EVALUATION OF FOUR ADHESIVE SYSTEMS ON A METALLIC STRUCTURE NOT NOBLE FOR DENTAL PORCELAIN.

SUMMARY:

In this work was determined the adhesive value bonds of four cements, with its adhesion systems to a metallic alloy of Chromium-cobalt-Molybdenum. They were analysed microscopically the interphases produced between the materials in study and the dental alloy. It was determined that the resin cement produced minor interphases and major adhesive value that the glass ionomer cement.

INTRODUCTION:

In the actual prosthetic odontology it was granted great importance to the system of cemented of a fixed metallic structure. It is important remember that all the crown or incrustations must get friction to the dental structure.

The existent cements in the world market are:

* Zinc phosphate cement: Ceramic material with good mechanical properties and bad biocompatibility, not present any adhesion to the dental stucture, metallic, ceramic and organic.
* Glass ionomer cement:Ceramic material with good mechanical properties and better biocompatibility. It has specific adhesion to the dental structure and several dental alloys.
* Glass ionomer cement polimerizable: The aggregate of a resin to the glass ionomer convencional decrease the fragility of the material, the opacity and permits addit to the already known specific adhesion a mechanics through adhesive that form hybridization cape.

*Resin cement: These cements are materials composed with mechanical properties superior to other cements, with an incompatable aesthetics and with the possibility of getting micromecanics adhesion, specifics or both to several structure (dentine, enameels, alloys, poecelain and acrylic).

The resin cement was based in a matrix, a filling (until 75% by weight) and a silane. Its is hardening system can be light cure, self cure or both, in this last case was call dual cement. All adhesion micromecanic is based in microretentiones that its present in the substratum in question, capable of retaining to the adhesive material. If the adhesive cement incorporates in its composition phosphoretted group, 4Meta, Carboxiles can add its a specific adhesion to all structures that present ions capable of be won by the mentioned group.

A phrase doesn’t discussed by the investigators is: The obtained values intervening micromecanic adhesions, in adhesive systems dental is superior to the obtained by specific adhesions or chemical.

Resin cement can be used only or accompanied of a dentin adhesive. A dentin adhesive presents less percentage of filled than an adhesive cement, motives that grants to the material major fluidity, with capacity of penetrating easily in the rugosities of the substratum.

The Objetive of this work is:

- To determine microscopically the interphase produced between four cements with its
adhesive systems and an alloys for dental porcelain of chromium – cobalt – molybdenum.
- To compare between four dental cement with its adhesive respective the adhesion force to the dental alloy already mentioned.

METHODS and MATERIALS.

This study was realized with four cement called adhesives.

* Glass ionomer cement with resin: Protec Cem (PC) Vivadent: This material is based on carboxylics groups for united to the oxides to the alloy.

Powder:
Glass of Fluoridealuminimmsilicate of Barium
Ytterbium trifluoride
Dioxide of highly dispersed silicon
Initiators and pigments

Liquid:
Methacrylate modified of polyacrilic acid
Hema
Dimethacrylates
Water

Middle of the size of the particle 7.5 um
Material of doubly hardening system, acid - base reaction and autopolymerization.

* Resin cement Relyx ARC (R) (3 M). Jointly with an adhesive monocomponent, Single Bond (SB) (3 M)
  Middle of the size of the particle 1.5 um.

Composition. Single Bond:

Water
Etanol
HEMA
BISGMA.
Dimethylacrylates,
Methacrylate with the Copolimero of the polyacrilic and itaconic acids.

Lightcure hardening system.

*Resin cement High Q Bond (HQ) (BJM) with its adhesive monocomponent Prima 97 (P97) (BJM)

Composition. Prima 97:

TEGDMA
UDMA
HEMA
Glutaraldehyde
Acetone
Initiators

* Resin cement  ABC dual (ABC) ( Vivadent ) with its acondicionator(A) on the basis of acid phosphoric.

* Chromium - molybdenum - cobalt alloy PREMIUM.

Microscopy:

It had been accomplished two test tubes for each system cement - alloy or cement-adhesive-alloy, this last cast and treated in forms similar to a metal framework for porcelain (oxidized and not sanded ). The test tubes went submerged in oral solution NAF laboratory during 48 hours. The possible interphases went observed with a SEM Its marks Jeol model T-100 maximum increase 75 000.

Test of adhesive resistance:

It made 8 test tubes for each adhesive system.

The test tubes went realized by a mechanism of cast. The test tube has 2 mm of thickness for 3 cm long and 1 cm breadth cm, in one of the extremes of each test tube was made a circular perforation of 0.4 cm of equidistant diameter of the breadth of the rectangle, this orifices went necessary for to place a wire and It can support it to the machinates of cuts. Before preparing the cements all the test tubes went oxidized simulating the work of necessary laboratory in an alloy for dental porcelain.

The test tubes went separated in four group that was manipulated of the following manner:

**Group 1**: Glass Ionomer cement with resin.

It was prepared material with three liquid drop for a dust scoop ( indication of the manufacturer ), itself mixed during 30 second, therefore the material placed on a surface of 1 cm² in one of the extremes ( opposite side to the orifice ).

It was waited 1 hour before submerge it in artificial saliva.

**Group 2**: Resin cement HQ + P97

It was painted with the adhesive P97 on each one of the car of the test tubes, it waited 15 second, therefore was extended and Photocure the adhesive during 20 second with a lightcure unity XL 2500 ( 3 M ). To continuation was gotten on a satined paper partly equals of the base and catalyst pastures of the adhesive cement HQ and was extended on
P97 and photocure. It waited the autopolymerization. Then they went submerged in artificial saliva

**Group 3**: R + SB.

It had accomplished the same procedure that for the group 2, making the reservation in the photopolymerization times of the adhesive monocomponent, in the Single Bond is 15 second wait and 10 second of photopolymerization.

**Group 4**: Resin cement ABC + A

It had accomplished the same procedure that for the previous group, with the difference that the acondicionator is not cured.

The four groups went studied with a machinates universal Instron model 4483 with displacement of 2 mm/min. Once produces the separation between the alloy and the alloy went observed by optic microscopy to determining if the fault went cohesive in the material or adhesive between the adhesion system and the alloy.

RESULTED:

Microscopy:
Of the microphotography obtained went determined the following resulted:

**Group 1**.

Went observed in this group very notorious interphases.
In the microphotography N°1 It was observed cavernous zone very definite formed between the cement and the alloy, values 10 μm.

![Cement Interface Alloy](attachment:image)

**microphotography N°1 x 500**
Group 2.

The interfaces observed went least, between adhesive - cement 1.5 um and adhesive - alloy 1 um

![Microphotograph](image)

microphotography N°2 x 500

Group 3.

Here the interfaces are partially minor to the group 1 and major to the 3, with values of 5um so much for the adhesive cement union as for the interface of the adhesive to the alloy.

![Microphotograph](image)

microphotography N°3 x 500

Group 4.

The value of the interfaces between the cement and the adhesive was 2 um, between the adhesive and the alloy is in 3um

In the microphotography N°4 it was observed that the interfaces produced are some major to the group N°2
Test of adhesive resistance:

The result obtained of the forces adhesive on load of cuts are observed in the following table:

<table>
<thead>
<tr>
<th>MATERIALS</th>
<th>Values in MPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protec Cem (Vivadent)</td>
<td>4.9 ± 0.5</td>
</tr>
<tr>
<td>High Q Bond + Prima 97 (BJM)</td>
<td>18.4 ± 2</td>
</tr>
<tr>
<td>Relyx ARC + Single Bond (3M)</td>
<td>14.7 ± 3</td>
</tr>
<tr>
<td>ABC Dual + Aconditioner (Vivadent)</td>
<td>16.1 ± 3</td>
</tr>
</tbody>
</table>

ACKNOWLEDGMENTS:

In base to the results obtained we arrived to the following conclusion:

Microscopy.

1- The interfaces produced between chromium – molybdenum – cobalt alloy and the resin cements is manifestly minor to the interfaces found between the Glass Ionomer cements with resin and the dental alloys.

2- The interfaces produced between chromium – molybdenum - cobalt alloy and the resin cement High Q Bond with adhesive monocomponent Prima 97 ( BJM ) resulted lesser than that the obtained by the system Relyx ARC- Single Bond ( 3 m ). And ABC Dual - Acondicionator ( Vivadent )
Adhesion values:

If it observes the result table concludes we said that the resin cements produced a better adhesion to certainly alloy structure than the Glass Ionomers cements with resin. We suppose that the Glass Ionomers cements are based in carboxil group for unite to the oxides of the alloy but its chemical unions and size of the particles decrease the fluidity, obtained value minors. The dentin adhesive (material that takes contact with the alloy) not presents elements capable of unite chemically to the metallic structure. It presents an optimal fluidity by its low superficial tension and the size and percentage of particles. Is the equal importance the union of the cement to the adhesive that of the adhesive to the alloy, this is due to that if it occurs a cohesive fault the values of the adhesive system-metal is disesteemed.

The difference in the composition between the adhesive Prima 97 and the rest can be the causer of the differences in the adhesive values obtained. To ending the conclusions we determined that the existence of a intimate relation between the interfaces observed by SEM and the adhesion values obtained by load of cuts. The product High Q Bond + adhesive monocomponent Prima 97 is the material that better adhesion gets to the alloys for dental porcelain based on chromiums - molybdenum - cobalt.
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