

Oral Surgery

Many case-based questions on the INDBE will be surgical cases that require the integration of pathology, anatomy, and medicine. These notes cover the high yield material to succeed on any question relating to oral surgery diagnosis, treatment, techniques, and best practices.



1 Armamentarium for Oral Surgery

The following is a list of the most common instruments used in Oral Surgery. For the INDBE, you will need to be able to recognize these instruments and understand how, when, and why to use them.

Bite Block

Bite blocks are soft, rubber devices that allow the patient to rest their jaw while keeping their mouth open. These blocks help maintain a good field of vision for the operator while maintaining patient comfort. In addition, the bite block helps to stabilize the mandible, which can facilitate an easier surgery.



Figure 1.01 Bite block

Suction Tips

There are two different suction tips used for oral surgeries: the **Yankauer** and **Frazier** suction. Be familiar with both types and their utility during surgery.

Yankauer Suction

- Only used for soft tissue (no hard tissue options)



Figure 1.02 Yankauer suction

Frazier Suction

- Can be used for soft and hard tissue
- If using on hard tissue, cover the hole on top to increase suctioning power
- If using on soft tissue, keep hole on top open
- Can be used to pick up tooth fragments when the hole is covered

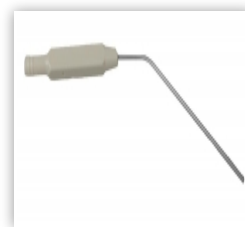


Figure 1.03 Frazier Suction

Towel Clip

The main purpose of towel clips is to stabilize drapes around the patient during surgery. These clips function like hemostats. To use, clip the drapes placed on the patient while taking care not to pinch the patient. In addition, you can stabilize any suction tube with these clips to prevent them from falling on the ground.



Figure 1.04 Towel clip

Scissors

For oral surgery, there are two types of scissors that are commonly used: Dean and Mayo scissors.

Dean Scissors

- Main function of these scissors is to cut sutures
- The blades are angled upward to help in cutting sutures



Figure 1.05 Dean scissors

Mayo Scissors





These scissors are specifically for cutting fascia and soft tissue



Figure 1.06 Mayo scissors

Blades

Blades are the primary instrument used to cut into soft tissue for oral surgery. After assembly with the blade handle, the instrument should be held with a **pen grasp** to allow for maximal control. For the INDBE, there are four different

Blade	Use	Image
10	Used for large incision into skin	
11	For stab incisions, which are used for drainage	
12	Primarily for mucogingival surgery. Access to sulcus is made easy with curved blade	
15	Most common blade for intraoral surgery	

Blade Handle

The blade/knife/scalpel handle is assembled with the surgical blade to puncture and separate soft tissue. The blade handle holds the blade.



Figure 1.07 Blade handle

Tissue Retractors

Tissue retractors are used to move and control soft tissue to allow for better access and visibility to the surgical site. Finger retraction is unreliable and should never be used as it only allows for retraction of the cheek, tongue, or flap. Tissue retractors can retract the cheek, tongue, and flap at the same time. Below are the four most common tissue retractors.

Austin

- Specifically for small flaps
- Bend is a right angle

Minnesota

- **Most used tissue retractor**
- Used for cheek & flap retraction
- Curve is offset and broad



Figure 1.08 Minnesota tissue retractor

Weider

- Used to protect and retract the tongue
- Broad heart shape allows for tongue protection
- Used in mandibular lingual surgery



Figure 1.09 Weider tissue retractor

Seldin

- Used for elevating tissue in the floor and the mouth
- Long and flat shape
- Used in mandibular tori removal



Figure 1.10 Seldin tissue retractor

Dental Elevators

Elevators are a key instrument for oral surgery procedures. They provide various functions like **disrupting PDL fibers, luxating teeth, and expanding alveolar bone.**

All elevators have three components:

1. Blade
2. Shank
3. Handle

Elevators should be gripped with a **palm grip** with the **pointer finger resting near the blade.** This technique allows for the operator to obtain adequate leverage and control for ideal use.

Before understanding each type of dental elevator, let's look at the three functionalities of elevators.

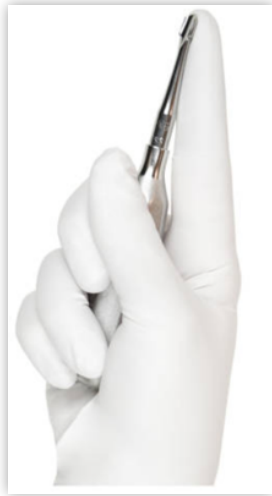


Figure 1.11 Dental elevator

Levers

Elevators that work as a lever have three components: **Fulcrum**, **Effort**, and **Load**. These three components act as a **class I lever** where the fulcrum is between the load and effort. The elevator is the effort that allows the blade (working end) to apply load onto the tooth with the fulcrum being the crest of the alveolar bone.

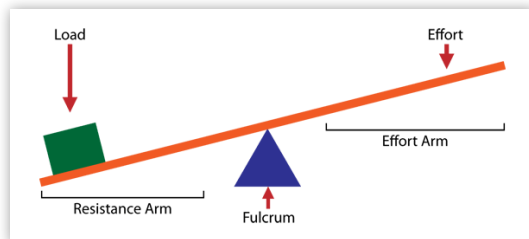


Figure 1.12 Lever

Wedges

Wedges are placed between two objects with the goal of **expansion**, **splitting**, or **displacement**. Elevators that are wedges are typically placed between the root and bone parallel to the long axis of the tooth. Force is applied the elevator to split, expand, or displace the tooth from the socket to allow for a lever to remove the tooth from the socket.

Wheel & Axle

This type of elevator applies force in a rotational manner to elevate the tooth. Elevators that apply this kind of force aim to remove hard to access root tips from the bone. Utilizing wheel & axle force application is more aggressive than the other two. Improper application of a wheel & axle elevator can lead to mandible fracture.

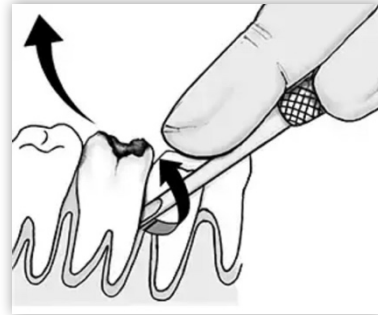


Figure 1.13 Wheel & axle

Straight Elevator (#301)

- **Most used elevator**
- Acts as a **lever**; can be used as a wedge but is mostly used as a lever
- **Technique:** Place the concave part of the blade towards the tooth that is being elevated



Figure 1.14 Straight elevator

Triangular Elevator (Cryer)

- **Second most used elevator**
- Function is to **extract roots left inside a socket**
- Acts as a **wheel & axle**
- Left & right variants



Figure 1.15 Triangular elevator

Pick Elevator

- Two Versions:
 - **Crane Pick** = heavy version
 - **Root Tip** = delicate version
- Function is to **remove retained/broken/isolated root tips** → this is accomplished by placing elevator between a retained root tip and the buccal plate in the PDL space.
- **Wedge**



Figure 1.16 Pick elevator

INBDE Pro Tip:

Straight Elevator = Lever (+/- Wedge)
 Triangular Elevator = Wheel & Axle
 Pick Elevator = Wedge

Periosteal Elevators

Periosteal elevators are separate from dental elevators. They have a much thinner body and are typically used at the beginning of an extraction. Their function is **to reflect the mucoperiosteum from underlying bone** to clear the gingiva from the working area. There are two periosteal elevators to be familiar with for the INBDE.

Woodson Periosteal

- Smaller of the two periosteal elevators
- Sharp end is used to lift a flap
- Broad, round end is used to elevate and reflect a flap

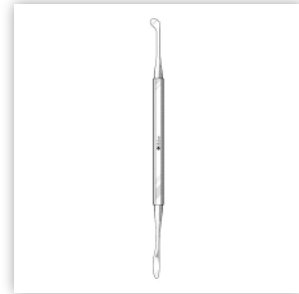


Figure 1.17 Woodson periosteal

#9 Molt Periosteal

- Larger periosteal elevator
- Sharp end used to reflect the papilla and lift a flap
- Broad end used for general reflection of mucoperiosteum from the bone

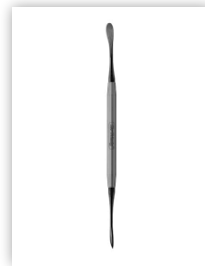


Figure 1.18 Molt periosteal

Extraction Forceps

Extraction forceps are used to obtain a strong grip on the tooth for final removal. These forceps are comprised of a beak, hinge, and handle. There are six extraction forceps to be familiar with for the INBDE.



Figure 1.19 #150 forceps

#150

- Universal forceps designed for **upper teeth**
- Mainly for molars, but 2 variants for other teeth
 - A = Mainly premolars, also used for canines, incisors
 - S = Primary Teeth

#151

- Universal forceps designed for **lower teeth**
- Beaks pointed more **down** to improve access
- Mainly for molars, but 2 variants for other teeth
 - A = Premolars, canines, incisors
 - S = Primary Teeth

#23 Lower Cowhorn Forceps

- These extraction forceps are for lower molars



Figure 1.20 Lower cowhorn forceps

- They possess two sharp beaks to engage in bifurcations of mandibular molars

#88R/L Upper Cowhorn Forceps

- These cowhorn forceps are used for upper molars
- There are right & left variants



Figure 1.21 Upper cowhorn forceps

#74 Ash Forceps

- Used specifically for mandibular premolars



Figure 1.22 Ash forceps

#65 Upper Root Forceps

- These forceps help facilitate access of maxillary roots



Figure 1.23 Upper root forceps

Non-Extraction Forceps

Non-extraction forceps are not equipped to help with extractions directly, but rather to manipulate other objects/tissues. There are two important non-extraction forceps to be familiar with.

Adson Tissue Forceps

- Used for handling soft tissue
- Two types
 - Toothed:
 - Specifically for **periosteum, muscle, aponeurosis**
 - Non-tooth:
 - Specifically for **fascia, mucosa, pathological tissue for biopsy**



Figure 1.24 Adson tissue forceps

Utility Forceps

- Used for handling items on the surgical tray
- Used to prepare packing materials
- Do NOT use for hard or soft tissue manipulation



Figure 1.25 Utility forceps

Irrigation

Irrigation is the process of applying a stream of sterile saline or water with a **Monoject syringe**. Irrigation is done when using a surgical bur or when cleaning a surgical site. It is crucial to irrigate while using a surgical bur to increase efficiency of drilling and to prevent heat damage to the bone. A syringe can also be given to the patient to rinse the extraction site with warm salt water at home.



Figure 1.26 Irrigation

Curettes

Curettes are used to mechanically clean surgical sites of all remaining soft tissue. The ends are spoon-shaped to better scrape away soft tissue at the base of sockets. It is crucial to **always curette a socket once a tooth is removed**; this step can never be skipped as it allows for better clotting and wound healing.



Figure 1.27 Curettes

Rongeurs

Rongeurs are double spring pliers that are used to trim small amounts of bone. It is particularly good for removing interradicular bone left after a tooth has been extracted. Clinicians will sometimes use these as extraction forceps; however, this is not the intended purpose of this instrument.



Figure 1.28 Rongeurs

Osteotome

The osteotome, aka bone chisel, is used in conjunction with a mallet to remove bone. The wedge-like end is placed on bone and the surgical mallet is used to tap on the flat end. At the end of the instrument there is an angled sloped called a **bevel**. Osteotomes can be **mono-beveled** or **bi-beveled**. Mono-bevels are used to remove tori while bi-bevels are used to section teeth.



Figure 1.29 Osteotome

Bone File

Bone files are used with a **pull stroke** to smooth out bone before suturing. If any sharp edges of bone remain around the extraction site, a bone file is used to smoothen the area.



Figure 1.30 Bone file

Surgical Handpiece

Surgical handpieces are used to remove larger amounts of bone or section teeth during a surgical extraction. It is important **to never use an air-driven handpiece** (restorative handpiece). Air-driven handpieces can push air into the socket and **cause subcutaneous emphysema (air emphysema)**. There are two types of burs used with surgical handpieces in oral surgery:

- **Straight Fissure Bur:** used to section teeth
- **Round Bur:** used to remove bone

INBDE Pro Tip:

A potential complication of using an air-driven handpiece is **subcutaneous emphysema**

Sutures

Sutures are the **needle & thread** used to immobilize flaps and facilitate healing. The diameter of sutures is denoted in # of 0's (10-0, 9-0, etc.), and the greater the number of 0's, the smaller the diameter. For the INDBE, be able to recognize different suture materials, know the different suture techniques, and be able to compare the diameters of different suture.

Suture Materials

Absorbable:

- Gut: plain or chromic
- Vicryl
- Polydioxanone (PDS)

Nonabsorbable:

- *Silk*: caution is needed with silk sutures as they possess a **wicking property** that allows for saliva and bacteria to travel through the thread into the surgical site by capillary action and cause infection
- Nylon
- Polypropylene (Prolene)
- Mersilene (Dacron)

Types of Suture Techniques

- **Simple interrupted**
- Simple continuous
- Mattress (horizontal or vertical)
- Figure "8"
- Continuous locking
- Subcuticular

INBDE Pro Tip:

Simple Interrupted is the most common suture technique.

Needle Holder

The needle holder is like the hemostat except it is only for holding the needle end of a suture. To aid in stability, the **face of the beak is crosshatched** to allow for positive grasp of the needle.

Hemostat

Hemostats are instruments that can be locked in place to hold or clamp different objects. There are curved or straight beak hemostats both with serrated ends to aid in grip strength. Below are two common uses of the hemostat:

1. Clamping blood vessels closed before suturing or cauterizing
2. Dissection of soft tissue in incision & drainage (I&D) procedures
 - Using a hemostat in I&D procedures involves entering an incision while closed and then opening it to separate the soft tissue inside.

2 Extractions

Indications & Contraindications

Below is a table of common indications and contraindications for tooth extraction. Keep in mind, these contraindications are relative and should be used as markers to refer to an Oral Surgeon. Be sure to recognize each of these clinical conditions as they will likely show up on case-based scenarios. In addition, any bulleted points are high yield material.

Indications	Contraindications
Non-restorable teeth	Uncontrolled diabetes: High risk of infection
Pulpal necrosis; RCT failure	End-stage renal disease
Compromised periodontium	Uncontrolled cardiac disease (HTN; Unstable angina; MI)
Orthodontics	Increased bleeding risk - Hemophilia; thrombocytopenia - Anticoagulant drugs
Cracked Tooth	IV Bisphosphonates: increases the risk of osteonecrosis of the jaw
Pathology (cancer, cysts, etc..)	Chemotherapeutic agents
Tooth malposition/ eruption disturbances	Pregnancy: - Although dental work can be done at any time during pregnancy, best time to perform elective dental procedures is during the second trimester
Supernumerary Teeth: Most common = mesiodens (extra tooth)	Pericoronitis: - If severe, treat with antibiotics - If not severe, treat local, causative factors

Medical Indications: - Pre-radiation therapy - Pre-cardiac surgery - Pre-transplant surgery - Pre-bisphosphonate therapy	Head & Neck Radiation: Hyperbaric oxygen pre & post-op can help mitigate against osteonecrosis of the jaw for these patients
Non-restorable tooth / non-restorable fracture	Leukemia & Lymphoma: - High risk of infection (low WBC) - Contraindications includes Hodgkinson's & Non-Hodgkinson's Lymphoma

INBDE Pro Tip:

Acute infection is NOT a contraindication for extractions. However, an infection can interfere with local anesthesia efficiency. The low pH environment can inactivate the specific molecules that facilitate anesthesia.

Complications of Extractions

Below are the most common and highly tested complications that could arise during an extraction procedure. Be sure to understand how each of the complications may occur, how to prevent them pre-operatively, and how to treat them if they occur.

Subperiosteal Abscess

A subperiosteal abscess occurs when **pus collects under the periosteum after surgery**. Necrotic tissue or other debris left under a flap following extraction could cause an infection that leaks pus subperiosteally. **The risk for development of a subperiosteal abscess is highest when elevating a mucoperiosteal flap.**

Prevention: ensure the extraction socket is clean through curettage and irrigation

Treatment: Surgical drainage +/- Antibiotics

Oro-Antral Communication (OAC)

This complication occurs when an **exposure is created between the sinus and oral cavity during surgery**, aka sinus exposure. This complication clinically presents as a black hole connecting the oral cavity to the sinus. If observed, caution is needed with irrigation as liquid can enter the sinus and potentially into patient's nose. The teeth where OAC is most likely to occur are the **maxillary 1st molars**.

Prevention: A good **pre-op radiograph** should be used to assess the distance between the root and sinus and **excessive apical pressure should be avoided** during surgery.

Treatment:

Treatment for OACs is dependent on the **diameter of opening** between the sinus and oral cavity. The following are the different standards of care for various diameters:

< 2mm diameter:

- No surgical treatment needed
- Optional suture for closure
- Monitor with post-op visits
- Pt instructions:
 - Do not blow nose
 - Do not poke
 - Mouth open when sneezing or coughing
 - No negative pressure (straws)
 - No smoking

2-6mm diameter:

- Use **figure 8 suture** to promote hemostasis
- 4A's:
 - Antibiotics
 - Antihistamines
 - Analgesic
 - Afrin Nasal Spray bid:
 - Vasoconstrictor
 - Relieves sinus pressure
 - Px: 2x/day

> 6mm diameter: Flap Closure Surgery

Alveolar Osteitis (Dry Socket)

This complication occurs 3-5 days post-operatively when a **blood clot dislodges or dissolves before the wound heals**. Without the clot in the socket, the bone and nerves are exposed, which causes **intense throbbing pain** (possibly radiating) for the patient. This complication is most common after the extraction of mandibular molars.

Prevention:

- Post-Op instructions & compliance
 - No negative pressure (straws)
 - No smoking
- Stimulate hemostasis after surgery via curettage
- Place collagen plug or gel foam into extraction site

Treatment:

- Thorough irrigation of extraction site with sterile saline to flush out debris
- Medicative dressing composed of **Eugenol**
 - Change every 48 hours till patient is asymptomatic
- Local pain control with:
 - OTC pain medication (Acetaminophen/Ibuprofen)
 - Prescription pain medications (opioids)
- Antibiotics are generally NOT indicated

Instructions After Treating Dry Socket:

- Cold pack compressed on surgical site
- Warm salt-water rinse

Nerve Injury

This complication occurs when a nerve is damaged during surgery. The nerve most often damaged is the **IAN** during **mandibular 3rd molar** extraction. The **lingual nerve** can also be damaged as it travels very close to the lingual cortex. Injury to a nerve can manifest as **paresthesia** in areas associated with the damaged nerve. General Dentists should refer cases with high probability of nerve damage (tooth near a nerve) to an oral surgeon.

Prevention:

- Preliminary **panoramic radiograph** to assess proximity to IAN
- Order **CBCT** to determine true relationship of tooth to IAN in 3D space when necessary

Treatment:

- Medrol Dosepak (methylprednisolone) - steroid) prescription to treat inflammation
- Monitor closely with periodic neurosensory testing/mapping of affected area until resolution
- Refer patients for micro-neurosurgery consultation if numbness lasts for more than 4 weeks.

Tooth Displacement

During surgery, it is possible for a tooth, tooth roots, or fractions of a tooth, to be displaced. This is a rare but serious complication that must be considered when planning and executing an extraction. Below are common locations of displacement for several teeth. This material is **highly tested** on the INDBE.

- **Maxillary 1st/2nd Molar** = Maxillary Sinus
 - Palatal root of maxillary first molar is the most likely to be displaced into maxillary sinus
- **Maxillary 3rd Molar** = Infratemporal fossa
- **Mandibular 3rd Molars** = Submandibular space

Prevention:

- Good pre-op radiograph to identify risk level
- Surgical extraction from onset
- Avoid excessive apical vertical forces on teeth & fractured segments

Treatment:

- Suction/tease out root fragment if possible
- If small (<3 mm), non-infected root fragment displaced into high risk area (close to sinus, IAN): do not remove fragment, inform patient, and monitor closely in the future
- If large root fragment is displaced into the maxillary sinus: Caldwell-Luc approach to remove the fragment

Aspiration/Ingestion of Foreign Object

Aspiration of foreign objects or teeth into the airway is a serious and dangerous complication that must be acted on immediately. An awake patient will violently cough and gag to remove the foreign object. A sedated patient might show less severe cough and gag reflexes.

Prevention:

- Place pharyngeal curtain in sedated patient
- Full attention and eyes should always be on the extraction site throughout the procedure

Treatment for aspiration:

- If laryngeal obstruction and patient unable to breathe: perform Heimlich maneuver, Advanced Cardiovascular Life Support
- If unsuccessful removal: emergency cricothyrotomy
- Referral to ER for chest X-ray and possible bronchoscopy

Treatment for ingestion:

- An awake patient will know if they ingested the teeth vs. aspirated the teeth
- Reassure patient that the tooth will eventually be excreted out of the body
- Refer patient to ER for chest X-ray to confirm ingestion

Other Complications

The following are other important complications of oral surgery.

- **Root Fracture – most common complication**
- Bleeding
- Infection
- TMD
- Jaw fracture
- Maxillary tuberosity fracture
- Air emphysema
- Soft tissue injuries
- Damage to adjacent teeth

Impacted Teeth

A tooth is considered impacted if it **fails to erupt into the dental arch within the expected time**. The primary cause for an impacted tooth is **inadequate arch length**.

A common test question on the INDBE is to identify the tooth that is most likely to be impacted. The three most likely teeth to be impacted are the **mandibular 3rd molars, maxillary 3rd molars, and maxillary canines**. These teeth are ranked below from most to least likely to be impacted. Be sure to memorize this order as this is a highly tested fact on the INDBE.

- **Mandibular 3rd molars > Maxillary 3rd molars > Maxillary Canines**

Classifications of Impacted Teeth

While the concept of impacted teeth is simple, there are several classification systems to categorize the diverse presentations of impacted teeth. These systems are important to understand as they dictate diagnosis and treatment. The three classification systems tested on the INDBE are:

1. **Nature of Overlying Tissue**
2. **Winter's Classification**
3. **Pell & Gregory Classification**

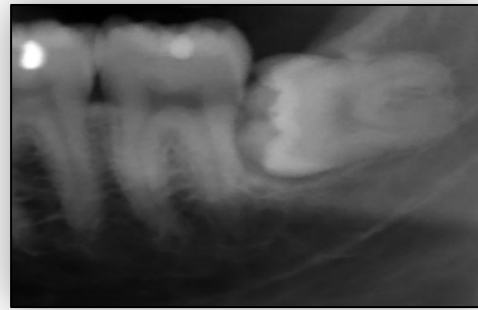


Figure 2.01 Horizontal partial bony impaction

1) Nature of overlying Tissue

This system uses the amount and nature of tissue overlying the impacted tooth as the criteria for classification. While any impacted tooth can be classified with this system, it is primarily for impacted 3rd molars. There are two classifications:

1. Soft Tissue Impaction

- ▶ A tooth falls into this category if its impaction is limited to soft tissue without bone involvement. In other words, the gingiva is covering the tooth fully or partially without bone atop the occlusal surface. This is the easiest type of impacted tooth to extract.

2. Hard Tissue Impaction

- ▶ This type of impacted tooth has bone overlying its crown and is more difficult to extract than soft tissue impactions.

There are 2 subclassifications within this category:

1. Partial Bony Impaction

- ▶ If the bone incompletely covers the tooth crown, it is a partial bony impaction. The level of difficulty of extraction is in the middle compared to full bony impaction and soft tissue impaction.

2. Full Bony Impaction

- ▶ These impacted teeth are fully surrounded by bone. Because these teeth are under hard tissue, they are the hardest to extract.



Figure 2.02 Types of bony impaction

INBDE Pro Tip:

Memorize the order of extraction difficulty for the Nature of Underlying Tissue Classification.

Fully Bony > Partial Bony > Soft Tissue

2) Winter's Classification

This classification system is only for **impacted 3rd molars** and is based on the **relative position of the long axis of the 3rd molar compared to the long axis of the 2nd molar**.

The following are the specific classifications:

- **Vertical** = Crown of the impacted tooth is parallel to the adjacent tooth.
- **Mesioangular** = Crown of the impacted tooth is tilted towards the adjacent tooth.
 - ▶ Least difficult to remove for impacted mandibular molars
 - ▶ Most difficult to remove for impacted maxillary molars
- **Horizontal** = Crown of the impacted tooth and occlusal surface is perpendicular to the adjacent tooth.
- **Distoangular** = Crown of the impacted tooth is tilted away the adjacent tooth.
 - ▶ Most difficult to remove for impacted mandibular molar
 - ▶ Least difficult to remove for impacted maxillary molars)
- **Transverse** = Crown of the impacted tooth is perpendicular to the adjacent tooth. Occlusal plane does not face the adjacent tooth. (Aka Buccolingual)
- **Inverted** = Crown of the impacted tooth is upside down relative to the adjacent too.

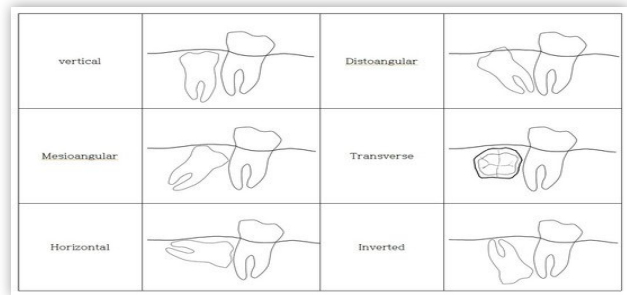


Figure 2.03 Winter's classification

INBDE Pro Tip:

A general rule to assess how difficult a mandibular 3rd molar extraction is:

The further away from the ramus, the easier the extraction.

3) Pell & Gregory Classification

This classification system is only for **impacted lower 3rd molars**. A complete Pell & Gregory Classification involves two different categories: **Impaction Depth & Ramus Relationship**.

Impaction depth classifies the relative height of the 3rd molar to the adjacent molar's height. The *Ramus Relationship* measures the depth of the 3rd molar inside the ramus.

Impaction Depth

- **Class A** = The impacted tooth's crown is on the same plane as the adjacent molar
- **Class B** = The impacted tooth's crown is in between the occlusal plane and the cervical line of the adjacent molar
- **Class C** = The impacted tooth's crown is below the cervical line of the 2nd molar

Ramus Relationship

- **Class I** = The impacted tooth's crown is anterior to the ramus
- **Class II** = The impacted tooth's crown is partially inside ramus
- **Class III** = The impacted tooth's crown is completely inside the ramus
 - ▶ A major complication for class III extractions is **nerve damage to the IAN**.

INBDE Pro Tip:

Class C impaction depth and **Class III** ramus relationships are the hardest to extract.

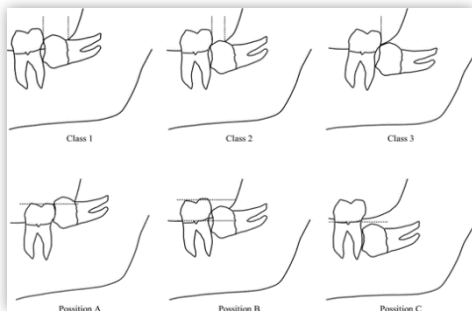


Figure 2.04 Pell & Gregory classification

Simple vs. Surgical Extractions

There are two types of extractions: Simple & Surgical. While both involve the removal of teeth, each requires unique considerations before, during, and after the procedure. Before diving into specifics, there is a common list of preparatory steps that must be taken:

Steps to Prepare for Any Extraction

- Pre-Op BP
- Ensure correct tooth is being extracted
- Check tooth condition
- Check radiograph
- Obtain informed consent
- Ensure patient is seated comfortably
- Sufficient anesthesia has been achieved
- Bite Block & Throat Screen

Factors Predicting Difficult Extractions

Below is a list of conditions that indicate a surgical extraction is necessary vs a simple extraction. Be able to recognize these clinical scenarios.

- Long and/or divergent roots
- Root dilacerations
- Dense bone & hypercementosis
- Root fracture
- Endo-treated tooth
- Proximity to the floor of the sinus or IAN
- Gross caries
- Bruxism causes a stronger PDL
- Severe crowding
- Exostoses or tori
- Limited opening

Simple Extractions

A simple extraction is when the tooth is removed with dental forceps; it typically **does not require an incision or sutures**, although a small number of each could be used. A surgical handpiece is never used, and a flap is not necessary. Below are the general steps of a simple extraction.

1. Severe Soft tissue Attachment

- ▶ The purpose of this step is to sever the gingival and PDL fibers attached to the tooth to prevent soft tissue tear during extraction
- ▶ Use a Woodson or #9 periosteal elevator
- ▶ Provides space for apical placement of forceps

2. Luxate Tooth with an Elevator

- ▶ **Luxate** = To Dislocate
- ▶ Using a **lever-type elevator**, place the **blade against the tooth** to be extracted and the **back of the blade against the alveolar crest** – avoid damaging the adjacent teeth
- ▶ Find a Purchase Point
 - **Purchase Point** = point between bone & tooth where you can feel resistance as you slowly twist elevator, so the blade turns occlusally (clockwise or counter clockwise) in a slow & controlled manner
- ▶ Socket wall should expand and PDL should tear at this stage

3. Deliver Tooth with Forceps

- ▶ **Slow** and **deliberate force** should be used instead of quick, jolting actions
- ▶ Care should be taken to expand the socket and loosen the tooth before removal is attempted
- ▶ There are **five different directions of pressure** that can be applied at this stage to help release the tooth
 - Outward (Buccal/Labial)
 - ◆ Initial movement for most permanent teeth
 - Inward (Lingual/palatal)
 - ◆ Initial movement of most primary teeth
 - Rotational
 - ◆ Initial movement in straight, **single-rooted** teeth
 - Apical
 - ◆ Applied to every tooth initially to grab the tooth as apically as possible
 - ◆ Avoid excessive apical pressure in maxillary molars → risk of displacement into maxillary sinus
 - Tractional
 - ◆ This is a straight pulling force that delivers the tooth from the socket

4. Post-Extraction Hygiene

- ▶ It is important to bend the bone back in place unless orthodontics or implants are in the treatment plan. This facilitates better healing since the bone was expanded during luxation.
- ▶ **"CSI" Protocol:**
 - Curettage socket to remove all soft tissue
 - Smooth bone with bone file or rongeur
 - Irrigate with sterile saline

Considerations for Different Teeth

Understanding the general steps of a simple extraction is important; however, there are specific considerations for each type of tooth. The following list outlines the specific details on simple extractions for specific teeth.

Upper Incisors & Canines

- Forceps need to be seated as far apically as possible for the best grip on the tooth
- **Initial luxation with labial force** and hold for a couple of seconds
- Then, apply force **lingually** and hold
- Rotational forces may be used
- Tooth is **removed to the labial-incisal** with tractional force
- Canine's **longer roots** and the **canine eminence** make them more difficult to extract than incisors

Upper First Premolars

- **Apply pressure buccally first** and then lingual pressure
- **Do not use any rotary force** to remove tooth because these teeth typically have two roots
- Rotary movement risks root fracture with teeth that have two or more roots.

Upper 2nd Premolars

- Apply pressure **buccally first** and then lingually
- You can use rotary force since they typically have only one root

Upper Molars

- Apply pressure **buccally first** and then lingually
- For upper molars, **pressure applied should favor the buccal direction** as the palatal root may be forced into the sinus with excessive palatal pressure

Lower Incisors & Canines

- Care needs to be taken while extracting these teeth as the bone is thin labially and lingually and can fracture easily
- Roots are less conical and circular, which require more buccal/lingual pressure and less rotary force
- Crowding is common in this area, which makes access difficult

Lower Premolars

- Conical and single roots of lower premolars make them easy to extract
- Rotational force can be used when appropriate

Lower Molars

- Multi-rooted and often possess divergent roots, which make them the **hardest to extract**
- Use **buccal to lingual pressure** and **no rotary pressure**

INBDE Pro Tip:

Rotational force should only be used with **single rooted teeth** with **conical root shapes**.

Surgical Extractions

Surgical extractions are more invasive than simple extractions, involving soft tissue flaps and bone removal. This section will review flap design, types of flaps, surgical handpieces, factors predicting difficulty of extraction, and tips for removing root tips.

Flaps

The purpose of a flap during a surgical extraction is to gain better access and visibility at the surgical site. When creating a flap, there are several guiding principles that must be followed:

- The blade should be placed at 90 degrees to the soft tissue and incisions should be made with a single, firm, continuous stroke
- The **base** of the flap needs to be **wider than the neck** to ensure proper blood supply and prevent flap ischemia and necrosis
- Incisions should always be over **intact bone**, never over bony defects, or eminences
- Avoid vital structures (nerves, arteries, papilla, etc)
- Place **flap margins 1-2mm away from the tooth** being working on

Mucoperiosteal (Full thickness) Flap

A mucoperiosteal flap involves the incision and reflection of both the mucosa and underlying periosteum, exposing the bone. There are three different types of mucoperiosteal flaps.

- **Enveloped** = 0 vertical releases, only sulcular incision
 - Difficult to reflect, minimum exposure, prone to tear due to increased tension
- **Three-Cornered** (Triangular/L-shaped) = 1 vertical release with sulcular incision
 - Easier to reflect, good exposure, not prone to tear due to decreased tension
- **Trapezoidal** = 2 vertical releases with sulcular incision
 - Easiest to reflect, best exposure, not prone to tear due to no tension

Semilunar Incision

This type of flap is placed apical to the mucogingival junction and is specifically for apicoectomies. This cannot be done on the maxillary palatal soft tissue as it is attached to underlying bone, preventing flap release.

Double “Y” Incision

This incision creates a flap for palatal torus removal. An incision is made down the midline of the hard palate and two “Y” shaped vertical releases are made at each end.

Using a Surgical Handpiece

The use of a surgical handpiece is a telltale sign of a surgical extraction. **If a surgical handpiece is used, the extraction is automatically surgical.** In general, there are three utilities of a surgical handpiece for extractions

- Removal of buccal bone
 - Makes elevator placement easier through creating a trough between the tooth and cortical bone – be aware this can create a deficiency especially in the aesthetic zone
- Removal of interradicular bone
 - Makes tooth removal easier by moving the center of resistance apically
- Sectioning teeth
 - Sectioning Lower Molars
 - Surgical bur splits tooth in half
 - Insert the elevator to complete the break
 - Remove each half separately
 - Sectioning Upper Molars
 - Split the tooth into three sections with surgical burr
 - Extract each piece separately

Removing Root Tips

A common occurrence during a surgical extraction is fracture of the tooth that leaves a root tip in the socket. Below are techniques to remove retained root tips. Do not forget to carry out the “CSI” protocol after removing the root tip.

- Use a root tip pick to pry out the root tip
- Osteotomy of buccal bone to allow for facial elevation
- Create a bone window apically and push the root out

Important Miscellaneous Facts

The following are highly tested facts related to oral surgery. Be sure to learn and understand these concepts.

- To assess the position of tooth radiographically using **SLOB (Same Lingual Opposite Buccal)** or **BAMA (Buccal Always Moves Away)** rule.
- Wait to perform elective extractions until **6 months** after Coronary Artery Bypass Surgery
- If a tooth is swallowed or lost in the oropharynx, **refer to ER** for chest and abdominal x-rays.
- Teeth within the line of a jaw fracture can be salvaged. However, it cannot interfere with reduction of the fractured bone segments
- **Osteoradionecrosis** can occur when performing an extraction on an area previously exposed to **Radiation Therapy**
- Recommended order for extractions
 - **Maxillary → Mandibular Posteriors → Mandibular Anteriors**

3 Implants

Indications & Contraindications

The following is a list of indications and contraindications for implants. Keep in mind, these contraindications are relative and should serve as markers for referral to an oral surgeon. You will notice that many of the contraindications for implants and extractions are the same.

Indications	Contraindications
Replace a single missing tooth	Uncontrolled diabetes: high risk of infection
Abutment for a bridge	IV Bisphosphonates: Increases the risk of osteonecrosis of the jaw
Implant supported dentures	Head & Neck Radiation Hyperbaric oxygen pre & post-op can help mitigate against osteonecrosis of the jaw
	Immunocompromised patients: high risk of infection
	Bruxism
	Smoking: poor healing and osteointegration
	Cleft palate
	Low bone volume and/or height
	Adolescences: patient not done growing, so the implant can migrate as bone grows
	Recent heart attack or stroke (within the past 6 months)
	Pregnancy: delay implant placement until post delivery

INBDE Pro Tip:

Old age is NOT a contraindication for implants. While special considerations should be taken with older patients, they can still receive strong, effective implants.

Types of Implants**Subperiosteal**

Subperiosteal implants are not placed inside bone. Rather, they are anchored directly underneath the periosteum. Only fibrous integration occurs and no osteointegration occurs. Generally, these implants are **weak and have poor outcomes**. Hence, they are rarely used today.

Transosteal

Placement of transosteal implants occurs extra-orally and are therefore only used to restore mandibular anteriors. To place this type of implant, the operator must drill through the inferior border of the mandible and into the oral mucosa. Due to a low success rate and invasive nature, transosteal implants are rarely used.

- **Primary indication** = atrophic mandible

Endosteal

Endosteal implants are the most used implant today. They are placed inside the bone and are delivered intraorally. The following information about implants is primarily applicable to endosteal implants.

Implant Components

Endosteal implants are comprised of four main components: **Implant Body, Abutment, Abutment Screw, and Implant Crown**. Below are the high yield details for each component for the INDBE.

Implant Body

This part of the implant is also called the implant or fixture. It is the component that is placed into bone and acts as the foundation for the entire apparatus. Implant surgery is required to place the implant body into bone, which involves drilling subsequently larger holes into the bone until the body tightly fits. This sequential technique provides three main benefits:

- Heat control
- Create appropriate axis for free hand placement
- Allow for angle adjustments as needed

Typically, threading is created in the bone during this drilling process for the implant body to screw in. These are called **Tapped Holes**. Some implant bodies are **Self-Tapping**, which mean they drill threads into the bone while being placed.

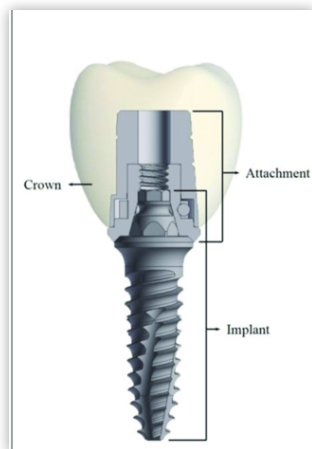


Figure 3.01 Body of implant

INBDE Pro Tip:

Know the difference between self-tapping and non-self-tapping implant bodies.

Abutment & Screw

The abutment is the part of the implant that is placed into the body. Just like an abutment for a fixed partial denture, this component is where the restoration is placed. There are two types of abutments: One-Piece & Two-Piece

One Piece

- Abutment screw and the abutment are a single unit
- There is no anti-rotational component

Two-Piece

- Abutment screw and abutment are separate
- Has an anti-rotational component
- More commonly used

The **Anti-Rotational Component** of an implant serves to prevent rotation of the abutment and provides stabilization. There are two types of anti-rotational components: internal and external hex. **Only two-piece abutments have anti-rotational components.**

Implant Crown

This is the restoration that is placed on the abutment. Below are the various types of implant crowns.

Screw Retained

- A screw is placed through the implant and crown, making it a two-piece abutment
- Con: **presence of a screw access hole**
 - Usually located in the **central fossa for posteriors** and **cingulum in anteriors**
 - Can pose an aesthetic problem if poor implant angulation resulting in buccally inclined implant in aesthetic zone
- Pro:
 - Can be removed for cleaning or replacement without sectioning
 - No cement

Cement Retained

- The abutment is attached to the implant via cement
- Better for aesthetics zones since there **is no screw access hole**
- Must be sectioned to be removed
- Cement cannot be left sub-gingivally as this could lead to **peri-implantitis**

INBDE Pro Tip:

For cement retained implant crowns, take a **periapical radiograph** after cementation to detect any cement that may have been left behind

Integration & Stability

Implant success is highly dependent on integration and stability. **Integration** refers to the implant binding to soft or hard tissue.

Stability refers to how well the implant can resist movement.

Integration

Osseointegration is the **ideal form of integration** to maximize implant success.

Osteointegration occurs when surface of the implant is directly connected to the living bone and this is confirmed histologically.

Fibrous integration occurs when the surface of the implant is in direct contact with connective tissue and not bone. The presence of fibrous integration means **osseointegration has failed**, and the probability of implant failure is higher.

Stability

Just as with integration, there are two types of stability: primary & secondary stability. The overall stability of the implant is determined by the sum of the primary and secondary stability.

Primary Stability

Primary stability refers to how the implant stays in the bone immediately after surgery. This form of stability is **mechanical** and is dependent on the quality of threading from bone tapping. Primary stability is essential for limiting implant movement and achieving osseointegration. If poor primary stability is observed after implant placement, a two-stage implant surgery is indicated. Primary stability peaks at implant placement and decreases during the following weeks as some level of bone necrosis & osteoclastic activity occur due to trauma by implant placement.

Secondary Stability

Secondary stability occurs when there is **osseointegration of the implant to the bone**. The quality of this type of stability predicts the long-term health and success of the implant. Secondary stability becomes the main stabilizing force as primary stability decreases over time

INBDE Pro Tip:

Secondary stability can **only** occur with osseointegration. Fibrous integration can **never** result in secondary stability

Bone Quality

Bone quality is an important factor to consider when planning for an implant. Placing an implant in weak bone will severely hinder implant success. Below are the four classifications of bone and their respective locations in the Oro-facial complex.

• **Type I**

- Dense cortical bone - Hardest & densest type of bone
- Great cortical anchorage but Less vasculature, which results in longer healing timelines (5 months)
- Location: Anterior Mandible

- **Type II**
 - Core of dense trabecular bone surrounded by thick cortical bone
 - Softer than type I
 - Shorter healing timeline than type I (4 months)
 - Location: Posterior Mandible
- **Type III**
 - Core of trabecular bone surrounded by thin cortical bone
 - 6 months of healing time
 - Location: Anterior Maxilla
- **Type IV**
 - Low density trabecular bone with surrounded by almost no cortical bone
 - 8 months of healing time
 - Location: Posterior Maxilla

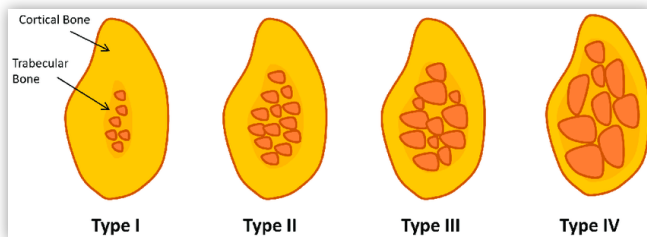


Figure 3.02 Types of bone quality

INBDE Pro Tip:

Know that for placing implants, Type II bone is the best.

Implant Placement

The entirety of this section is important and will be on the INDBE. The amount of bone available needs to be measured to ensure proper space and support for the implant before placement. There are minimum amounts of bone needed in between the implant and a certain landmarks. Below are the specific minimum bone requirements.

- Buccal & Lingual Plate = 1mm
- Maxillary sinus = 1mm
- Nasal cavity = 1mm
- Inferior Border of the Mandible = 1mm
- IAN = 2mm
- Adjacent Implant = 3mm
- Adjacent teeth = 1.5mm
- Mental Nerve = 5mm

This information will be tested with in the context of a case. For example, a question may asked, "if you were If you were placing a 3mm diameter implant in the posterior mandible, what is the minimum buccal-lingual space needed to place the implant."

- Answer: **3mm of implant + 1mm for buccal plate + 1mm for lingual plate = 5mm needed total**

Socket Preservation

Socket preservation typically occurs after an extraction to maintain the height and width of the alveolar ridge for future implant placement. The main requirement for this procedure is an atraumatic extraction, i.e. no breakage of the buccal plate and trauma is limited to the extraction area. The following are the steps of pocket preservation:

- Irrigate extraction site
- Remove granulation tissue
- Place graft
- Cover with resorbable collagen membrane
- Primary closure is not needed

Remember, **disease control always comes first**. If a periodontitis patient presents with a hopeless teeth & resorbed buccal bone & soft tissue recession, treatment is extraction **without** socket preservation as often there is no socket to preserve. If the same patient desires for an implant, **let the extraction site heal** and plan for ridge augmentation or guided bone regeneration.

Biologic Width of Implant

In the periodontal notes, you learned about biological width. Implants possess a biological width that differs from a normal tooth. First, it is important to remember that cementum and PDL is not present because the implant directly attaches to bone. However, some gingival fibers do connect to the implant cuff and are oriented **parallel to that cuff**. Finally, the part of the implant that interfaces with bone is rough to allow for better osteointegration, but the surface that interfaces with soft tissue is smooth.

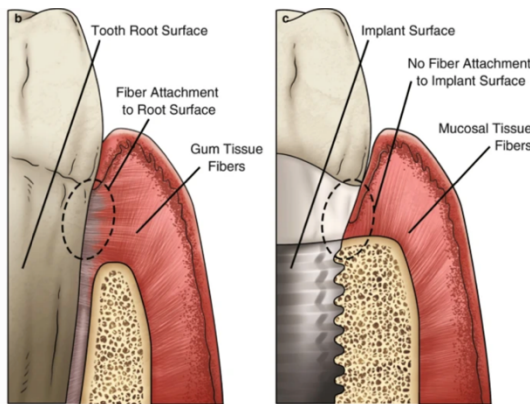


Figure 3.03 Biological width of implant

Surgical Stents

Surgical stents are devices used to help guide implant surgery for proper placement. Often, the radiographic stent can be modified into the surgical stent. There are three dimensions these stents can aid with: **Location**, **Angulation**, and **Depth**.

INBDE Pro Tip:

Use the acronym "LAD" to help remember **Location, Angulation, and Depth** as the dimension's surgical stents aid.

One vs Two-Stage Surgery

Implant surgery can take place in either one or two stages. The following are high yield information for each stage.

One Stage

- Only one surgery is needed to place the implant
- The implant and healing abutment is placed in one visit
- The healing abutment is not covered by soft tissue and is exposed to the oral cavity
- The restoration can be place at the next visit once the healing abutment is removed

Two Stage

- Two surgeries are needed for two stage implants
- During the first surgery, the implant is placed with a cover screw and covered with soft tissue
- At the second surgery, the implant is re-exposed, and the healing abutment is placed
- The following are reasons to do a two-stage surgery over a one stage
 - ▶ If the implant has poor primary stability, covering the implant from occlusal forces could preserve it until it gains secondary stability
 - ▶ Required if placing a graft
 - ▶ Primary closure is best for medically comprised patients to decrease risk of infection

Implant Success vs. Failure

There are several conditions that are clear indications of success or failure for implants. Understand these conditions and be able to recognize them for the INDBE.

Success:

- Immobility
- No peri-implant radiolucency
- Less than 0.2mm vertical bone loss annually following the first year of implant function
- No pain post-surgery

Failure:

- Absence of all the above conditions for success
- Large concentration of gram-negative anaerobic rods & filaments
- Inappropriate temperatures
 - Exposing the implant to 47C for 1 minute or 40C for 7 minutes is enough to compromise osseointegration

Peri-implant Mucositis

Reversible soft tissue inflammation surrounding implant

Risk factors

- Plaque
- Smoking

Treatment

- Professional mechanical debridement
- Subgingival CHX irrigation
- Self-performed OH (toothbrush + toothpaste for mechanical plaque control) with CHX rinse

Peri-implantitis

Inflammatory reaction involving soft and hard tissues resulting in loss of alveolar bone surrounding the implant

Risk factors

- History of periodontitis
- Poor plaque control and lack of regular maintenance

Diagnosis

- Presence of BOP or suppuration on probing
- PD increased compared to previous exam OR $\geq 6\text{mm}$ if no previous record
- Further bone loss after initial bone remodeling OR bone level $\geq 3\text{mm}$ apical of most coronal portion of implant if no previous record

Treatment:

- Remove the failed implant, debride socket +/- bone graft with a resorbable membrane

INBDE Pro Tip:

Understand the difference between Peri-implant mucositis & Peri-implantitis

4 Trauma & Orthognathic Surgery

Trauma Surgery

Be familiar with the following types of trauma surgeries:

- **Reduction** = Fracture fragments are returned to their normal position
- **Opened Reduction** = Surgical dissection of tissues to expose fracture fragments
- **Closed Reduction** = Manipulation of fracture fragments without surgical exposure
- **Internal Fixation** = Use of titanium bone plates to hold bone together
- **Inter-Maxillary Fixation/Maxillomandibular Fixation** = Wiring jaws closed, arch-bars, and elastics

Maxillofacial Fractures

There are two important types of fractures to be familiar with for the INDBE: **Mandibular & Midface fractures**.

Mandibular Fracture

Fractures of the mandible are most frequently **caused by trauma to the jaw** and should be evaluated with a **panoramic radiograph**. The following regions of the jaw are listed from most to least likely to be fractured. Be sure to memorize this order!

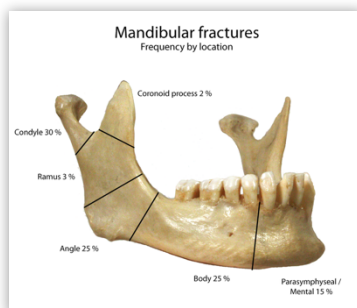


Figure 4.01 Mandibular fractures

1. **Condylar**: This is the most common location for fracture due to its small size and location in the glenoid fossa. A condylar fracture is characterized by a shortened ramus on the affected side, This will cause deviation of the mandible to the affected side
2. **Angle**
3. **Symphysis**

INBDE Pro Tip:

Trauma to the parasymphyseal region of the mandible can cause a fracture on the contralateral side, particularly the subcondylar region.

The following are five different classifications of **mandibular fractures** to learn.

- **Simple** = Fracture is closed to oral cavity
- **Compound** = Fracture communicates with the external environment. Infection is a common complication.
- **Greenstick** = Fracture goes part way through the bone, with the other side bent. Most often seen in children
- **Comminuted** = Fracture of bone into multiple pieces
- **Pathologic** = Fracture at a site weakened due to previous disease

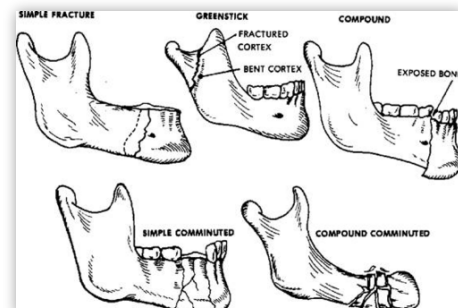


Figure 4.02 Five classifications of mandibular fractures

Treatment

- Closed reduction/maxillomandibular fixation (MMF)
- External fixation
- Open reduction and internal fixation

INBDE Pro Tip:

Mandibular fractures are ideally treated with **open reduction and internal fixation (ORIF)**.

Midface Fracture

These fractures are much more serious than mandibular fractures and require **CBCT radiographs** for proper evaluation. Midface fractures are classified via the Le Fort classification system, which differentiates these fractures into three groups:

- **Le Fort I** = Horizontal fracture across the midface
 - Maxilla is mobile with intact nasofrontal complex
- **Le Fort II** = Pyramidal Fracture
 - Maxilla is mobile with mobile nasofrontal complex
- **Le Fort III** = Complete craniofacial disjunction
 - Maxilla is mobile with mobile nasofrontal complex and malar processes

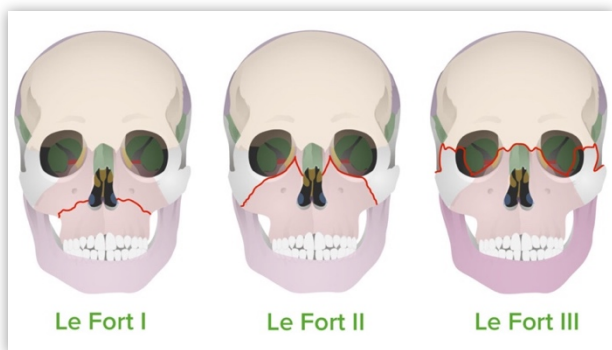


Figure 4.03 Midface fractures

In addition to Le Fort fractures, it is important to understand **Zygomaticomaxillary Complex Fractures**. These were formerly known as a tripod fracture and are caused by **trauma to the malar eminence**. A distinctive feature of this fracture is **bleeding under conjunctiva**. The three regions involved with this fracture are:

- Lateral orbit
- Zygoma
- Maxilla

Orthognathic Surgery

The purpose of orthognathic surgery is to correct severe **skeletal discrepancies** by manipulating the upper and/or lower jaw.

Skeletal Discrepancies

The follow are skeletal discrepancy terms you should be familiar with for the INDBE:

- **Retrognathic mandible** = Class II
- **Prognathic mandible** = Class III
- **Apertognathic** = Anterior open bite
- **Vertical Maxillary Excess** = Maxilla is too long with the presentation of a gummy smile
- **Horizontal Transverse Discrepancy** = posterior crossbite
- **Macrogenia** = enlarged chin
- **Microgenia** = small chin

Treatment

For orthognathic surgery treatment planning, **lateral cephalometric radiographs** are the standard radiographical record. Below are the types of surgeries that would be completed to achieve the following goals:

- Move maxilla → Le Fort I Osteotomy
- Move Mandible → BSSO
- Move the chin → Genioplasty

Le Fort I Osteotomy

A Le Fort I fracture is created to advance the maxilla forward. It is particularly useful to fix a retrusive maxilla or vertical maxillary excess.

Bilateral Sagittal Split Osteotomy (BSSO)

A cut is made on each side of the mandible above the IAN to allow for manipulation of the mandible without disruption to condyle position. This surgery is useful for correcting retrusive or protrusive mandibles. The most common post-op complication is **nerve damage to the IAN**.

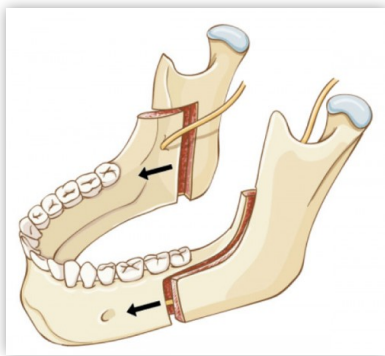


Figure 4.04 BSSO

INBDE Pro Tip:

Correcting class III malocclusions surgically involve different surgeries depending on the presentation:

- Retrusive Maxilla = Le Fort I
- Protrusive Mandible = BSSO
- Both = BSSO & Le Fort I

Distraction Osteogenesis (DO)

This surgery done to lengthen bone through creating an artificial suture to allow for bone deposition. The artificial suture is gradually separated, allowing bone to fill in with each extension. It is important to note this procedure only lengthens bone, **no width is gained**. There are three phases to DO

- **Phase I = Osteotomy** is completed
- **Phase II = Latency** period where appliance is mounted to bone on both sides of the cut. Appliance is not activated for 1 week.
- **Phase III = Distraction** phase where the appliance is activated to separate the bone at the osteotomy site. Bone fills in the gap

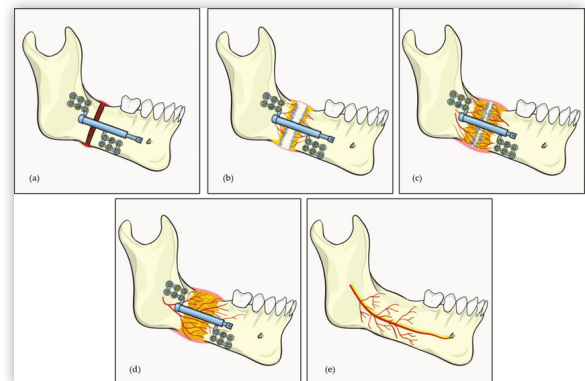


Figure 4.05 Distraction osteogenesis

5 Orofacial Pain

Biopsychosocial Model of Pain

This model of pain is comprised of two parts:

Axis I	Axis II
"Bio" part of biopsychosocial	"Psychosocial" part of biopsychosocial
Involves nociceptive input from somatic tissue	Involves the interaction between the thalamus, cortex, and limbic structures
Responsible for acute pain	Responsible for chronic pain

Pain Pathway

This pathway is the way nociceptive stimuli travel from the site of detection to conscious perception. Each step is listed in sequential order.

1. **Transduction** = Pain information travels from PNS to CNS
2. **Transmission** = Information travels from CNS to higher cortical centers and thalamus
3. **Modulation** = Altering the flow of the pain. Mostly limitation of pain.
4. **Perception** = Subjective experience of pain that is an amalgamation of the above physiological processes with psychological factors.

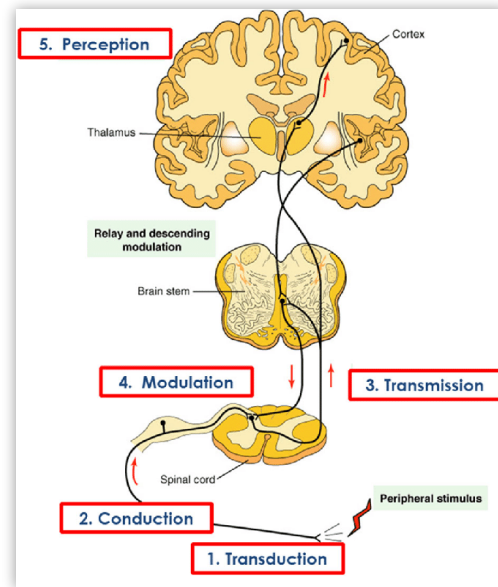


Figure 5.01 Pain pathway

There are four types of pain that can be transmitted through this **pain pathway**:

- Somatic pain
- Neuropathic pain
- Psychogenic pain
- Atypical pain.

Painful stimulus is carried to the brain by either **Aδ fibers** or **C fibers**

- **Aδ fibers** – sense mechanoreceptive pain, localized, fast (due to myelination); intense, acute pain
- **C fibers** – sense nociceptive pain, larger area, slow (no myelination); throbbing, chronic pain

Somatic Pain

Somatic pain is any kind of pain derived from the activation of pain receptors in tissues. This is the type of pain involved with day-to-day dental pain. In general, as you increase the stimulus causing the pain, the pain also increases, aka **stimulus-dependent pain**. For the orofacial complex, you can have somatic pain of musculoskeletal or visceral origins.

- **Musculoskeletal** = TMJ, periodontal tissues, muscles
- **Visceral** = Salivary glands, pulpal tissues

Myofascial Pain Syndrome (MPS)

MPS is a chronic muscular pain disorder. It is somatic in nature and is the **most common cause of masticatory pain**. Typically, the pain is diffuse through the preauricular region with the **muscles of mastication** being particularly sensitive. MPS is thought to be a stress-related disorder with pain can be exacerbated by parafunctional habits and muscle hyperactivity. Treatments include physical therapy, stress management, splint therapy, and medication.

Neuropathic Pain

Neuropathic pain is pain independent of stimuli, aka **stimuli-independent pain**. Therefore, perception of pain does not correlate to modulation of stimuli associated with the pain. There are several specific cases of neuropathic pain that are common to see clinically and important to know for the INDBE.

Trigeminal Neuralgia (TN)

TN, aka *tic douloureux*, involves pain along any branch of the trigeminal nerve (CN V). The quality of pain can be described as electric, sharp, and/or shooting. Typically, TN pain is **unilateral** and **episodic** with periods of refractoriness. Treatment of TN can involve **anticonvulsants like carbamazepine, tricyclic antidepressants like amitriptyline** and/or surgery for destruction of the sensory neuron.

Atypical Odontalgia (AO)

Directly translating to “not typical tooth pain,” AO involves pain at a site where part of the neural pathway was removed (i.e., RCT or extraction). This type of pain can be thought of as a “phantom toothache.”

Postherpetic Neuralgia (PN)

This type of pain often presents as a burning, aching, or shocking sensation. Commonly, PN results **from herpes zoster infection resulting in shingles**. However, it is important to note that this pain **does NOT result from herpes simplex virus**. Treatment involves anticonvulsants, antidepressants, or sympathetic blockers

Burning Mouth Syndrome (BMS)

BMS presents as it is named, a burning pain in the mouth often accompanied by dryness and potentially altered taste. It is more common in post-menopausal women and associated with type II diabetes, malnutrition, and xerostomia. There are two types:

- **Primary BMS** = Idiopathic burning sensation of oral mucosa; some research suggest it is the result of damage to nerves that regulate pain and taste
 - Treatment is largely supportive (sucking ice chips, drinking cold water);
 - can refer to MD for prescription of topical clonazepam or systemic anticonvulsant & antidepressant medications used in neuropathic pain management
- **Secondary BMS** = Caused by an underlying medical condition

Chronic Headache (CH)

CH's, aka neurovascular pain, have two types of presentations: migraines or tension type headaches.

- **Migraines:**
 - Presents as unilateral and pulsating headaches
 - Episodic
 - Accompanied by nausea and vomiting, both of which are exacerbated by light and sound (**photophobia & phonophobia**)
 - Tx: SSRIs (Triptan)

- **Tension Type:**

- Bilateral and non-pulsating in nature
- No aggravated by light, sound, or other routine activities
- Cluster = Intense pain near one eye

Psychogenic Pain

Pain associated with psychological disturbances. For example, strong emotions could prolong or exacerbate pain.

Atypical Pain

Facial pain of unknown cause and without a definitive diagnosis.

6 Temporomandibular Disorder (TMD)

TMD is a group of musculoskeletal & neuromuscular conditions involving TMJ, masticatory muscles, and associated tissue. This section will discuss various presentations of TMD and outline important anatomical information about the **temporomandibular joint (TMJ)**.

TMJ Anatomical Structures

Bony Anatomy

- Condyle
- Mandibular/Glenoid Fossa
- Articular Eminence
- Articular Disc
 - Lower Joint Space: responsible for **rotation**
 - Upper Joint Space: responsible for **translation**

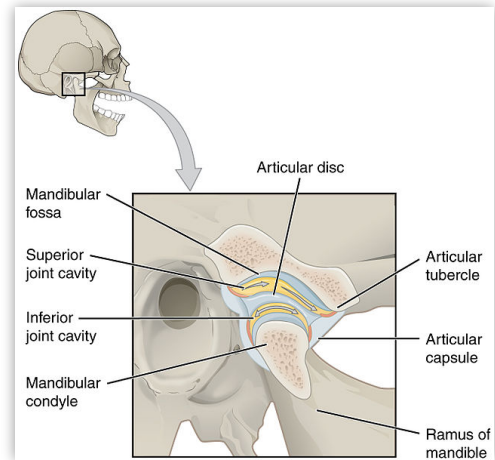


Figure 6.01 Bony anatomy of TMJ

Muscular Anatomy

Muscles of the TMJ move the mandible. Be sure to learn each muscle and the specific movement they are responsible for.

- **Lateral Pterygoid** → Anterior translation of mandible to prepare for opening
- **Masseter, Temporalis, Medial Pterygoid** → Closing the mouth

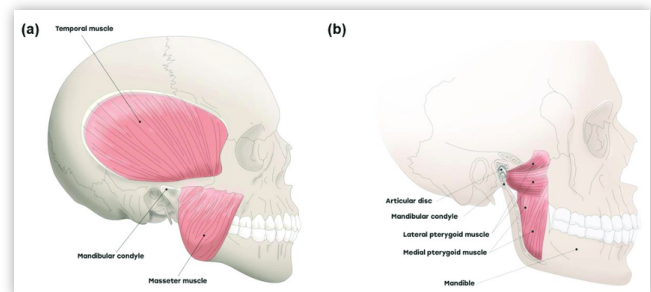


Figure 6.02 Muscular anatomy of TMJ

Ligaments

The function of ligaments in the TMJ is to limit the movement of the mandible. The following are the important ligaments to learn and their specific functions.

- **Capsular Ligament**
 - This ligament covers the TMJ space and protects the TMJ
 - If you were to surgically access the upper joint space, you would need to puncture this ligament
- **Discal/collateral Ligament**
 - Attaches to the medial and lateral poles of the condyles and keeps the disc attached to the condyle during movement
- **Posterior Ligament**
 - Attaches to both the articular disc and the back of the condyle
 - Function is to **prevent anterior disc displacement**
- **Lateral Ligament**
 - Wraps around condyle and attaches to articular disc
 - Prevents posterior and inferior disc displacement

Blood Supply

The TMJ is supplied by several arteries. An acronym to remember these arteries is **MADS**.

- M = Maxillary Artery
- A = Ascending Pharyngeal Artery
- D = Deep Auricular Artery
- S = Superficial Temporal Artery

Opening Patterns

There are two types of opening patterns to be familiar with for the INBDE: Deflection & Deviation.

- **Deflection** = The mandible is **stuck to one side at maximum opening**
 - The mandible **deflects towards the side that is stuck**
 - This is because the mandible can only rotate on that side and not translate
 - For example, if the **right condyle is stuck** in place, opening will **move to the right**
- **Deviation** = During opening, the mandible deviates to a side but **returns to the midline at maximum opening**
 - Deviation is a variation of normal
 - Sometimes presents with TMD, but not always
 - Clinically, pain and tenderness present **on the side where the deviation is located** upon palpation

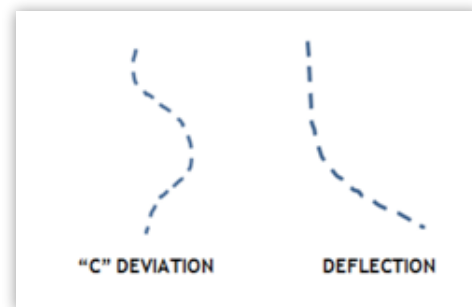


Figure 6.03 two types of opening patterns

INBDE Pro Tip:

There is no scientific evidence to suggest that occlusion is the etiology of TMJ disorders

Disc Displacements

Disc displacement refers to when the **articular disc is not in its anatomically normal position**. There are two types of displacement: with and without reduction.

- **Displacement With Reduction**
 - Patients will present with a clicking noise upon opening
 - The clicking occurs because the **condyle pops anteriorly over the displaced disc** and **pops when it returns to the fossa** (reciprocal clicking)
 - **The condyle can still move**
- **Displacement Without Reduction**
 - **The condyle is locked in place** behind the articular disc
 - Patient presents with a limited range of motion and ipsilateral movement upon opening
 - **The ipsilateral movement will occur towards the side with disc displacement**

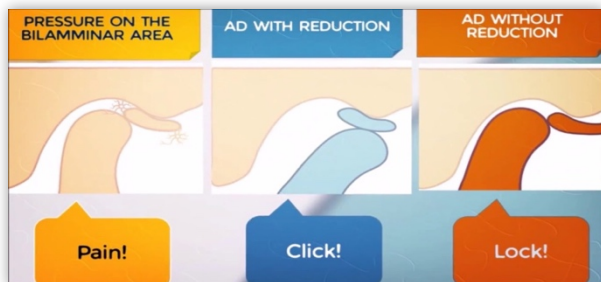


Figure 6.05 Disc displacement

Recurrent Dislocation

This form of dislocation occurs when the **condyle translates anterior to the articular eminence**. When this occurs, direct manipulation of the jaw downwards and backwards is required to put the condyle back in its proper anatomical place. Treatment for this condition includes Botox injections of the lateral pterygoid or surgery if it is chronic.

TMJ Clinical Exam

Below are the important steps for performing a TMJ clinical exam.

- Evaluate tenderness to palpation
- Palpate the lateral aspect of the joint while the patient opens and closes their mouth
- Palpate the posterior aspect of the mandibular condyle by palpating the anterior wall of the external auditory meatus
- Measure mandibular range of motion including vertical, lateral, and protrusive movements
- Assess clicking and crepitus for both joints

INBDE Pro Tip:

Clicking and crepitus does not always signal pathology, especially without pain.

Ankylosis

Ankylosis within the context of TMD occurs when the condyle and the skull are fused at the level of bone or ligament, severely limiting the mandible's range of motion. The most common cause of this condition is **trauma**, but other causes include local or systemic infection, systemic disease, surgery, and radiation therapy. Treatment for this condition is mostly surgical.

Bruxism

Bruxism is a condition involving severe clenching and grinding of the teeth. There are two types of bruxism, sleep & awake bruxism. Both types can present together. The primary cause of this condition is thought to be **stress**. The main treatment includes an occlusal guard to relax muscles and better distribute masticatory forces.

TMD Therapy

Non-surgical Therapy

Generally, there are five types of non-surgical therapies available in the treatment of TMD. Each are listed below in order from most conservative to most aggressive:

- **Counseling:** the goal of counseling is to stop any parafunctional habits that could be exacerbating TMD symptomology
 - Ex: Grinding teeth, biting nails, stress, etc.
- **Medication:** medications commonly prescribed to treat TMD include
 - NSAIDs
 - Steroids
 - Analgesics
 - Antidepressants
 - Muscle Relaxants
- **Physical Therapy (PT):** forms of PT for TMD include electrical nerve stimulation, massage, and thermal treatment
- **Occlusal Splint:** used to unload the joint
- **Arthrocentesis:** emptying the superior joint space with needles

Surgical Therapy

For the INDBE, be familiar with following five surgical therapies for TMD. Again, these are listed from most conservative to most aggressive.

- **Arthroscopy** = Instrumentation of the superior joint space with two cannulas
 - Allows for direct visualization of TMJ and injection of steroids
- **Arthroplasty** = Repositioning of the disc surgically
 - Indicated for chronic, painful clicking and closed lock
- **Discectomy** = Repairing or removing a severely damaged disc
- **Condylotomy** = Osteotomy of the vertical ramus to allow for soft tissue to reposition the condyle and disc into a more favorable position

Indications

- When conservative treatment fails to reduce symptoms
- Intra-articular pathology is causing symptoms
- Symptoms severely lower quality of life

INBDE Pro Tip:

The nerve most likely to be damaged during TMJ surgery is the **facial nerve**.

7 Biopsy Techniques

Biopsy Techniques

Cytology/Brush Biopsy

This technique involves scraping cells off a lesion with a kit brush. Cells removed are smeared on a glass slide to be fixed and analyzed. Ideally, cells are obtained from all epithelial layers (basal, intermediate, and superficial cells). Particularly useful for **large white patch on buccal mucosa** that wipes off. This technique is non-invasive and able to be performed by hygienists. However, there is a **high false positive rate**.

Indications

- Monitoring large areas of mucosal change for dysplastic changes (ex. herpes or pemphigus).

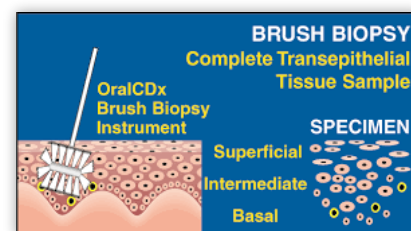


Figure 7.01 Cytology/Brush biopsy

Aspiration (Fine Needle Aspiration)

For aspiration, a **needle and syringe** are used to extract contents of a lesion and ascertain the identity of that fluid. This is often used to explore **radiolucent intraosseous lesions** (ex: odontogenic cyst, ameloblastoma) to determine malignancy and fluid filled lesions (except mucocoele). It is great for **distinguishing benign and malignant bone lesions**. Cannot be used for firm, calcifying lesions.

Excisional

This biopsy technique involves complete removal of a **small (<1cm) lesion**. Normal tissue should be included in the margins, specifically **2-3mm margins** of normal tissue in an **elliptical shape**.

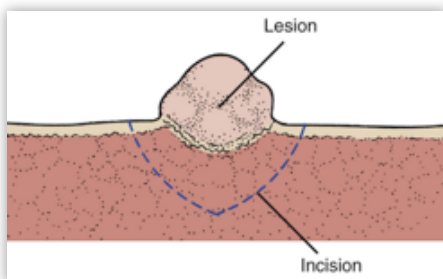


Figure 7.02 Excisional biopsy

Incisional

This biopsy technique is indicated for **large (>1cm) lesions that are suspected to be malignant or lesions in hazardous locations**. Only part of the lesion is removed for analysis. To complete, a **deep, narrow wedged incision** is created **down to healthy tissue** and a representative portion of the lesion is removed with some normal tissue around it. It is vital to **avoid necrotic tissue**.

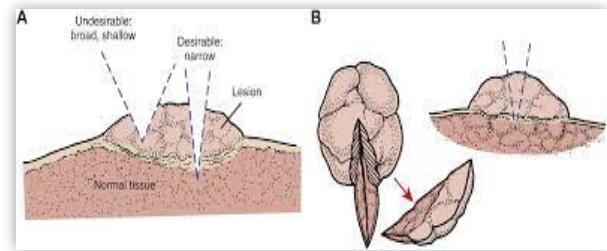


Figure 7.03 Incisional biopsy

Good Practices

- Block anesthesia is preferred over local infiltration as local can distort the lesion, making biopsy more difficult
 - ▶ If local infiltration is necessary, mark the borders of the lesion with a sharpie before administration of anesthetic and inject the anaesthetic at least 1cm away from the lesion
- Avoid handling biopsies directly as the cells can be crushed. Use tractional suture through the specimen or handle gently with fine tissue forceps.
- Samples are generally stored in **10% formalin solution** that is 20x the volume of the surgical specimen for delivery to an oral pathologist

Biopsy Indications

- Any lesion that persists for more than 2 weeks with no apparent etiology
- Any lesion with signs of malignancy
 - ▶ Rapidly changing or growing
- Brown or black pigmented lesions
- Lesion with associated tissue paresthesia

INBDE Pro Tip:

Biopsies are indicated after **2 weeks** of monitoring a lesion that does not go away.

8 Medical Emergencies

This section covers various medical emergencies seen in a dental setting. Be sure to understand each condition and how to manage a patient undergoing an emergency in the dental chair.

Cardiovascular Emergencies

Anticoagulation

Medical emergencies surrounding anticoagulation events, aka excessive bleeding, can be avoided through a thorough medical history. In the medical history, be sure to note any blood disorders, any anticoagulants that are being taken, and why. It is imperative to know these facts about a patient because the relevant coagulation test to assess the probability of an anticoagulation event is dependent on specific conditions and/or medications.

- **Complete Blood Count (CBC)** → Anemia, leukopenia, thrombocytopenia
- Bleeding time → Improper platelet function
- **Prothrombin Time (PT)** → Anticoagulant medications, liver damage, vitamin K deficiency
 - Tests the extrinsic clotting pathway
- **INR** → Patient on Warfarin/Coumadin
 - This is a standardized PT value calculated by normalizing PT results across all types of PT tests
 - Normal clotting = 1; < 1 = Increased clotting; > 1 = Increased bleeding
- **Partial Thromboplastin Time** → Heparin, renal dialysis, hemophilia
 - Tests the **intrinsic clotting pathway**

Angina

Angina is most simply understood as chest pain caused by **ischemia without necrosis**. Only assume dx of angina for chest pain if there is previous history of angina, **assume myocardial infarction if no history of angina present**. This chest pain occurs when the **coronary arteries are unable to provide enough blood to cardiac tissue**. There are two types of anginas: stable & unstable.

- **Stable Angina** = Angina caused by a stimulus like exercise. There is a repeatable pattern of onset.
- **Unstable Angina** = Chest pain that occurs at rest without a stimulus.

INBDE Pro Tip:

MI's involve ischemia **WITH** necrosis; angina involves ischemia **WITHOUT** necrosis

Treatment: check ABCs, Administration of 100% oxygen, nitroglycerin (NTG), and aspirin if no resolution

- **NTG (0.4mg sublingual tablet) administration protocol**
 - NTG → 5-minute wait → NTG → 5-minute wait → NTG
 - If no resolution → call 911 →
 - 160-325mg Aspirin chewed
 - NTG is contraindicated when systolic BP < 90mmHg or patient has recently used 5-PDE inhibitor (ex. Viagra)

INBDE Pro Tip:

Avoid NSAID & narcotics with asthma attacks.

Myocardial Infarction

MI's, aka heart attacks, occur when there is a sudden block of a major coronary vessel. Typically, the vessel blocked is the **left anterior descending artery**. MI are classified as **ischemia with necrosis** and are therefore more serious than episodes of angina.

Key Signs and Symptoms:

- Chest pain with tightness & pressure
- Levine's sign
- **Radiating** pain to the neck and left arm.

Treatment: Check ABCs → call 911 → ASA 160mg or 325mg → nitroglycerin (if systolic BP >90 & no 5-PDE inhibitor used recently) → analgesic with morphine (2mg IV or 5mg IM) or 50% Nitrous oxide

- Only administer 100% oxygen if indication present - pale, grey, or cyanotic patient

Respiratory Emergencies

Asthma

Generally, asthma is caused by the constriction and/or inflammation of the bronchioles. The classic sign for asthma is a high-pitched **wheeze on exhalation**.

Treatment: Administer emergency inhaler, typically **albuterol** (2 puffs, repeat prn) which relaxes the smooth muscle around the bronchioles. If no resolution, give Epi (0.3-0.5mg, 1:1000) IM, repeat q5min

Hyperventilation

Hyperventilation occurs when a patient has **too much oxygen and not enough CO₂**, causing quick and erratic breathing. Signs include light-headedness, dizziness, and weakness. Because of the physiologic state that causes this, **never give oxygen to a hyperventilating patient**.

Treatment: Sit patient upright and give a brown paper bag to breath into and inhale from to increase CO₂ concentrations in their blood.

Airway Obstruction

The common sign of an airway obstruction is hands wrapped around the throat. If a patient has an airway obstruction, the goal is to clear the pharynx of any obstruction.

How to Handle:

- Check for breathing
- Tilt the chin upward to extend the neck
- Open airway by protruding the mandible and tongue
- Encourage coughing, Heimlich maneuver
- If patient becomes unresponsive, perform CPR

INBDE Pro Tip:

DO NOT place a pregnant woman in the Trendelenburg position as the fetus can compress their inferior vena cava. Instead, lay them on their left side.

Anaphylactic Shock

This medical emergency is a severe allergic reaction. The best way to prevent this emergency is to take a thorough medical history before administering any treatment.

Treatment

- Check ABCs, call 911, 100% O₂
- Epi (0.3-0.5mg, 1:1000) IM repeat q5min
- Diphenhydramine 50mg IM
- Hydrocortisone 100mg IM (if available)

Neurological Emergencies

Syncope

Syncope, aka fainting, is the most common medical emergency in the dental chair. There are two types of syncope to be familiar with: Vasovagal Syncope & Orthostatic Hypotension.

- **Vasovagal Syncope**
 - Fainting due to needle anxiety
 - Most common form of syncope in the dental chair
- **Orthostatic Hypotension**
 - Fainting due to blood pressure falling after standing up quickly
 - Caused by a failure of the baroreceptor reflex to mediate peripheral vascular resistance
 - Second most common cause of syncope

Treatment: Place patient in a supine position with the patient's feet above their head, called the **Trendelenburg position**, give 100% oxygen.

Seizures

Seizures are uncontrollable electrical disturbances of the brain that can cause erratic movements. In general, the goal of seizure management in the dental office is to **protect from injury without restraint**. There are two general types of seizures to be familiar with: Grand Mal & Status Epilepticus.

- **Grand Mal Seizure**
 - Most common type of seizure with a tonic-clonic presentation
 - **Treatment** = Dilantin (Phenytoin)
- **Status Epilepticus**
 - Seizure that lasts more than five minutes
 - **Treatment** = Valium (Diazepam)

Stroke

Strokes occur when brain tissue does not receive an adequate amount of blood. Signs of a stroke are **facial droops, arm drifts, and slurred speech**. One cause of stroke to know for the INDBE is **hyponatremia**. Also be familiar with the difference between **transient ischemic accidents (TIA)** and **cerebrovascular accidents (CVAs)**. TIAs involve temporary presentation of stroke signs and symptoms, aka a mini-stroke, while CVAs are full strokes.

Treatment: Administer oxygen and call 911

Epinephrine Overdose

This emergency is **rare** and occurs when local anesthetic with epinephrine is injected rapidly into vasculature. Signs include a rise in heart rate and blood pressure with a noticeably strong heartbeat.

How to Avoid:

- Inject slowly
- Aspirate before injection to ensure you are not injecting directly into a blood vessel
- Calculate the appropriate amount of epinephrine for each patient

Diabetes/Hypoglycemia Hypoglycemia is another common medical condition to be aware of, especially for diabetic patients. Symptoms for hypoglycemia include:

- Sweating
- Pale appearance
- Irritability
- Sleepiness
- Hunger

Treatment: Treatment depends on if the hypoglycemic patient is conscious or unconscious.

- Conscious = Give glucose tab or juice
- Unconscious = IV dextrose or intramuscular glucagon (1mg)

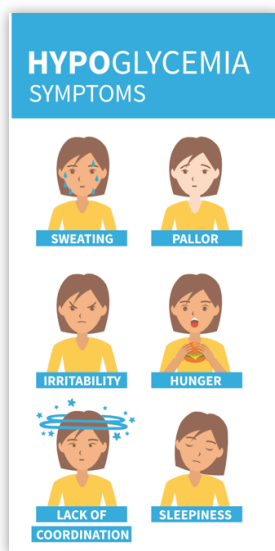


Figure 8.01 Symptoms of Hypoglycemia