**Last week we talked about metal try in and porcelain try in and now we will talk about a very important step in crown and bridge , if all the steps were good and you missed up the cementation step you may have bad consequences.**

**Important points during cementation:**

**1-good isolation**

**2-know the type of cement you are using and how to mix it**

**3-remove excess cement**

**4-orla hygiene instructions : the crowns are treated like natural teeth , it should be flossed and brushed , but because bridges have pontic area and cant be cleaned easily we introduce patients to:**

 **a. super floss (it can access the area under the bridge and under the pontic),**

**b. interdental brush: clean the embrasures**

**types of cements :**

**1-provisoinal cements (soft cements):**

**-zinc oxide eugenol or zinc oxide non eugenol**

**-weaker than permanent cement (in properties ) , made this way to allow you remove your provisional**

**2-permenent cements (hard cements ) .**

**We can classify them into different categories according to different criteria :**

**- conventional cements : example :zinc phosphate cement : gold standard of conventional cement , used for more than 100 years this means it’s a good cement .**

**-conventional cements can be further classified into**

**1-acid based : most cements we use are acid base reaction like zinc phosphate and zinc polycarboxylate**

 **2-resinbased:**

**-These cements contain resin so undergo polymerization (like composite ) could be self cure, light cure , self etch , cold cure, etc..**

**-Mechanism of retention for conventional cements is mechanical cause these are non adhesive cements (some conventional cements have adhesive properties like glass ionomer and zinc polycarboxylate with the glass ionomer having stronger adhesive properties than z.polycarboxylate )**

**So mechanism of retention could be :non adhesive, micro mechanical bonding , or molecular adhesion when we start listing the non adhesive cements the 1st one to mention is zinc phosphate .**

**-micro mechanical bonding reminds us of composite so the resin cements are the cements that are retained this way .**

**-molecular adhesion (ionic interaction ) : like glass ionomer**

**-so conventional cements are non adhesive cements ,however the polycarboxylate cement and the GI cement have some adhesive properties .**

**To increase retention of a crown on a prepared tooth :**

**1-we can add grooves on the preparation it self**

**2- sand blasting of the crown which is the method that increases retentive value of the crown the most .**

**3-tin plating : since gold is an inert mineral plating will add a layer that can interact chemically with resin cements**

**4-silanization of crowns made of glass ceramics like EMPRESS or veneers by using silane coupling agents.**

**5-you should know the appropriate type of cement to use and the justification of using it (why you are using it ?)**

**6-the powder :liquid ratio and type of mixing the cement are also important factors , mixing time, working time , and setting time of the cement are also important .**

**-zinc phosphate cement :**

**-the gold standard of conventional cements**

**-have no adhesive properties**

**-has been used longer than any other cement**

**-the liquid part of the cement is phosphoric acid (very acidic , PH is 2 )**

**-the cement is acidic due to the presence of phosphoric acid but within 24 hours the cement PH goes back to neutral , so this cement have initial acidity that become almost neutral within 24 hours .**

**-some people don’t prefer using this cement on vital teeth because the initial acidity can cause irritation .**

**-some articles prefer using varnishes or bonding agents on the prepared vital teeth before applying this cement just to protect from the acidity.**

 **-the film thickness of this cement is very thin (the lowest film thickness)**

**-high compressive strength , resistance to water dissolution**

**-disadvantage:low tensile strength so we might face a problem of debonding .**

**-the only cement that have high tensile strength is the resin cement**

**-have no chemical binding properties so the retention of this cement is mainly dependant on geometry of the preparation .**

**-25% of the cement serves to retain the crown , the other functions of the cement is to fill the spaces between the crown and the preparation to prevent leakage.**

**-it doesn’t have any resistance to acid dissolution**

**-recommendations : can be used for crowns and posts (metal posts, cast or pre-fabricated posts )**

**-fiber posts cant be cemented except with resin cements**

**-how to mix the zinc phosphate cement ?**

**Mixing is very special in that is :**

**-mixed on a glass slab (cold slab)**

**-the cements react by exothermic reaction so cold slab will delay the setting of the cement.**

**-I want to delay the setting time in order to have time to work with the cement and to incorporate more powder in the mix , because the more powder you add the better properties you get and the less the acidity of the mix since the acidity is due to the liquid so I need to add more powder but if the setting was fast I will not have the chance to add more powder so I need to delay the setting .**

**-incremental mixing (the only cement) , you should be able to know by looking at pictures representing increments of powder being mixed that this is zinc phosphate cement.**

**-no need for hard mixing just you need to make sure you get the desired consistency .**

**Zinc polycarboxylate cement :**

**-has very weak properties**

**-some say it can be used as long term provisional cement**

**-still classified as conventional cements despite its weak properties**

**-its acidic but its PH can drop only to 4 not to 2 like the zinc cement so it doesn’t cause much pulp irritation , polyacrylic acid cements also don’t cause irritation because they are less acidic and they are large molecules and don’t enter the tubules .**

**-no cement stays acidic all undergo neutralization**

**-advantages:**

**1.reasonable working time**

**2.good compressive strength but not as good as zinc phosphate cement**

**3.some sort of adhesion to enamel and dentine thus reduces the micro leakage and increases the retention.**

**4.adequate resistance to water dissolution still less than zinc phosphate cements**

**Disadvantages :**

**1-low tensile strength**

**2-no resistance to acid dissolution**

**-recommendations : can be used to all types of preparations and some prefer to use it on vital teeth instead of zincphosphate cement but there is no evidence that its better on vital teeth.**

**-some times when you have a provisional crown that will stay for a year you use the zinc polycarboxylate cement**

**-during mixing this cement its viscous at the beginning but once you put it in the crown and you press on its not viscous any more.**

**Glass ionomer cement :**

**-adheres to tooth structure by bonding to hydroxylapatite crystals (its mineral contents)**

**-liquid of GI is either polyacrylic acid or water**

**-disadvantages :**

**1-senstive to humidity (water) it can absorb or lose water and in both cases the physical properties of the cement is affected , GI have three setting levels and it is especially sensitive to water during the 1st stage (initial phase ) this is why we cover the GI restoration the 1st 7 minutes with Vaseline or bonding agent**

**2-low tensile strength**

**3-not resistance to acid dissolution**

**4-intial acidity but undergoes neutralization faster**

**5-some times its associated with post operative sensitivity because it absorbs water from dentinal tubules**

**-recommendations : can be used with all types of crowns and all posts except fiber posts , also recommended with high risk of caries (because of fluoride release )**

**-resin modified Glass ionomer :**

**-hyperid cement (combination of resin cements and GI cement so it have properties of both)**

 **-can be used with all types of crowns**

**-available in different forms.**

**-advantages on GI:**

**1-higher tensile strength**

**2-less sensitive to moisture**

**-so its introduced to overcome the moisture sensitivity and low tensile strength of GI**

**-advantages :**

**1-good compressive and tensile strength**

**2-resisstance to water dissolution**

**3-flouride release**

**-this cement is a low track cement : it has been used for 20-30 years**

**-because it contains resin that could absorb water some times its not used with all ceramic crowns , because they are not very strong crowns because absorption of water will cause expansion underneath a relatively weak crown.**

**-can be used with ceramo-metalic crowns , zircon crowns , but not with glass ceramic crowns**

**-even with GI water absorption and expansion might occur**

**-usually glass ceramic crowns are cemented using resin cements**

**-resin based cements
-like composite are composed of resin matrix and an inorganic filler, and the resin matrix could be one of a variety of monomers or molecules like bis-GMA , HEMA, methylyacrylate**

**-filer content is less than composite because I want to use it as a luting agent I don’t want it to be viscous and thick , and it's not a restoration subjected to occlusal forces , Its only needed in a film thickness to give adhesive properties and good physical properties so the filer content should be less to have less viscosity**

**-if you saw the flowable composite you will notice that its less viscous than regular composite**

**-the resin modified GI is used in conjugation with dentine bonding agents ,some are self cure resin cements ,light cure, dual cure resin cements and some are self etch cements.**

**-you etch then bond your preparation when using theses cements (like composite)**

**-has a high tensile strength ,and very good properties in bonding to dentine.**

**-4 things in prosthodonticas cant be cemented with conventional cements & can only be cemented with resin cements**

**1-maryland bridge or adhesive bridge or resin bonded bridge : a bridge with 2 wings and rests on adjacent teeth of the pontic placed palataly and the resin used with this bridge are resin cements**

 **2-composite onlays and inlays \ceramic onlays & inlays : also cemented with resin cements**

**3-fiber posts**

**4-veneers**

**-resin cements can be used with metals and porcelain , how can they bond to porcelain ??**

**We etch and bond the tooth structure just like we do with composite and the crown itself should be etched using hydrofluoric acid (we don’t etch the ceramics with phosphoric etch) , etching of the ceramics will affect the silica part of the ceramics ( the ceramics contain fillers and glassy matrix which contain silica ) and the effect of etching the ceramic is the formation of micro pores , we will also use silane coupling agent to increase adhesion.**

**-advantages of resin cements :**

**Good compressive strength &high tensile strength -**

**-resistance to water ,&relatively resistance to acid**

**-can enhance the strength of ceramic restoration: meaning that the crown when not cemented is not as strong as when you add the cement to it , same principle as the undermined enamel we leave it in the cavity when we are doing composite restoration because the composite will bind to the tooth structure and will enhance the restoration.**

**- disadvantages of the resin cements is that:**

**1- they have variable film thickness , & the excess material is difficult to take out when its set**

**-usually when we use conventional cements like polycarboxylate you remove the excess once its set and it comes out easily , but this is not the case with resin cements what we do with these cements is that we do light curing for few seconds then remove the excess then finish the curing.**

**2-must be bound to tooth structure**

**-what are the indications of resin cements ? poor retentive preparation , but some times with a poor preparation no cement can give good retention**

**\*\*\*\*important notes :**

**-any cement should be manipulated according to manufacture recommendation**

**-each cement has specific advantage and disadvantage**

**-non of the cements can over come the poor preparation**

**-no cement is an ideal cement**

**\*\*\*\* how do we cement ??**

**-never attend the clinic to cement the crown if your patient is having signs and symptoms**

**-remove excess cement , and remove remaining provisional cement because for example eugenol in the provisional cement will inhibit the resin cement**

**-cleaning the crown could be in ultrasonic path, acetone, alcohol then leave the crown to dry on the bench , do good isolation (cotton roll , saliva ejector)**

**-some times with vital teeth you can give local anesthesia because teeth are sensitive when you remove provisional**

**-mix according to manufacture recommendations**

**-apply the material inside the crown and put extra cement because having excess cement means good cementation**

**-press at the beginning with your hands (on the crown) dont ask the patient to bite on it**

**-remove excess cement if conventional is used once your cement is fully set, use floss to remove excess interproximaly**

**-resin cements : remove excess before complete setting**

**-some times we use provisional cements on final crowns just in case you needed to make some adjustment on the crown**

**-post cementation is more difficult cause you need the cement to go in the canal so we use lentulo spiral we use it on the hand piece to deliver cement inside canal, or we can use special tips to inject the cement inside the canal (we can use resin or conventional cement )**

**-post space is very small so if you add too much cement it might get trapped inside canal and the post will not go inside the canal because it doesn’t fit any more**

**-some times posts have bends to have the excess cement out**

**-inlays and onlays : if the material you are cementing is ceramic them you have to etch it with hydrofluoric acid then apply silane coupling agent , if composite then you sand blast it and apply silane coupling agent on it but you don’t use hydrofluoric acid with composite , if its gold we can do tin plating to increase retention then we do sand plasting but we cant etch the gold and use acids on it**

**-hydrofluoric acid is not used with composite because I don’t want the silica in composite to be affected**

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