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CEMENTATION OF CROWNS AND BRIDGES

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INTRODUCTION

Cementation often does not receive the same attention to details as other aspects of restorative dentistry. Careless cement selection can result in margin discrepancies and improper occlusion and may even require cutting the restoration from the patient's mouth and making a new one. The choice of cement depends first on whether a conventional casting or an adhesively bonded restoration, such as a ceramic inlay or resin-retained fixed partial denture, is to be cemented. Traditional dental cements can be used for cast crowns and fixed partial dentures, but not where adhesion is needed.

Rules for cementation[2]

1. Use proper portions and methods of incorporation or mixing.
2. Both tooth and retainer be kept dry before, during and after cementation.
3. Both tooth and retainer must be clean.
4. The restoration be completely seated.
5. Continous pressure be maintained.
6. No air be trapped inside of crowns or retainers.
7. Keep liquid in well stoppered bottle and powder covered. Shake bottles well before using.
8. Don't use scratched instruments or slab.
9. Mix slowly and evenly.
10. Proper type cement for each case.
11. Proper shade, take shade in both natural and artificial light. Colour that approximates the tooth.
12. Mix sufficient or if in doubt mix too much. Keep slab cool. May use two mixes started at different times if a large quantity is needed.
13. Place soft wax in the inter proximal areas. This will control the cement and also aid in its removal. Dismiss the patient with wax in place, it will dissolve and come out.

Control of setting time

Hasten setting

1. Warm slab
2. Mix rapidly
3. Increasing amount of powder in mix
4. Using a finer powder

Lengthen setting time

1. Cold slab
2. Mixing of thinner consistency
3. Mix slowly
4. Using a coarse powder

Cementation of crowns[1, 2, 6]

I. Try on tooth before cementation, check for the following:

a. Retentive properties - (tenso-frictional grip).
b. Gingival adaptation.
c. Contact points - carbon marking on adjacent teeth, serve as an aid in proper determination.
d. Contour.
e. Anatomy present, grooves, marginal ridges etc.
f. Occlusion (protrusive, right and left lateral, centric)
g. Check shade - try with cement and water or glycerine (porcelain jackets). For trial cementation use glycerine rather than water. Water makes jackets appear too light especially the darker shades.
h. Check with X-ray for gingival overhang.
i. Any correction should be made now. Cut porcelain should always be reglazed.

II. Preparation of the tooth prior to cementation

a. Keep dry at all times, prevent gingival seepage.
b. Thoroughly clean preparation.
c. Sterilize - phenol, warm air plus alcohol, or a solution of alcohol and thymol.
d. Desensitize tooth structure (Na F, 33 1/3 %) or Ammoniacal AgNO3.
e. Apply cavity lining to preparation (Keep away from margins).

III. Cement crown to place

a. Thin mix - particularly in porcelain jackets.
b. Apply and coat preparation thoroughly.
c. Fill internal surface of crown.
d. Use crystals of thymol or fomaldehyde in cement liquid.
e. Use oil on external surface of crown - assists in removal of cement.
f. Mild astringent applied to soft tissue at dismissal.

Cementation of bridge [1,2, 5]

Test bridge before cementation by observing the following: (Must be clean internally)

1) All margins, particularly gingiva (Check with X-ray) must be covered.
2) Contact points - check with dental floss or by marking on adjacent teeth with pencil or carbon paper.
3) Verify Occlusion - protrusive, right, left, centric. Check with carbon paper or wax. Remove high spots before cementation, better done out of mouth than after bridge has been cemented.
4) Relation of pontic to ridge-Should have contact but no great pressure, should be one of stimulation.

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5) Final test - try bridge in without pontics, just the metal portion (see how it fits). Now-try in the pontics (see how they fit). If both are satisfactory, proceed.

Preparation of abutment teeth for cementation

1. If they have been free from saliva, protected with temporary covers, need only to remove crown or bridge, dry sterilize and cement.
2. If on the other hand such was not the case, use disclosing solution, glycerine and iodine or mercurochrome and them scrub teeth with pumice, tooth dried, sterilized, cavity varnish prior to cementation.

Treatment of Sensitive dentine

1. Use careful operative procedures. Avoid excessive thermal changes.
2. Always cover cut teeth, don't have excessive occlusion, many times this will produce hypersensitivity.
3. Can use - cavity varnish (thin solution).
   Ammoniacal Ag NO_3 reduced with eugenol
   Phenol Plus warm air
   $ZnCl_2$-6-10%
   Wash with 4% NaF. Repeat if necessary. Use polishing cups.
4. Buckley's paste - good to use after tooth preparation.

Cementation procedure for temporary bridge

a) Thoroughly clean the preparations.
b) Dry and phenol all preparations.
c) Coat the preparations with a cavity varnish.
d) Fill the internal areas of the abutment crowns with sticky wax. Heat and force to place.
e) Leave in place until adjustment is complete. Later when the patient is adjusted, the bridge is removed, thoroughly cleaned and permanently cemented to place.
f) When temporarily cementating large span restorations, observe carefully the excessive convergence of terminal abutment preparations.

Such terminal abutment teeth are in need of much support as possible

Cementation procedure for permanent bridge [1,2,6]

Thoroughly dry and sterilize all prepared teeth. Use phenol, and alcohol for anterior and silver nitrate for posterior sterilization. Incorporate 1 crystal of thymol in the cement liquid prior to mixing/ Mix the cement to a thin creamy consistency.

a) Apply cement to inside of retainers (completely fill).
b) Apply cement to abutment teeth.
c) Seat with firm pressure until excess cement is extruded out.
d) Have patient register one quick, heavy closure to verify if occlusion is correct, then have them immediately open again.
e) Maintain pressure from 8-10 minutes, then allov to set further under pressure for another 1(minutes. Can use - Dry foil. Keep dry at all time until completely set.
f) Remove excess cement.
g) In dowel teeth, cement is carried by cana pluggers.
h) Take post operative X-ray.
i) Cover all margins with cavity varnish and finish a later visit.

Difficulties in cementation [2]

a. Don't mix too thick. Complete operation quick mix thin.
b. Crowns may be in hyper occlusion.
c. Four grooves placed on inside of crown towar periphery directs cement outward.
d. Excessive saliva - might have to be controlled b medication.
e. Inaccessibility to area - may have to use hemostat for holding of restoration.
f. Can control inlays by having sticky wax on end c a tooth pick, onto which the inlay is fastened s that tooth pick will act as handle and can eas be detached when inlay is in cavity.

Procedure following cementation

a. Verify occlusion (test with paper, wax, etc).
b. Correct slight discrepancies which will preve trauma at some later time.
c. Bathe tissue with luke warm water, mild astringe etc. Clean out inter proximal spaces remo spindles of cement.
d. Massage soft tissue.
e. Take complete record of existing conditions a so record.

Patient education

a. Advise in care of appliance - syringes, too brushing dental floss, flexible rubber tip.
b. Demonstrate use of massage on soft tiss buccally and lingually
c. Use of proper mouth wash.
d. Need for periodic care, attention and regular den inspection with X-ray examination.

Method of bridge removal

Use care, many destroy preparation or castings.

(a) Some times difficult to remove after trial insertio
(b) Use removal buttons (part of sprue left on lingu can be removed at time of final polish.
(c) Use two strands of wire (Brass ligature wire), wra around each solder joint and bring together i common loop, then use an instrument in the lo exerting pressure in one steady direction.
(d) Use crown puller placed at some advantageo place on pontic backings away from margins o retainers.

Luting agents [2,4,6,7]

The different types of luting agents employed are :

1. Zinc phosphate cement
2. Zinc polycarboxylate cement
3. Glass ionomer cement
4. Zinc oxide - cugenol with and without EBA
5. Resin modified glass ionomer luting agents
6. Resin luting agents

Comparison of available luting agents

Luting agent type	Chief Advantages	Chief Concerns	Precautions
1. Adhesive resin	Adhesive, low solubility	Film thickness, history of use	Moisture control
2. Composite resin	Low solubility	Film thickness, irritation	Use bonding resin, moisture control
3. Glass ionomer	Fluoride release	Solubility, leakage	Avoid early moisture exposure
4. Reinforced Zinc oxide eugenol	Biocompatible	Low strength	Only for very retentive restorations
5. Resin ionomer	Low solubility, fluoride	Watersorption, history of use	Avoid with ceramic restorations
6. Zinc phosphate	History of use	Solubility, leakage	Use for "traditional" cast restorations
7. Zinc polycarboxylate	Biocompatible	Low strength, solubility	Do not reduce powder/liquid ratio

Indications for luting agent types [3,4,5,7]

1. Cast crown, metal ceramic crown, fixed partial denture
   - Adhesive resin, Compositeresin, Glass ionomer, Reinforced ZOE, Resin ionomer, Zinc phosphate, Zinc polycarboxylate
2. Crown or FPD with poor retention - Adhesive resin
3. Metal ceramic crown with porcelain margin
   - Adhesive resin, Composite resin, Glass ionomer, Reinforced Z0E, Resin ionomer, Zinc phosphate, Zinc polycarboxylate
4. Casting on patient with history of post-treatment sensitivity
   Reinforced ZOE or Zinc polycarhboxylate
5. Pressed, high leucite, ceramic crown
   Adhesive resin or composite resin
6. Slip cast alumina crown
   - Adhesive resin, Composite resin, Glass ionomer, Reinforced Z0E, Zinc phosphate, Zinc polycarboxylate
7. Ceramic inlay - Adhesive resin , Composite resin
8. Ceramic veneer - Adhesive resin, Composite resin
9. Resin - retained FPD - Adhesive resin, Composite resin
10. Cast post - and - core
    - Adhesive resin, Composite resin Glass inonomer, Resin ionomer, Zinc phosphate

Cement relief

The better a restoration fits the more essential is to provide space for the cement inorder to allow it to be completely seated after cementation. An internal relief of 25-35 is recommended, and the margins should be kept 1mm away from the finish line.

Cementation procedures for ceramic veneers and inlays[7]

a. Etching the fitting surface of the ceramic with hydrofluoric acid.
b. Applying a silane coupling agent to the ceramic.
c. Etching the enamel with phosphoric acid.
d. Applying a resin bonding agent to etched enamel and silane.
e. Seating the restoration with a composite resin luting agent.

DISCUSSION

Dental cements do not actually adhere in a chemical sense to the tooth surface or the metal. There is no attraction of unlike molecules. They must not be relied on to hold the casting in place. Such a concept can lead only to failure. The cement serves merely as a luting material to occupy the small space that exists between the restoration and the tooth. Even with a casting that visually fits perfectly, a minute crevice is present that is occupied by the cement. It is also theorized that the cement, provided it will extrude into a sufficiently thin film, will work as way into the irregularities in the tooth structure and in the cavity side of the casting. Upon hardening, the cement furnishes a certain amount of mechanical retention for the restoration. To keep this intimate adaptation and to avoid leakage, it is imperative that solubility be minimized and adequate strength be retained to avert fracture of these small projections of the cement.[3,7]

CONCLUSION

(1) Cemented restorations will serve satisfactorily over long periods of time
(2) Cemented restorations should be examined roentgenographically two or three times during the first year of service, then twice yearly.
(3) Great emphasis must be placed on the necessity for periodic clinical examination and inspection.
(4) Patients must be thoroughly instructed in mouth hygiene.
(5) The dentist and the patient must share equally the responsibility for the health and maintenance of all restorations. Failure on the part of either to cooperate may lead to difficulty and failure.

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