This procedure is indicated in a primary tooth with a normal pulp, with carious lesions, or that a traumatic or mechanical trauma occurred, and the conditions must be favorable. (Irreversible pulpitis) we are working under rubber dam. (not clear)

After this we use stainless steel crowns to prevent micro leakage.

Direct pulp capping in primary teeth has a poor prognosis, and it is no longer used, especially when the exposure happens with no rubber dam. NOT RECOMMENDED

If the molars pulp was exposed in a primary tooth we go for a pulpotomy and not direct pulp capping

Pulpotomy is done when there is a tooth with extensive caries but has no evidence of radicular pathology, or when there is a mechanical or carious exposure. The indications are 1) tooth is asymptomatic and 2) the pain is transient. 3) vital coronal pulp tissue.

We have to make sure that there is no radicular pathology, only a coronal pathology.

Rationale:

To remove all the coronal pulp, leaving behind a healthy radicular pulp

The remaining radicular pulp is then treated with a medicament prior to the placement of the final restoration ideally stainless steel crown.

Technique:

Good local anesthesia from the start. Good isolation ideally under rubber dam, if not applicable, we should make sure we have a good isolation with cotton rolls right and left.

It is recommended that all pulpal therapy be performed under rubber dam, or equally effective isolation to prevent contamination of the working site.

How do you do it?

1) remove all the caries before going into the pulp , the field should be clean before reaching the pulp, if we can. We remove the caries from the DEJ and then the ones on the surface of the pulp using a large round bur or a spoon excavator.

If an exposure occurred, then perform pulptomy following the removal of all carries.

If an exposure occurred, where you see redness and there is no perfuse bleeding this will be an indication that the conditions are ideal for a pulpotomy rather than a pulpectomy.

2) after the complete removal of the caries, you open a wide access to the coronal pulp with a high speed bur. After the drop, we do unroofing of the pulp chamber, we usually do this with a high speed bur to save time, but it can be done with a low speed bur. Once drop in is felt we don’t go deeper, we start moving the hand piece sideways to remove the roof of the pulp chamber. We need a complete removal of the roof.

Judge the condition of the pulp, the color and hemorrhage:

If there was no hemorrhage at all, then this means that the tooth is necrotic.

Moderate hemorrhage is the ideal condition for pulpotomy.

If severe hemorrhage then this most probably means that the radicular pulp is involved (although it is too early to tell).

After we’ve opened the entire roof, and the coronal pulp is exposed, we need to remove all the coronal pulp tissue. This can be removed by either a sterile sharp excavator, or large round bur in a slow hand piece (the risk that is associated with a large round bur is that the floor of the pulp might get perforated therefore we should be careful) very large and very gentle removal.

After that we need to attain initial radicular pulp homeostasis by gentle application of cotton pellet moistened with saline.

Two radicular pulps, two cotton pellets with saline and keep them inside for two to three minutes until the bleeding stops. Then we reevaluate the bleeding, if there is no bleeding then we can continue. if the bleeding didn’t stop, and there was continuous perfuse bleeding, we should check that the roof was entirely removed. This is done by checking for ledges, we place the excavator inside, if the excavator disappears then this means that there is part of the roof that wasn’t removed and we should widening the access to remove the left pulp tissue. Again, we place cotton pellets and then we reevaluate. If there was a perfuse bleeding then we go for pulpectomy or extraction depending on the conditions that we have.

Selection of medicaments for the pulpotomy which are directly placed on the radicular pulp

You would place the dressing of your choice and then you’d reevaluate the pulp stumps

Medicaments available:

1. Formacresol: 20% Buckley’s formacresol: fixation of the pulp.
2. Ferric sulfate solution 15.5%
3. MTA
4. Pure calcium hydroxide powder
5. Gluteraldhyde
6. Electro surgery
7. Laser

***Formacresol: 20% Buckley’s formacresol: ☺***

Carcinogenic.

Was used in multiple visits pulpotomy. It was placed in the first visit and the patient is sent home. in the mean time, complete mummification occurs, then removed in the second visit.

Nowadays this is not recommended, only a three to five minutes formacresol placement is done.

Composition:

19% formaldehyde, 35% cresol, 17.5% glycerol and water

We use a 1in 5 dilution of formacresol to give the same effect.

It’s applied on a cotton pledget then on the radicular pulp for five minutes to achieve superficial tissue fixation. Then we remove it

Has a high clinical success rate and it has been used for a long time. Its disadvantage is that it releases formaldehyde, which is a possible carcinogen. It doesn’t promote pulp healing so that’s why it is not used in permanent teeth.

If you look at the tooth histologically after the use of the formacresol, you will see fixation of the pulp in the coronal third of the root, and loss of cellular integrity in the middle third of the root, and the apical third showed formation of granulation tissue. So basically it’s fixating the pulp, with no healing, so basically we just want it to keep the tooth fixated until the tooth exfoliates.

Systemic spread of formacresol from the tooth and its possible toxic reactions have been a concern for dentists.

The problem in the formacresol is in its components, formaldehyde from one end and cresol on the other end, cresol’s disadvantage is that it burns, locally destructive; however its potential systemic distribution is negligible.

In 2004 Formaldehyde has been classified as a carcinogen for human beings.

83% of the dentists in America are still using formacresol. This is because it has a high success rate, plus the amount that we are using for tooth fixation has an inconsequential risk. This means the risk of carcinogenesis when using the small right amount needed is inconsequential.

It has been studied that the amount of formaldehyde present systemically after a GA procedure ,preparing many teeth together , is negligible.

There is another approach that states that if there is a potential risk then why use it. So they started looking for a new medicament that can replace its use. Ferric sulfate is the medicament that is used to replace the use of formacresol, which has a comparable success rate. However, the formacresol has proven to have a higher success rate than ferric sulfate.

Technique:

After stopping the bleeding, only a small trace of formacresol should be placed on the cotton pellet and then placed on the pulp stumps and leave it for five minutes. We should be careful not to use excess material so that it would not harm or burn the surrounding tissues.

Squeeze the excess remove it on another cotton roll, and then get rid of it directly.

After leaving the formacresol for five minutes, and the bleeding has stopped and the pulp turned black, make sure to remove all the formacresol and the cotton pellet before placing the IRM. The IRM will be condensed on the pulp stumps.

The IRM is used as a base material directly over the pulp stumps. This material must be a thick. Then this mix is shaped into a ball which can then be placed on the pulp chamber. If this mix was a thin mix it would be hard for the dentist to control it, so the mix won’t be placed directly over the pulp stumps.

The IRM must be placed in the pulp chamber and condensed well using a wet cotton pellet or cotton pellet with powder, or we can use a small condenser which has been wet with water or we put powder on it …

So gentle condensation with a moistened cotton pellet, forceful bleeding might cause the pulp to start bleeding again. If we are planning to place a stainless steel crown on the tooth, the tooth must be filled with IRM to the top; we don’t place a filling between the IRM and crown.

***2) Ferric sulfate ☺***

It is used in cons as a haemostatic compound that stops the bleeding. It doesn’t fixate the pulp tissue; instead it forms a metal protein clot at the pulp stumps (it seals the blood capillaries). Acts as a barrier that stops irritating material that is applied after and protects the vital radicular pulp from the medicaments that are placed later (IRM). So its chemical reaction with blood is what makes a haemostatic agent.

Histologically it has been shown that ferric sulfate induces favorable results such as secondary dentin and dentinal bridging.

When we use it we make sure we have maximum retention of vital pulp and conservation of without raddicular pulp without production of reparative dentin.

The success rate: equivalent radiographic and succusser premolar outcome to the form cresol pulpotomy.

No health risks published in the medical or dental literature.

Concentration 15.5%

Only used for fifteen seconds on the pulp stumps

The same thing as in formacresol remove the coronal pulp, control bleeding and then you can use ferric sulfate, by rubbing it over a micro brush or a small cotton pellet. And it is placed only for fifteen seconds and then rinse it with water. Then the filling is placed above it. You can use either IRM or glass ionomer but IRM is more favorable.

So ferric sulfate proved to be a good replacement for formacresol with a comparable success rate. And because of its low health factor it may become a replacement in primary molar teeth.

**3) MTA: ☺**

It has been used in endo

It is a bioactive material and stimulates hard tissue formation. You mix it with water and then you place it on the pulp stumps after the bleeding stops. Then we put the crown. It has a very high success rate, higher than that of formacresol and ferric sulfate. It may be the preferred pulpotomy agent in the future.

The disadvantage of the MTA is its cost. Therefore, new studies are investigating the effectiveness and efficiency of the use of Portland cement as a pulpotomy agent instead. It is less expensive so they’re evaluating it. Further studies are needed.

**4) Calcium hydroxide: ☺**

It facilitates the regeneration of dentine, formation of a dentinal bridge and promotes the healing of the pulp tissue. Has a much lower success rate than formacresol. It’s always associated with internal resorption.

Because of its extreme alkalinity, it causes tissue destruction therefore not recommended as a medicament for primary molars.

Don’t use it

**5) Gluteraldehyde: ☺**

It’s a better fixative than normal formacresol, it also has a lower toxicity, it has a lower success rate. It doesn’t penetrate the apical tissue as how formacresol does.

It causes a hypersensitivity reaction to the dentists therefore it’s not being used a lot.

**6) Electro surgery ☺**

Its non chemical devitalization process it carbonizes and deep denatures the pulp, so you do routine amputation of the coronal pulp , the pulp stumps and then …. Pulp techniques. You get a layer of coagulation necrosis that is formed by electro surgery application, the odontoblasts are stimulated to form a dentine bridge and the tooth is maintained in the arch as a vital radicular tissue until it exfoliates. It has similar success rate like formacresol but requires the purchase of special equipments, if you have them then you can use them in primary molar pulpotomy.

1. **Laser: ☺**

It creates a layer of coagulation necrosis that remains compatible with the underlying tissue; the pulp retains vitality and capability of normal pulp healing. It has a comparable success rate with formacresol but still further research is needed and we have to take into consideration the high cost of the equipment.

Research suggests that formacresol pulpotomy, ferric sulfate pulpotomy, electro surgery or pulpectomy are equally successful techniques. More studies have been showing the success of the use of MTA in pulpotomized primary tooth.

So again formacresol pulpotomy, ferric sulfate pulpotomy, electro surgery and MTA have all reported high success rates.

The tooth then must be sealed with a restoration that prevents micro leakage and the most effective restoration that has been reported is stainless steel crown.

If there is sufficient supporting enamel then an amalgam or composite restoration can provide a functional alternative when the tooth needs two to three years to exfoliate.

Periodic clinical and radiographic assessment is required after the pulpotomy has been completed. You need to keep the initial radiographs. And the assessment needs to be done every six months and could be performed as part of the overview of the dental health of the patient (periodic comprehensive assessment of the oral health of the patient).

Signs of failure:

1) Pain

2) Abscess formation

3) Increased mobility

Fistula

4) Radiographic interradicular resorption (must be compared with previous radiographs)

5) Internal or external resorption

**GOOD LUCK ☺**