Today we are going to talk about impression making after finishing the crown preparation step and how to prepare the site before making the impression.

In order to make an accurate impression I need to take fine details of my preparation especially the finish lines and a little bit beyond the finish lines (a little bit from the root surface about 1mm). This is called the emergence profile which is the angle at which the tooth comes out of the supporting osseous structure that will guide you how to prepare you crown to be in a line with the root surface.

* Impression: negative likeness for the teeth and the surrounding tissues that are necessary to obtain the working cast.

- The impression materials that are used in crowns and bridges are:

* Elastomers (rubber materials) mainly 4 materials :
* Polysulfide
* Polyether
* Condensation silicon
* Additional silicon

**Note:** Alginate is not accurate and zinc oxide eugenol is a rigid material so these are not good for impression making in cr & br but elastomers give fine details.

* Impression in crown and bridge should show:
1. The prepared tooth
2. The whole arch (for occlusion) because the cast will be mounted on the articulator.
3. Finish line (in very fine details).
* The challenges that we face when we make the impression are:
* Moisture control (no saliva, blood or any moist on the finish lines).
* Subgingival margins involvement. By gingival retraction methods or what is called gingival displacement.
* Before making the impression, you should have:

1- Healthy tissues.

2- Moisture control.

3- Ability to displace the gingival tissue to expose the finish lines.

- Tissue health:

 After tooth preparation a trauma will occur to the tissue especially when you prepare the subgingival margins. But this trauma is transient and reversible. So in this case we can’t make the impression in the same session of tooth preparation because there could be trauma and bleeding in the tissue. So we put a proper temporary restoration (provisional crown) and delay the patient 2 weeks then I make the impression.

Tissue trauma is reversible provided that the patient will come with a good gingival health if he keeps a very good oral hygiene and a proper temporary restoration [provisional crown] was prepared with smooth surface and margins, but if you put a very bad provisional crown he will come to your clinic with a worse gingival trauma.

- Fluid control:

In fluid control I need:

* Cotton rolls.
* Saliva ejector; It's very important in all cases.
* High suction volume.
* Svedopter.
* Antisialogogues drugs; these are drugs used to control the salivary flow inside the patients mouth it's rarely used (in 1% of the cases) so we use them only in severe cases with excessive salivary flow.
* Rubber dam is not used for isolation in cr & br because the impression will not reach to the subgingival margins by using rubber dam. In addition, the rubber dam contains sulfur that will interfere with the setting of certain impression materials.

**Note:** the local anesthetic that you use with epinephrine has a role in salivary flow control but just to a certain limit.

* Antisialogogues drugs; anticholinergic drugs or parasympathetic inhibitors:

These drugs make decrease in the salivary flow and sometimes causing a dry mouth.

- Anti-cholinergic drugs: 1. Mathantheline bromide

 2. Propanthelein bromide

- We prescribe them as 1 tablet 1hr before the procedure.

* Contraindications: (We don’t prescribe them in these cases):
1. Elderly patients with heart problems.
2. Hypertensive patients.
3. Glaucoma.
4. Obstructive diseases of the urinary or GI tract.

So the medical history of the patient is very important.

* + Side effects: Drowsiness and blurred vision.
* In addition to the anti-cholinergic drugs also we have anti-hypertensive drugs:
* These drugs are very safe and can be used to decrease the salivary flow.
* Name: clonidine hydrochloride.
* It can cause drowsiness and sedative effects.
* If the patient is already taking antihypertensive drugs we should consult his dr. in order to know if we can give him this drug or not.
* Displacement of the gingival tisssues:
* To make sure that the impression can reach the finish line subgingivally we should do the gingival displacement.
* What is the purpose of gingival displacement :
1. To create a space between the gingiva and the tooth in order to allow an access for the impression material to reach the finish line and a little bit beyond the finish line [at least 1-2 mm].
2. To ensure an adequate thickness of the impression material because if we don’t have an enough space the result would be a thin impression at the margins and when we remove the impression it will tear.
* Gingival displacement methods:
* Mechanical.
* Chemicomechanical.
* Surgical.

**- Mechanical method:**

* Retraction cord
* Copper band

Copper band:

- It is a ring like band that we put it around the prepared tooth in order to displace the gingiva (circumferential periodontal fibers) and expose the finish line.

- We use it very easily when we have multiple teeth.

- We put the copper band around each tooth then we inject the impression material.

 **Note:** You should be careful when you put the copper band as it may injure the gingiva because it’s sharp like the matrix band.

This is a difficult method; you apply it around the tooth to form a ring, cut the excess then bend it in a way that is suitable to displace the gum and avoid damaging it.

Retraction cord:

- It’s pushed into the gingival sulcus and it mechanically stretches the circumferential periodontal fibers.

- Fabrication of the retraction cord:

 Cotton – silk – wool – synthetic fibers.

* Types of the retraction cord:

- Twisted

- Braided

- Knitted

* Twisted: Its fibers are easily separated from each other ( you can separate one fiber according to the size of the sulcus).
* Braided (مجدلة): Doesn’t separate easily, so it is easier to be packed in the sulcus because the instrument will not penetrate the cord.

**Two types:**

- The filled cord; it has a central strand, it's more rigid, gives bulk to the cord and it gives a good horizontal displacement of the gingival tissues.

- Hollow cord: it's flexible and easier to be place; it has less bulk with lesser tissue displacement.

* Knitted type:محبوكة) )

- This type is the most one that can carry haemostatic agents inside its core.

- It has more hollow parts than the other types so if I want to put it inside epinephrine or haemostatic agent it will carry more agents than the other types of retraction cord because it has more hollows inside.

- This type carries the haemostatic agents by 25% more than the other types of retraction cord.

- It is more compressible and less rebound (it will not easily get out of the tissue).

**Note:** Remember that the retraction cord and chemical agents (haemostatic agents) =chemicomechanical method of displacement.

- We have different sizes of the retraction cords because we have different depths and sizes of the sulcus.

* Use the smallest cord is necessary to obtain or to create an adequate space [adequate gingival displacement] in order to reach the finish line.
* Using large less compressible cord results in:

- Tissue tearing

- Hemorrhage

- Stripping of the epithelial attachment

- Post-operative gingival recession (the worst result) which is an irreversible damage.

**General rule**: use the smallest retraction cord that gives you an adequate gingival displacement to put the impression material.

* Retraction cord can be impregnated or not-impregnated :
* if we use the non-impregnated (without any chemical) it is called a mechanical way of gingival displacement but if we add a chemical material with the retraction cord we call it impregnated (chemicomechanical).
* Packing instrument :

- Ach: it's like the spatula instrument that we use it to put TF & it is like a carver but with a rounded end.

**Types of instruments:**

- Serrated instrument:

* + We use it with firm cords (knitted and briaded).
	+ These are very useful but they may stuck in the sulcus.
* For the firm cords we use serrated packing instrument because it has a less chance to slip from the cord and it gives a very good packing to the cord inside the sulcus also a good control for packing the cord is achieved.
* With the twisted cord, it can catch to the cord and slip it out of the sulcus.

- Smooth ended packing instrument: used with the twisted type of retraction cord, here if the instrument is slipped out the tissue trauma will be lesser than the others.

* **How you pack the retraction cord:**
* You isolate the area.
* You cut a length that is adequate with the circumference of the tooth.
* You dip it in the agent if you want to make a chemicomechanical displacement or use it dry (non-impregnated).
* You loop the cord around the tooth.
* Then you start your packing with a slight force, we usually start packing interproximally because it is easier.
* Orient the packing instrument to the already packed cord and toward the root not toward the gum. (We don’t start toward the unpacked part because that will lead to slip the cord from the sulcus).

**Notes:**

* Over-packing should be avoided as it causes tearing of the gingival attachment.
* If the cord rebound you need more time not more pressure and try to hold it then remove the instrument if it still rebound you should chose another smaller cord.
* **We have single cord technique and double cord technique :**

 The double cord technique is used when the depth of the sulcus is allowing putting double cords, when I need more retraction or when the cord is small.

- Remember that the shape of the sulcus is a **V shape**, so the smaller cord is put first and the larger one above it because as we go down the size of the sulcus will be less . By this we get a good gingival displacement, and when we are going to make the impression we remove only the larger cord and leave the smaller one in its place that will help in avoiding the seepage of the crevicular fluid and will provide a dry surface (there is no need for the impression material to reach this area).

**Notes:**

- After removing the cord we immediately put the impression material before the tissue get rebound.

- Don’t forget to remove the cord before the patient leaves the clinic because in the next week the patient will come to you with a gingival abscess.

* **Good retraction means :**
* The entire finish line and the prepared margins are visible and clear.
* No interruption to the soft tissue around the prepared tooth and no tissue (gum) above the retraction cord.
	+ Chemicals are used either separately or with the retraction cord.
	+ We can use the chemicals only by putting it between the tooth and the gingival then we wait until they solidify and displace the gingiva.
* **Types of chemicals that we use:**
* Vasoconstrictors
* Astringents المواد القابضة

- The effect of the vasoconstrictor:

It constrict the blood vessels and cut the blood flow to the gingival tissues; this will help in the isolation (it reduces the amount of fluids and prevents bleeding as possible).

Epinephrine: is a vasoconstrictor that produces homeostasis (control bleeding). Availability is: 0.1-8% in solutions.

**0.1%** of epinephrine is used to impregnate the retraction cord

\* Epinephrine should be avoided in case of lacerated tissues because it may be systemically absorbed and result in:

- Tachycardia.

- Increase in the blood pressure.

- Increase in the respiration.

- Nervousness.

\* It's contraindicated in patients with:

- Heart problems.

- High blood pressure.

- Cardiovascular diseases.

- Hyperthyroidism.

- Hypersensitivity to the epinephrine.

- Astringents:

- These are safer than the vasoconstrictors. They shrink and coagulate the gingival tissue by causing transient ischemia.

- These are used with lacerated tissues instead of the vasoconstrictors.

- They provide a longer period of haemostasis.

- There isn’t any systemic side effect of the astringents but the only disadvantages of it are:

* It can leave debris on the prepared tooth.
* It degrades the cord if its amount is too much (because it is a metallic salt) so we wash it before the impression making step.
* Some kinds contain sulfur that interferes with the polymerization of the rubber materials so you should wash it very well.
* **Types of astringents:**

- Aluminum sulfate (alum).

- Aluminum chloride.

- Ferric sulfate.

* Some of these materials if they stay on the tissues for a prolonged period of time they may cause crystal bone loss and gingival recession.
* Aluminum sulfate:

- We use it alone or in combination with aluminum potassium.

- Concentration is 7%.

- It's slightly less effective than epinephrine.

- It has a limited haemostatic ability.

- It's highly toxic to the gingival tissues, so it is applied for 10-20 minutes maximally, because it will lead to irreversible damage to the gingiva, gingival recession and bone resorption.

- Presence of sulfur inhibits the setting reaction of **addition silicon impression material** (you should remember this material).

- It has the highest toxicity and the least effectiveness.

* Aluminum chloride**:**

- It’s more common than the aluminum sulfate.

- Concentration is 5-25 %

- If the concentration increases the haemostatic effect on the tissue will increase and the risk of toxicity will increase.

- It has a moderate haemostasis effect and tissue displacement.

- Its recommended time is 10 minutes.

- It has an unpleasant taste (all the types have this feature).

* Ferric sulfate:

- Concentration is between 13-20 %

- It causes tissue irritation but less than the aluminum chloride and can be used in combination with it.

- It has an excellent haemostasis.

- It has moderate-excellent tissue displacement.

- It should not be used with epinephrine.

- Working time is: 1-3 minutes and it is acceptable to work until 30 minutes.

- It has the least toxicity and the highest effectiveness.

- It causes a brownish discoloration on the tissues because it contains sulfur. This discoloration should be removed before the injection of the impression material.

 **Notes:**

- Sometimes you could combine more than one type of astringent together but in general either one astringent will work and give you a good haemostasis or whatever you put will not work if the tissues are lacerated, injured and the patient has poor oral hygiene. So there is no need to combine more than one type.

- Don’t combine between a vasoconstrictor and an astringent.

- Astringents can be used also in surgery to stop the bleeding.

* **Surgical methods:**

It means physically removing rather than retracting, and creating haemostasis by inducing coagulation.

\* It is an aggressive type [most aggressive type of all methods]

\* It will cause a gingival recession.

**Types of surgical methods:**

1. Laser (it has the least damaging effect). The laser cuts and widens the sulcus and causes coagulation at the same time. It can provide good homeostasis, and good surgical displacement.
2. Electrosurgery.
3. Rotary instruments (burs).
* Electrosurgery:

- It's the most common one.

- It means that the inner epithelial lining of the gingival sulcus is removed to improve the access and prevent the bleeding.

- It's the most aggressive method that results in gingival recession.

- We use it in the case of a very deep sulcus and when the finish line is very deep.

**Note:** The finish line should be only 0.5 mm below the gingival margin, why I need to extend the finish line deeply in the sulcus :

- If the crown is too short.

- If there is careis and old restoration.

- If I have a very deep sulcus.

* It's a high frequency current of [1-4] megahertz of electrodes are passing through the narrow metal electrode tip causing a rapid temperature rise, increasing the polarity and causing a cell break down.

The circuit is completed by contact between the active electrode within the patient mouth and another electrode (the passive electrode) that is positioned on the ground.

* The electrosurgery unit has different waves:

- Fully rectified unfiltered wave (the most common one). This kind of waves is needed for the crown and bridges preparation because this wave is used to give good homeostasis and good incision.

- The fully rectified filtered waves; induce a very nice smooth incision and a minimal tissue shrinkage.

- The partially rectified; only for coagulation, but not for incision.

* The unit components:

- Current generator.

- Pedal.

- The hand piece where the electrode's tips are holded.

- Passive electrode (this should be positioned below the back of the patient directly) but shouldn’t be in a direct contact with the patient skin.

- A small wire is used made of tungsten with different forms of cutting tips.

**Note:** The electrosurgery is contraindicated in patients with a pacemaker.

 **Considerations**

- The tissue should be moist not dry, but no pooling of saliva.

- The gingival tissues should be healthy and thick, avoid cutting the thin marginal gingival tissues, because once you cut them recession will occur.

- Profound anesthesia is important. It's contraindicated in patients with systemic appliances such as those with peacemaker.

- Cotton rolls and gauze patch should be kept slightly wet and moist.

- High suction volume should be provided, due to the bad odors that result from the cutting.

- The tip of the electrode should not touch a tooth or a metallic filling.

 - The tip of the active electrode is passed over the tissues (like a brush) and the current cuts, we don’t pass the current over the area again, we have to wait 5-10 seconds so that the fluid can accumulate in the area, when the tip of the electrode is dragging, that means that the tip is not cutting well, so the electrical current should be increased. If the power setting is too high, sparkling can be found, so you should decrease the setting.

 - After the procedure, the gingiva is swapped with 3% of hydrogen peroxide to remove the debris of the dead tissues. Then the retraction cord should be used afterwards to complete the retraction.

* **The Rotary Curettage**

During the preparation phase of the finish line, you cut the inner epithelial cells by using a high speed bur "torpedo" with copious water, it cuts from both sides; prepares the finish line from one side and cuts the tissues from the other side, and it should be done carefully by a very talented dentist as it needs a proper control.

 It’s the most aggressive method, so it's the least method used.

**Note:** In general the best method used for tissue displacement is either the retraction cord alone or the retraction cord with astringents or vasoconstrictors.

**Before you start any surgery you have to ensure that:**

- The tissues are healthy.

 - The sulcus depth is not more than 3mm.

- Presence of adequate thickness of keratinized tissue; (thick gingival tissue not a thin tissue because it will cause gingival recession).

 **Note**: Healing of the gingival tissues occurs within 2-3 weeks of all retraction methods, provided that the patient maintains a good oral hygiene and you were not very aggressive with your method.