  - Acid reflux
  - Miscarriage
  - **Preeclampsia** = high BP, proteinuria, edema, blurred vision
    - Life threatening if progresses to eclampsia

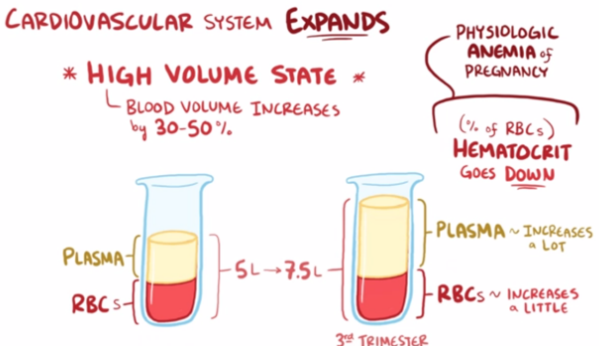

Figure 1.61 Effects of pregnancy

Oral Manifestations

- **Pregnancy gingivitis**
- **Pyogenic granuloma** – 'pregnancy tumour'
  - Mass of granulation tumour, commonly found on labial aspect of interdental papilla
- Increased caries risk
- Dental erosion – due to vomiting
- Hypersensitive gag reflex
- Sinus congestion

FDA Pregnancy Categories

The **FDA Pregnancy Categories** helps determine which drugs are and are not safe to use during pregnancy. There are 5 categories.

Category	Definition
A	No fetal risk in humans
B	No risk in animal studies No human studies Generally, pregnancy safe
C	Potential risk Use cautiously during pregnancy
D	Evidence of risk Avoid during pregnancy
X	Contraindicated in pregnancy

Category	Drug Examples
A	Folic acid, Vitamins, isoniazid, levothyroxine
B	Acetaminophen, NSAIDS (1st and 2nd trimester Lidocaine, prilocaine, chlorhexidine Oxycodone (other in category C)
C	Glucocorticoids Epinephrine, nitrous oxide Most opioids
D	Aspirin, NSAIDS (3rd trimester) Diazepam, lorazepam Doxycycline, tetracycline (linked to tooth discolouration)
X	Flurazepam, Triazolam

INBDE Pro Tip: The meaning of each category can be memorized as follows:

A = A-okay
B = Better than
C = Caution
D = Don't use
X = Never use

Supine Hypotensive Syndrome

Usually, it is not best to position a pregnant patient completely supine/flat, especially during late pregnancy. This is because the gravid uterus compresses aorta & inferior vena cava

- Results in hypotension, nausea, weakness, air hunger, pallor, sweating and dizziness
- Avoid by turning patient on their left side (left lateral decubitus position)

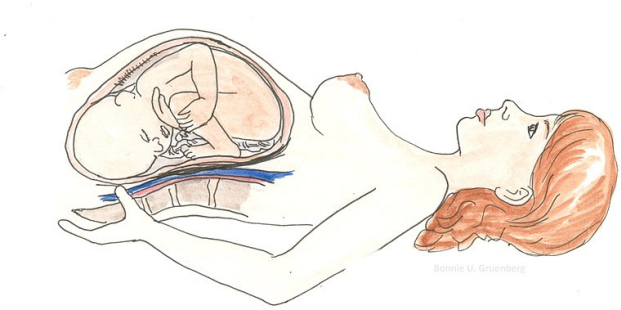

Figure 1.62 Supine patient who is pregnant

2 Dental Management

Pregnant Patient

- Recline chair in a non-supine position
- Take radiographs only when necessary
  - Thyroid collar and lead apron
- Monitor BP
  - If >140/90mmHg call OBGYN (risk for preeclampsia)
- Avoid benzodiazepines
- Avoid in 1st trimester
  - Elective care
  - Nitrous oxide – use in other trimesters should only be 30 min and with 50% oxygen
- Avoid in 2nd & 3rd trimester
  - Tetracycline – cause blue-grey staining
  - Excessive fluoride – can cause fluorosis
- Avoid in 3rd trimester
  - NSAIDS
  - Elective care during the second half

Hepatitis

1 Introduction

Hepatitis is a disease of inflammation of the liver. There are different causes to this disease with infection by the **hepatitis virus** being the most common. **Heavy alcohol** use and exposure to certain **chemicals** can also cause hepatitis. **Autoimmune hepatitis** involves the body attacking its own liver cells. times, the viral form of hepatitis can lead to **liver cirrhosis** and even **liver carcinoma**.

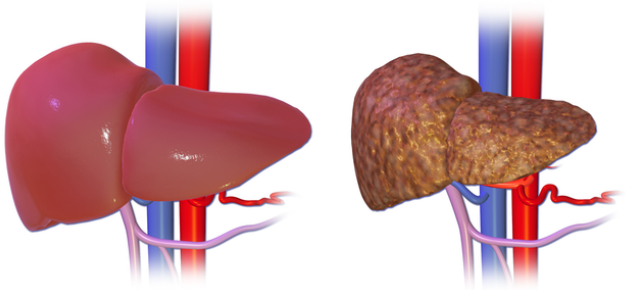

Figure 1.63 Normal liver vs. liver cirrhosis

Transmission

There are different classifications of hepatitis depending on the different routes of transmission.

1. **Hepatitis-A** – fecal-oral
2. **Hepatitis-B** – blood
3. **Hepatitis-C** – blood
4. **Hepatitis-D** – direct contact with bodily fluids, requires previous Hep-B infection
5. **Hepatitis-E** – fecal-oral

INBDE Pro Tip: INBDE Pro Tip: Memorizing each form of hepatitis with their route of transmission can be done by looking at the letters in the words themselves.

f**E**c**A**l-oral → Hep E & A
Contaminated **B**lood → Hep C & B
Direct → Hep D

Immunology

- **T-lymphocyte** – cellular immunity cell
- **B-lymphocyte** – humoral immunity cell that recognizes antigens
  - Differentiates into plasma cells that produces antibodies
- **Antibodies** – proteins produced by the immune system that help identify and neutralize antigens
  - **IgM** – first antibody created in response to antibodies, predominantly produced by neonatal B-lymphocytes
  - **IgG** – most common antibody produced
  - **IgE** – binds to basophil and mast cell receptors
    - Involved in allergic and anaphylaxis response
  - **IgA** – main antibody found in saliva

2 Types of Hepatitis

Hepatitis A

- Onset = acute rapid
- Incubation time = 2-6 weeks
- No chronic disease or carrier state
  - Hence, long term liver damage not common
- Symptoms
  - Jaundice & fever
  - Nausea & loss of appetite
- Vaccine available? – Yes

Hepatitis B

- High risk of transmission due to blood and body fluid transmission
  - 30% risk of transmission after percutaneous injury
  - Considered high risk of infection in dental setting
- Onset = acute rapid
- Incubation time = 2-6 weeks
- Symptoms
  - No symptoms 1/3 of the time
  - Jaundice
  - Fever, malaise
  - Nausea & loss of appetite
- Vaccine available? – Yes
  - Highly effective, 2-3 injections over 6 months
  - OSHA allows vaccine to be freely available to employees occupationally exposed to blood
- Postexposure prophylaxis available
- DNA virus (the rest are RNA) contained in the **Dane particle** (capsid that infects the host cells)
  - In the mouth, mostly concentrated in the gingival sulcus in the mouth
- Immunology

Blood test	+ meaning
Surface antigen (HBsAg)	Person is infectious
IgM antibody (IgM anti-HBc)	In person previously infected, temporary
Core antibody (anti-HBc)	In person previously infected, last for the rest of life
Surface antibody (anti-HBs)	Person has recovered and immune, found in vaccinated people

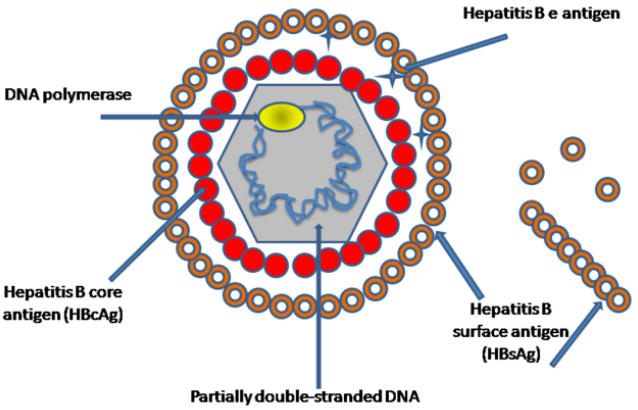

Figure 1.64 Hepatitis B

Hepatitis C

- 1.8% risk of transmission after percutaneous injury
- Incubation time = 2 weeks – 6 months
  - Slower disease
- Often asymptomatic
  - Similar to other hepatitis forms if symptoms arise
- Vaccine available? – No
- Treatment available
  - Interferon alpha - weekly
  - Ribavirin – daily, antiviral
- Most common bloodborne pathogen in US

3 Dental Management

Oral Manifestations

- Jaundice
  - Yellowing of skin and eyes, even the oral mucosa
- Petechiae
  - Damaged liver inhibits regular production of clotting factors
- Xerostomia
- Atrophic glossitis – smooth tongue
- Lichen planus – associated with Hep B & C
- Hepatocellular carcinoma – could metastasize to jaw as a mass on premolar or ramus region of mandible (rare)
- Fetor hepaticus – poor breath associated with liver disease

Active Hepatitis Patient

- Defer and refer treatment if elective
- Urgent care
  - Minimize aerosol use
  - Isolated operatory
  - PPE and infection control
  - Avoid prescribing drugs that are metabolized in the liver

Recovered Hepatitis Patient

Treatment remains the same as a healthy patient.