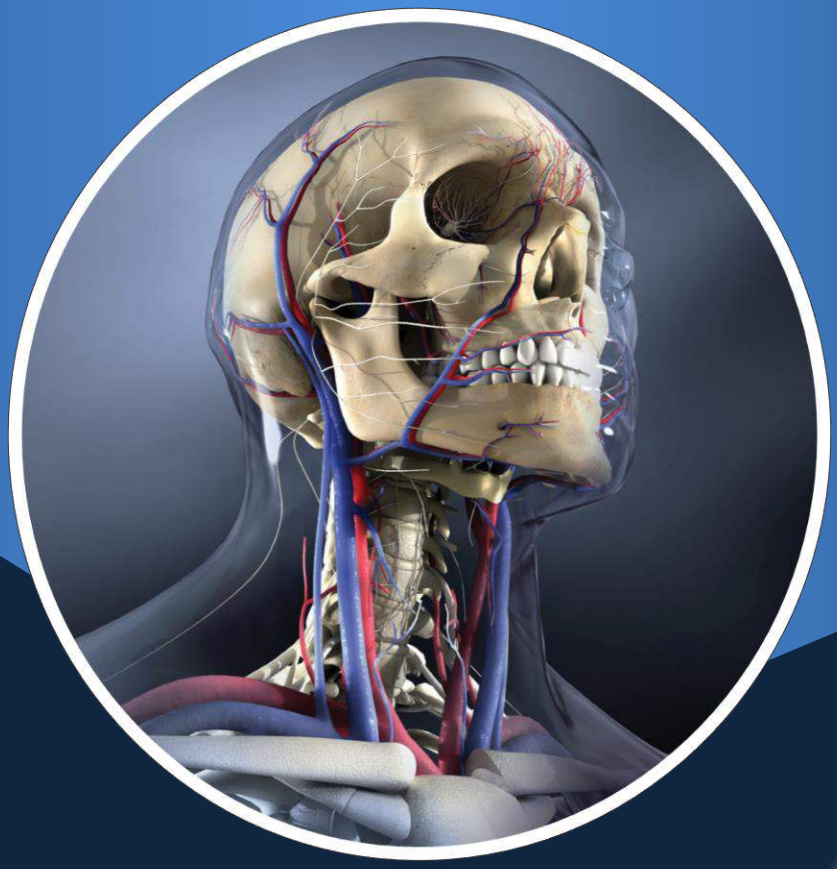
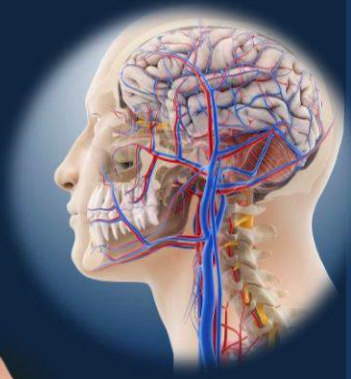


Oral Surgery

Third Stage







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Lecture 2

Instruments used in simple uncomplicated teeth extraction includes the followings:

- Diagnostic instruments: (Dental mirror, Probe, Tweezer in kidney dish).

- Dental forceps.

- Dental elevators.

The instrument required for extraction are selected, sterilized & placed in a sterile dish at the side of the patient.

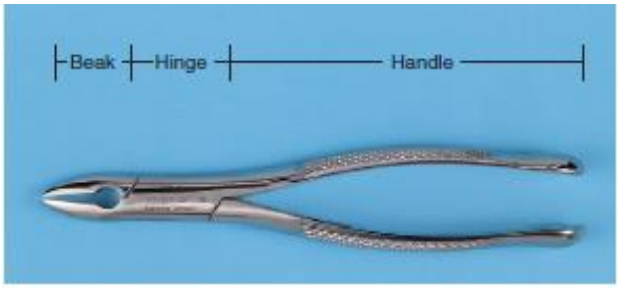
Dental forceps:

The most widely used instrument employed in extraction of the teeth are dental forceps. Dental forceps are designed in a large number of patterns & configuration which adapt to different teeth & techniques used to extract teeth. It is composed of three parts

1. Handle.

2. Hinge joint.

3. Blades (Beaks)



The more desirable properties & requirements of dental forceps are:

1. They must be made of strong metal so that it can resist the forces exerted during extraction movements.

2. It must be constructed of non -corrosive metal so that it can resist rusting during sterilization and autoclaving.

3. The handles of forceps should be serrated in order to prevent slippage & good grip during extraction movements. The handles must of such design so that they

can give the operator a chance to use maximum leverage force. Also it must be of suitable shape & size so that they can applied to area of extraction without injury to the opposing teeth & surrounding tissues.

4. The blades

The blades (beaks) are the source of the greatest variation among forceps.

- The beaks are designed to adapt to the root of the teeth at the junction of the crown & root & to adapt to the root surface & not to the crown. Also beaks designed for single rooted, two rooted, & three rooted teeth so that the tips of the blades will adapt closely to various root formation decreasing the chance for the root fracture.
- Other variation is the width of the beaks; some forceps are narrow (fine) & others are wider (heavy).
- The beaks of forceps are angled such that they can be placed parallel to the long axis of the tooth, with the handle in a comfortable position. Therefore, the beaks of maxillary forceps are usually parallel to the handles. Maxillary molar forceps are offset in a bayonet fashion to allow the operator to reach the posterior aspect of the mouth comfortably and yet keep the beaks parallel to the long axis of the tooth. The beaks of mandibular forceps are usually set perpendicular to the handles, which allows the surgeon to reach lower teeth and maintain a comfortable, controlled position.
- The edges of the blades is sharp enough so they cut through the periodontal fibers without causing injury to the gingiva.
- The blades should fit the surface of the extracted tooth. The space between the blades should be enough to accommodate the crown of the extracted tooth without making crushing of the crown.

5. The hinge joint:

Is that part of the dental forceps which transfers & concentrate the force applied to the handle of the dental forceps & then to the beaks. It is the part which connecting the handle to the beaks.

The joint must be:

- Beveled so that it will not cause pinching of the lip or injury to the lip.
- Heavy & strong to allow free movement without rocking.
- Lubricated with oil after sterilization to prevent rusting which lead to limitation & difficulty during application of the forceps blade to the tooth to be extracted.

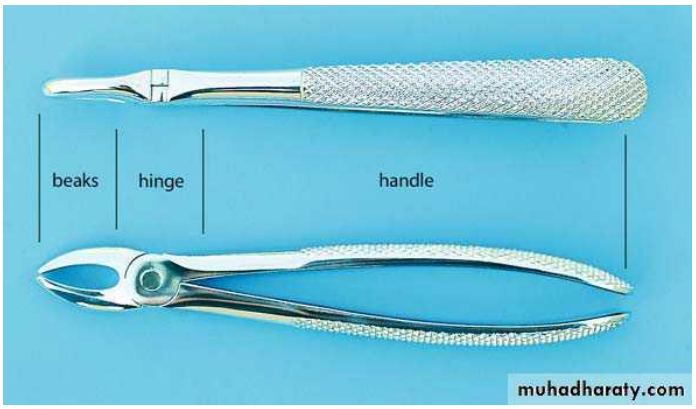
Types of Dental Forceps

The Forceps for Upper Teeth

1- The upper straight forceps: -

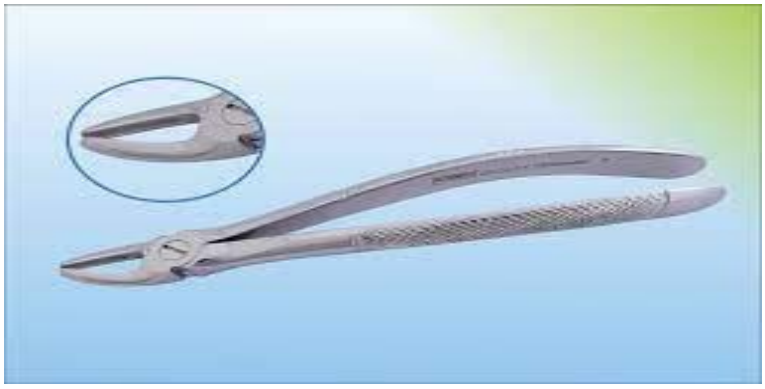
The blades, joint and handle are in one long straight line. We have two types, one with broad blades that is we call heavy blades and this is used for extraction of upper central incisors and upper canines, left and right.

The second type of straight forceps has narrow blades or we call it fine blades for extraction of upper lateral incisors (left and right) and upper anterior retained roots.



2- The upper premolar forceps: -

Here we have two bends in the design of the forceps, one where the beaks (blades) bend in relation to the joint of the forceps to apply the forceps parallel to long axis of premolar, the 2nd bend or curvature is of the handle to avoid injury to the lower lip and apposing teeth (mandibular). The upper premolars teeth have either one root or two roots (one buccal and one palatal), so there is no difference in the anatomy of the tooth root of the premolar on the buccal and palatal surface so the two blades of the premolars forceps are mirror image to each other.



3- The upper molar forceps: -

Since upper molar teeth have three roots, two buccal and one palatal, the blade of palatal side is round to conform or fit on palatal root, while blades on buccal has pointed tip or projection so it can enter or fit the bifurcation between the two buccal roots (mesial and distal) on the buccal side of the tooth. So we have two forceps; one for the right molars and one for the left molars and these forceps also double bend for the same requirement as mentioned for premolar teeth.



The Bayonet forceps, the blades of the forceps are offset to the long axis of the handles, used for extraction of upper 3rd molars right and left. In addition, there is another bayonet with fine curved blades for extraction of upper posterior roots.





-The Forceps of Lower Teeth; -

Here we have the long axis of the blades is in right angle to the long axis of the handle so the blades can be applied apical to the cemento-enamel junction (on the root) of the tooth surface parallel to the long axis of the tooth and the handle not to cause injury to the upper lip. The forceps for the lower teeth are: -

1- Forceps for extraction of lower central and lateral incisors and canine:

We have fine blades for extraction of the lower central and lateral incisors and lower anterior retained roots which have fine roots with flattened sides (mesiodistally) and heavy blades used for extraction of canines.



2- Lower Premolar forceps:

Because the bucco-lingual width of the crown in the premolar teeth is larger than that of lower incisors and canines we use forceps with heavy blades but partially away from each other when close to accommodate the crowns of these teeth without crushing for the crown.



3- Lower molar forceps:

Since the lower molar teeth have two roots, one mesial and one distal root so the buccal and lingual blades of the forceps designed with projected tapered tip to fit the bifurcation of these teeth on the buccal and lingual sides, so the buccal and lingual blades are identical so the same forceps can be used on the right and left sides on opposite to that in upper molar teeth.



4- Cowhorn forceps

These instruments are designed with two pointed, heavy beaks that enter the bifurcation of lower molars. After the forceps are seated into the correct position, usually while gently pumping the handles up and down, the tooth is actually elevated by squeezing the handles of the forceps together tightly. As the beaks are squeezed into the bifurcation, they use the buccal and lingual cortical plates as fulcrums, and the tooth can be literally squeezed out of the socket. As with the English style of forceps, improper use of the cowhorn forceps can result in an increase in the incidence of untoward effects such as fractures of alveolar bone or damage to maxillary teeth if the forceps are not properly controlled by the surgeon as the molar exits the socket. The beginning surgeon should, therefore, use the cowhorn forceps with caution.



Physics forceps:

The Physics Forceps uses first-class lever mechanics. One handle of the device is connected to a "bumper," which acts as a fulcrum during the extraction and stabilizes the beak during wrist movements. The beak of the extractor is positioned most often on the lingual or palatal root of the tooth and into the gingival sulcus

The bumper is most often placed on the facial aspect of the dental alveolus, typically at the mucogingival junction. Unlike conventional forceps, only one point of contact is made on the tooth being extracted. No squeezing pressure is applied to the handles or to the tooth. Instead, the handles (once in position) are rotated as one unit for a few degrees, and then the action is stopped for approximately 1 minute. The torque force generated on the tooth, periodontal ligament, and bone is related to the length of the handle to the bumper (8 cm), divided by the distance from the bumper to the forceps beak (1 cm). As a result, a force on the handle connected to the bumper will increase the force on the tooth, periodontal ligament, and bone by 8 times. No force is required to be placed on the beak, which is only on the lingual aspect of the tooth root. Therefore, the tooth does not split, crush or fracture.



Mechanical principles of extraction: -

I-Expansion of the bony socket: -

This is achieved by using the tooth itself as a dilating instrument, and this is the most important factor in forceps extraction, and this principle need: -

1- Sufficient tooth substance be present to be firmly grasped by the forceps.

2- The root pattern of the tooth in such that it is possible to dilate the socket to permit the complete dislocation of the tooth from its socket, e.g. dilacerated, divergent, converge roots.

3- Nature of the bone, elastic bone especially in young patients is maximal and decreased with age, older patients usually have denser, more highly calcified bone that is less likely to provide adequate expansion during extraction of the teeth.

4- Thickness of the bone. Thick bone expansion is less likely to occur by using normal force.

II- The use of a lever and fulcrum

This is used to force a tooth or root out of the socket along the path of least resistance and the principle is the basic factor governing the use of elevators to extract teeth or roots

III-The insertion of a wedge or wedges: -

Between the tooth-root and the bony socket wall, thus causing the tooth to rise in its socket and this explains why some conically rooted mandibular premolar and molars sometimes shoot out of their socket when forceps blades are applied to it.

Elevators

Are exo-levers, instrument designed to elevate or luxate the teeth or roots from their bony socket in close or surgical method of extraction to force a tooth or root along the line of withdrawal.

Line of withdrawal: -

Is the path along which the tooth or root will move out of its socket when minimal force is applied to it, and this line is primarily determined by root pattern (long axis of the tooth)?

Point of application: -

Is the site on the root at which force must be applied to effect delivery, it is determined by the line- of withdrawal. We have buccal point of application, distal point of application, and mesial point of application.

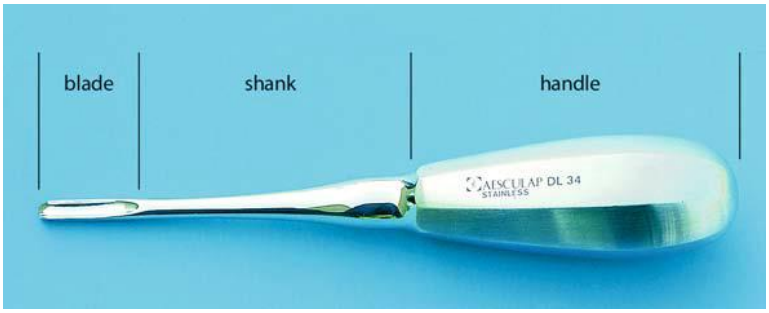
Parts of elevators: -

All elevators have the following parts: -

I-**Handle**: The handle of the elevator is usually of generous size, so it can be held comfortably in the hand to apply substantial, but controlled, force. The application of specifically applied force is critical in the proper use of dental elevators. This maybe a continuation of shank or at right angle to it.

II- **Shank**. The shank of the elevator simply connects the handle to the working end, or blade, of the elevator. The shank is generally of substantial size and is strong enough to transmit the force from the handle to the blade.

Ill- **Blade**: This part engages the crown or root and transmit force to the tooth, bone or both. The working side of the blade is either concave or flat. Always the concave surface of the working blade against the root or tooth.



Mechanical principles of uses of elevators: -

The work principles as applied to the use of elevators maybe that of: -

1- Lever principle.

2- Wedge principle.

3- Wheel and axle principle.

4- Combination of these principles.

Clinical uses of elevators: -

1- Elevators are used to luxate and remove teeth which cannot be engaged or grasped by the beaks of forceps (e.g. impacted teeth, malposed teeth), also badly carious teeth, and teeth with heavy filling.

2- To remove old roots and fractured roots and sectioned roots.

3- To loosen teeth prior to use of forceps.

4- To split teeth which have had grooves cut in them, as in separation of roots.

5- To remove small amounts of bone to create point of application for the beaks of forceps, or removal of interseptal bone.

6- Any tooth resisting normal extraction force by extracting forceps.

Elevators commonly used

There are so many elevators available but few are widely used because of their efficiency.

1-straight elevator: -

Elevator in which the blade, shank, and the handle are straight. The working blade or end is blind and round, there are many types and sizes of straight elevators.



2-Coupland's chisel (elevator):

It is similar to straight elevator but the working end is sharp and straight cut, used for chiselling of bone to create point of application or to split of teeth. It's of different sizes, size 1, size 2, size 3, depending on the width of the working end.



3-Cryer's elevators: -

In this type the working blades are sharp, pointed and triangular in shape just like a claw, forming an angle with the shank of the elevators. These are pair instrument mesial and distal (right & left) designed to fit the root surface on mesial and distal surface. It's mostly used for removal of retained root of the lower molar and for elevation for impacted teeth after surgical exposure of the bifurcation of the tooth.



4- Winter's elevator: -

In which the working end is the same that of Cryer's elevator but the handle is in right angle to the shank so it is called winter's (T-bar) cross-bar handle elevator. Winter's elevators are very powerful and great force may be applied or generated (sufficient to fracture the mandible) so the use of this elevator should be with great care to avoid fracture of the jaw.



5- Apexo elevators: -

The working blade is long, the margins are sharp, we have 3 Apexo, 2 angled and 1 straight (mesial, distal, straight). The blade forming an angle with the shank, this elevator is used mainly for removal of apical fragments of root deeply present in the socket of the lower jaw especially morals. We push it between the socket and the root to loosen the fractured tip and remove it from the socket.



6-War-wick James elevators: -

It is a light duty elevator. It's like Cryer's elevator, also we have two angled (mesial and distal) and one straight. The blade is short and the end is rounded and the handle is flattened, it's used for extraction of retained roots, deciduous teeth, anterior lower teeth extraction, and where there is less resistance area. e.g. extraction of upper wisdom tooth.



Guiding principles for use of elevators: -

The following rules should be observed when using elevators in general: -

1-Never use an adjacent tooth as a fulcrum, unless that tooth to be extracted itself in the same visit, and the fulcrum should always be bony one (alveolar bone).

2- An elevator should always be supported to avoid slippage and injury to the patient.

3- Avoid the use of excessive force if the tooth/root is resist luxation, by gentle rotation, then stop, look for the obstruction for elevation and deal with it.

4- The direction of force should be such that the roots are not directed toward major structures such as the maxillary antrum.

5-An elevator should never be used "blindly" in the socket.

6- If an application point is not present, then this should be created by careful removal of bone.

7-Elevators should always be sterile and sharp.

8- The sharp edges of the working blades are placed between the alveolus and the root surface and gently rotated apically along the long axis of the elevator to luxate or displacing the tooth or root.

Complications of use of elevators: -

Although elevators are very useful instrument for facilitating extraction of teeth, but misuse or miss-judgment may lead to some complications, part of it may be serious: -

1- Injury to the soft tissues, like injury to the tongue, floor of the mouth, soft and hard palate, caused by slipping of elevator during its use.

2- Wrong application of force or excessive force may lead to fracture of jaw especially the lower jaw at the angle of the mandible, also excessive force may lead to crushing of the alveolar bone and fragmentation

3- Fracture of maxillary tuberosity especially in extraction of upper third molars.

4- Uncontrolled force may lead to displacement of roots into maxillary sinus, infratemporal fossa, buccal soft tissue, submandibular space or inferior dental canal.

5- Use of elevator in periapical area of abscessed tooth may cause spread of infection to the surrounding tissue.

6- Tip of instrument (working blade) may be fractured and remain in the socket causing postoperative infection or delay healing, so always check the tip of instrument after use.

So most problems with elevators arise from: -

a) Miss-judgement of amount of force exerted.

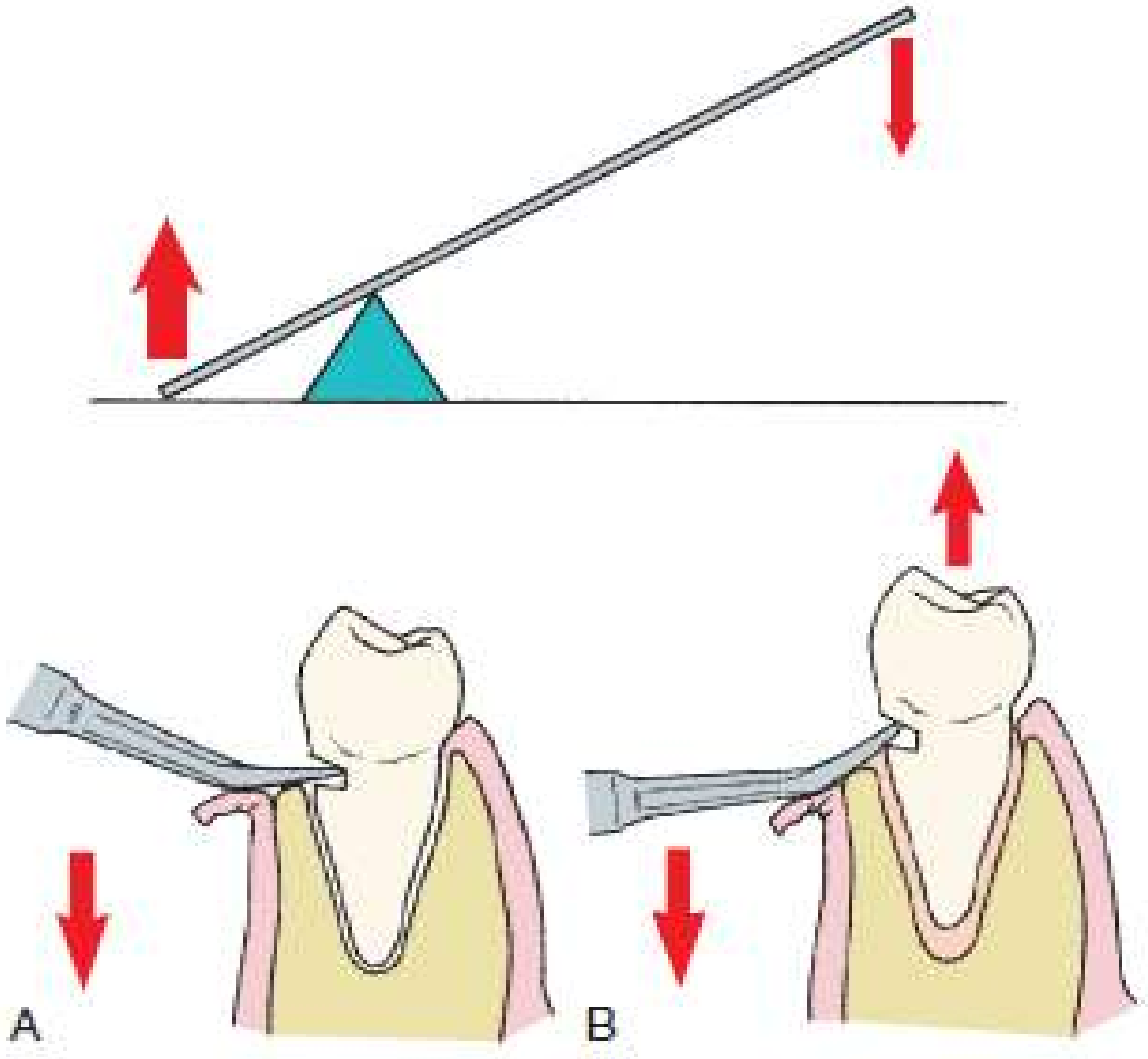
b) Improper positioning of the elevators.

Mechanical Principles Involved in tooth Extraction

The removal of teeth from the alveolar process requires the use of the following mechanical principles and simple machines:

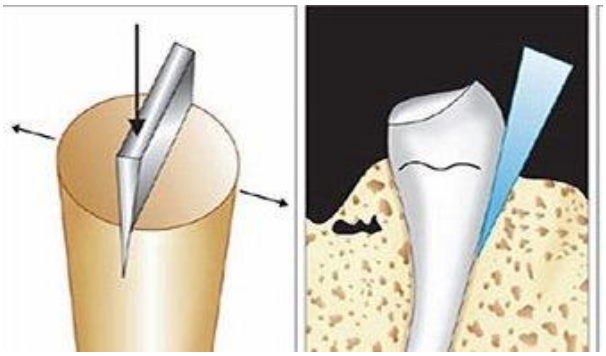
1. **The Lever**
2. **The Wedge**
3. **The Wheel and Axle**.

Elevators are used primarily as **levers**. A lever is a mechanism for transmitting a modest force—with the mechanical advantages of a long lever arm and a short effector arm—into a small movement against great resistance. An example of the use of a lever is when a Crane pick is inserted into a purchase point of a tooth and then is used to elevate the tooth.

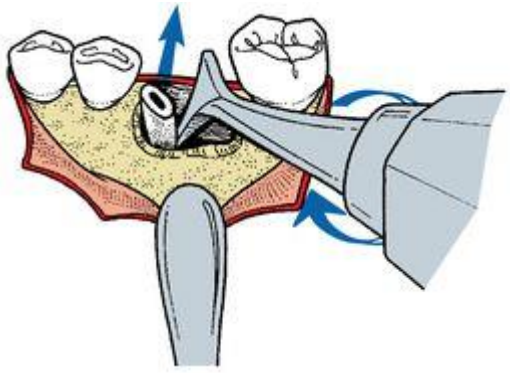


The second simple machine that is useful is **the wedge**. The wedge is useful in several different ways for the extraction of teeth.

a. When forceps are used, there should be a conscious effort made to force the tips of the forceps into the periodontal ligament space at the bony crest to expand the bone and force the tooth out of the socket.
b. The wedge principle is also useful when a straight elevator is used to luxate a tooth from its socket. A small elevator is wedged into the periodontal ligament space, which displaces the root toward the occlusion and, thus, out of the socket.



The third machine used in tooth extraction **is the wheel and axle**, which is most closely identified with the triangular, or pennant shaped, elevator. When one root of a multiple-rooted tooth is left in the alveolar process, the Cryer elevator, is positioned into the socket and turned. The handle then serves as the axle, and the tip of the triangular elevator acts as a wheel and engages and elevates the tooth root from the socket.



Basically, we have two methods of extraction: -

1 – Intra-alveolar extraction (forceps extraction, closed extraction).

2- Trans-alveolar extraction (surgical extraction, open extraction).

The closed technique is the most frequently used technique. The open technique is used when the clinician believes that:

1. Excessive force would be necessary to remove the tooth
2. When a substantial amount of the crown is missing or covered by tissue
3. When access to the root of a tooth is difficult such as when a fragile crown is present.

The correct technique for any situation should lead to an atraumatic extraction; the wrong technique commonly results in an excessively traumatic and lengthy extraction.

Whatever technique is chosen, the three fundamental requirements for a good extraction remain the same:

(1) Adequate access and visualization of the field of surgery,

(2) An unimpeded pathway for the removal of the tooth

(3) The use of controlled force to luxate and remove the tooth.

For the tooth to be removed from the bony socket, it is usually necessary to expand the alveolar bony walls to allow the tooth root an unimpeded pathway, and it is necessary to tear the periodontal ligament fibers that hold the tooth in the bony socket.

Technique of forceps extraction

Regardless of the tooth to be extracted in the oral cavity, some common principles are applied to all dental extraction. The general steps in the closed extraction (forceps extraction) procedure are: -

1- Soft tissue retraction: -

Before starting the application of the dental forceps, the gingival tissue surrounding the tooth should be reflected with blunt probe or tweezers, the neck of the tooth freed labially and lingually as far as the bony alveolar margin, so that no laceration or tearing of the gingival occur on extraction. So, care should be exercised to avoid application of the beaks over the gingival tissue.

C

The purpose of loosening the soft tissue from the tooth:

(1) It allows the surgeon to ensure that profound anesthesia has been achieved.

(2) The second reason that soft tissue is loosened is to allow the elevator and tooth extraction forceps to be positioned more apically, without interference from or impingement on the soft tissue of the gingiva.

2- Handling of the forceps: -

The forceps should be grasped by the palm of the right hand and the thumb finger is placed below the joint. The little finger is placed inside the two handles of the forceps so that it can control the opening and closure of the handle and guide the forceps beaks on the root surface, and when the tooth is grasped the little finger is placed outside the handle.

3- Retraction and support (the use of the left hand):

When using the forceps and elevators to luxate and remove teeth. It's important that the surgeon's opposite hand play an active role in the procedure. For the right-handed operator (dentist), the left hand has a variety of functions:

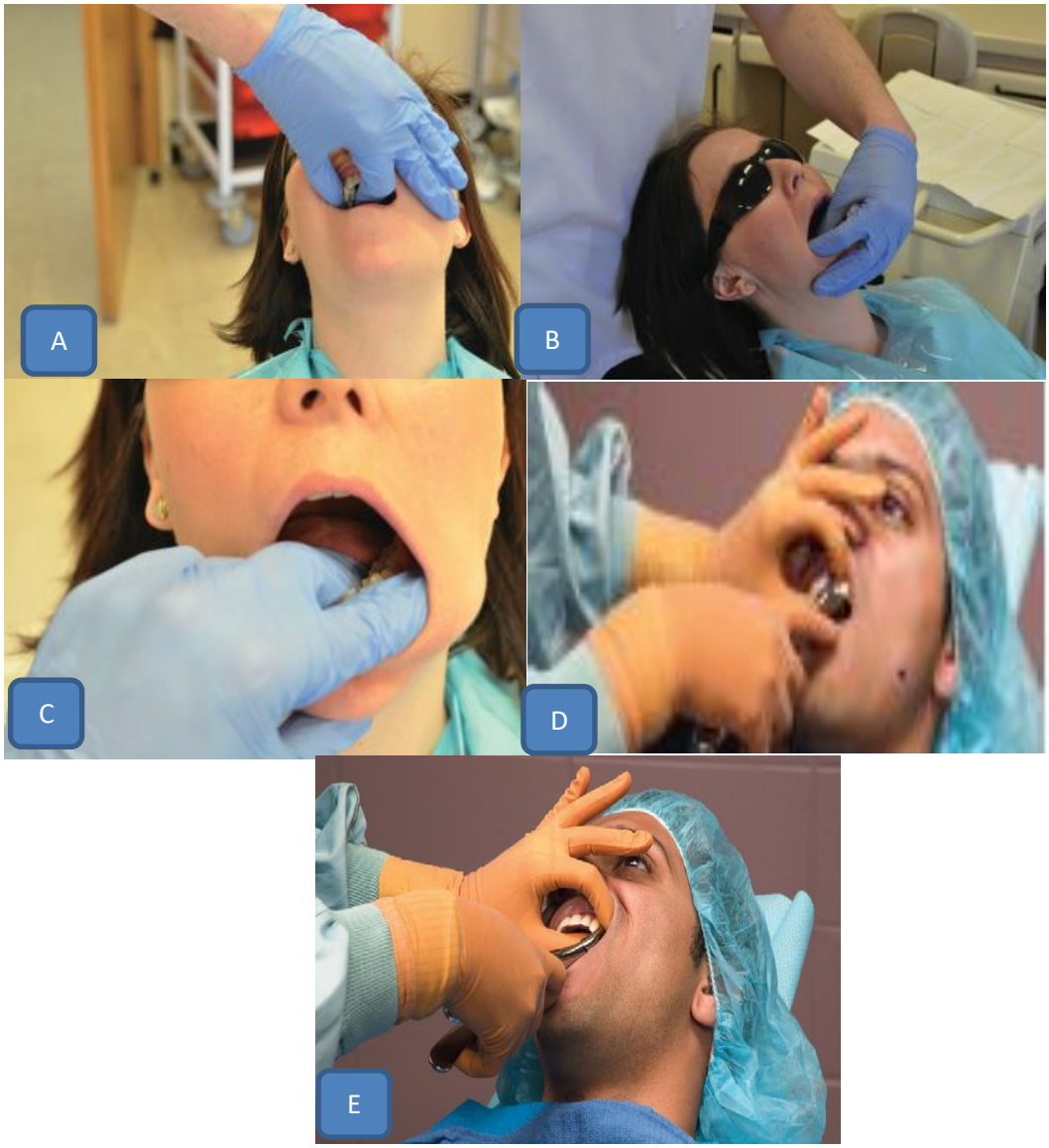
a) It's used to reflect the soft tissues of the cheeks, lips and tongue to provide adequate visualization of the area of surgery.

b) It helps to provide protection for the soft tissue structures and protect other teeth from forceps, if they release suddenly from the tooth socket.

c) It helps to stabilize the patient's head during extraction process.

d) The opposite hand plays an important role in supporting and stabilizing the lower jaw when mandibular teeth are being extracted to prevent injury and post-operative pain in the tempromandibular joint (T.M.J). And also, to prevent dislocation of the mandible during extraction especially when extraction is performed under general anesthesia

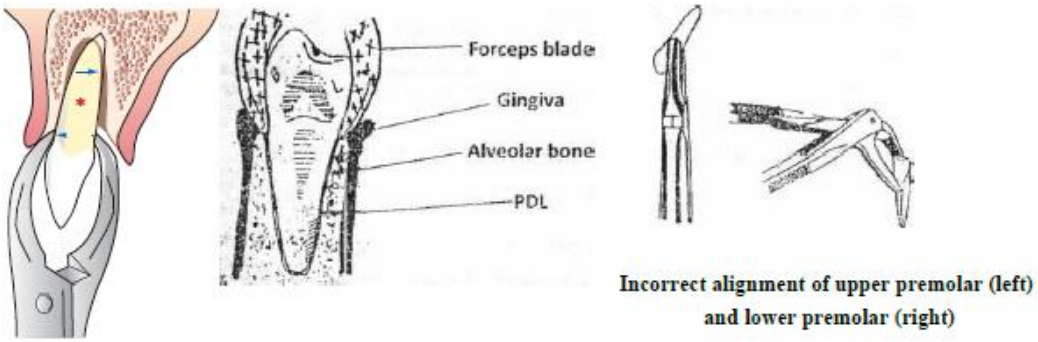
e) The opposite hand supports the alveolar process and provide tactile information to the operator concerning the expansion of the alveolar process during luxation process.



Position of supporting hand: (a) for extraction in upper right; (b) lower right; (c) lower left.(d) for extraction in upper anterior (e) for extraction in upper left

4- The application of forceps blades to the tooth (tooth grasp): -

After you select the proper forceps for the extraction of particular tooth. The forceps blades are applied on both labial (buccal) and lingual (palatal) surface of the tooth, so that the blades are parallel to the long axis of the tooth to be extracted

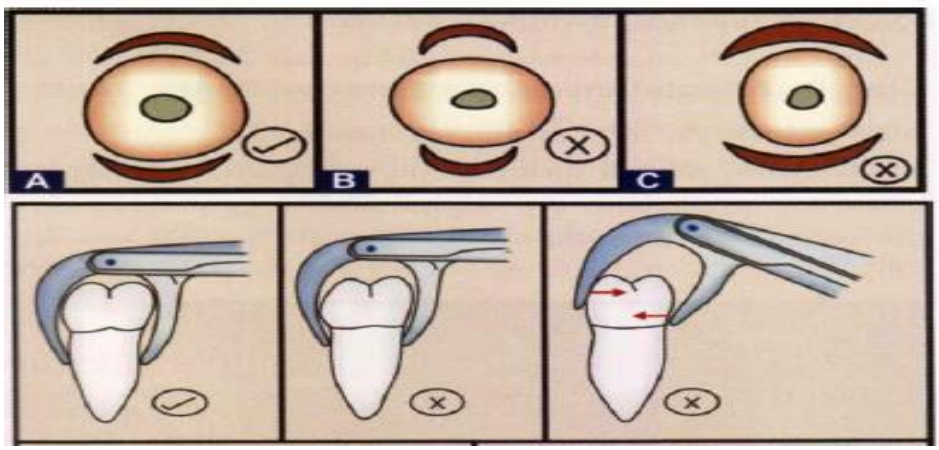


Incorrect alignment of upper premolar (left) and lower premolar (right)

The blades of the forceps are moved on the tooth surface apically and are allowed to move apically cutting through periodontal and gingival fibres to grasp the tooth root surface below the cemento-enamel junction. The tooth to be extracted is grasped firmly, the blades are not allowed to slide on the surface of the root during extraction movement.

It's a good practice to apply the blades of the forceps to the less accessible side of the tooth to be extracted first under direct vision and then apply the other blade on opposite side. If one side of the tooth is carious, then the forceps blades applied to the carious side first and extraction movement should be started toward the carious side.

The surface of the beaks of the forceps should lie as close as possible to the surface of the tooth grasped tightly without slipping during extraction movement.



5- The displacement of the tooth from its socket: -

This is performed by using the extraction movements.

The extraction movements are: -

a- Outward movement (labial or buccal)

b- Inward movement (lingual or palatal)

c- Rotatory movement (rotation movement).

The purpose of extraction movements is:

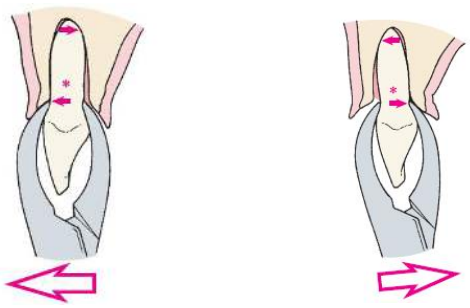
1-Cutting the tooth attachment.

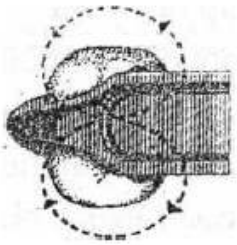
2- Separating the tooth from the wall of the socket.

3- Dilatation of the bony wall of the socket utilizing the resiliency of the living bone.

4- The removal of the tooth from the socket.

When the blades applied to the root surface a firm grip of the root taken by the forceps and buccolingual and lingobuccal movements are made in that order. This pressure should be firm but not crushing, smooth and controlled not jerking. By this movements normally after few lateral movements the tooth is felt to be loosen and begin to rise out of the socket, when this loosening occurs, rotatory or figure 8 movement will help to delivery of the tooth





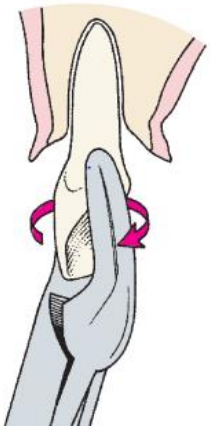
. Occlusal view of mandibular molar illustrating the figure 8 of movement

Rotatory movement:

Can be used as primary movement for extraction of teeth with conical straight roots such as the upper central incisors and lower second premolars, also rotatory movements are useful in completing the removal of teeth previously loosened by other means and this is called secondary rotatory movement.

The gross distortion and laceration of the buccal plate and mucosa are happened if excessive lateral movement is done. The final movement by which the tooth is removed from its socket should be always directed outwards, so reducing the trauma to the opposing teeth and preventing slipping of the tooth in the mouth which may be swallowed or aspirated by the patient.

If the tooth dose not yield (no movement) after applying a reasonable force, excessive force should not be used, stop and re-evaluate the case clinically and/or radiographically because the tooth may be need surgical extraction.



Post-operative care of extraction wound: -

1- Examine the extracted tooth to be sure that there is no fracture in the roots (retained root), keeping in mind the anatomical variations in number of roots of each tooth, because some teeth have accessory roots.

2- Always examine the socket for any loose fragments of bone or roots (pieces of enamel), foreign materials (e.g. calculus, amalgam particles, or pathology

(e.g. periapical granuloma, polyp) all these should be removed by using curette or suction tip or tweezer.

3- You have to remove or smooth any sharp bone or projections of inter-radicular bone, then apply suture if necessary, e.g. if there is laceration in the soft tissue.

4- The expanded bucco-lingual plate should be compressed or squeezed back to their original configuration or shape in order to reduce any distortion of the supporting tissue to re-establish the normal contour before extraction

5- Make sure that the socket is full of blood, (to form blood clot)

6- Place a properly shaped and size (2X2 Cm) gauze piece over the socket (and never put it into socket) in such a way that the patient close his mouth and it is not visible to gain initial control of haemorrhage. It is important to place the gauze directly over the extraction site in the space occupied by the crown of the extracted tooth and not over the occlusal table of teeth to ensure that the pressure is correctly transmitted over the socket to achieve hemostasis.



Instructions to the patient:

1- Keep biting over the gauze for at least (0.5-1) hours and discharge after that but if haemostasis is not established, you can use another.

2- Do not spit during first ***1/2*** hour and use minimal talking and avoid violent exercise or activity to assist the formation of a firm clot in the socket, so rest for the first few hours following extraction are recommended, avoid insertion of the tongue tip inside the socket which lead to dislodgement of clot or disturb its formation

3- Use only cold fluid and soft diet for the few postoperative hours and not take solid or hard food for the rest of the day, and chew on the opposite side of extraction.

4- in case of continuous bleeding. Place a sterile gauze in place over the wound and keep it in place for an hour, if bleeding not stopped contact your dentist.

5- Always prescribe the proper analgesic and antibiotic if necessary (e.g. the presence of residual infection, diabetic patient, patient on immunesuppressive drugs, aids...etc.