

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-Molibdenum. 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 than 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 structure, 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 polymerizable: The aggregate of a resin to the glass ionomer conventional decrease the fragility of the material, the opacity and permits add to the already known specific adhesion a mechanics through adhesive that form hybridization cap.

*Resin cement: These cements are materials composed with mechanical properties superior to other cements, with an incompatible aesthetics and with the possibility of getting micromechanics adhesion, specific or both to several structure (dentine, enamels, alloys, porcelain 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 micromechanic is based in microretentions that its present in the substratum in question, capable of retaining to the adhesive material. If the adhesive cement incorporates in its composition phosphoretic 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 micromechanic 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 Objective 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 carboxiles groups for united to the oxides to the alloy.

Powder:

Glass of Fluoridealuminiumsilicate of Barium
Ytterbium trifluoride
Dioxido 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,
Dimethacrylates,
Methacrylate with the Copolímero 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 conditioner(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 interfaces were observed with a SEM Its marks Jeol model T-100 maximum increase 75000.

Test of adhesive resistance:

It made 8 test tubes for each adhesive system.

The test tubes were realized by a mechanism of cast. The test tube has 2 mm of thickness for 3cm 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 were necessary for to place a wire and It can support it to the machinates of cuts. Before preparing the cements all the test tubes were oxidized simulating the work of necessary laboratory in an alloy for dental porcelain.

The test tubes were separated in four groups that were manipulated of the following manner:

Group 1 : Glass Ionomer cement with resin.

It was prepared material with three liquid drops for a dust scoop (indication of the manufacturer), itself mixed during 30 seconds, 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 faces of the test tubes, it waited 15 seconds, therefore was extended and Photocured the adhesive during 20 seconds with a lightcure unit XL 2500 (3 M). To continuation was gotten on a saturated 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 photopolimerization times of the adhesive monocomponent, in the Single Bond is 15 second wait and 10 second of photopolimerization.

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 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:

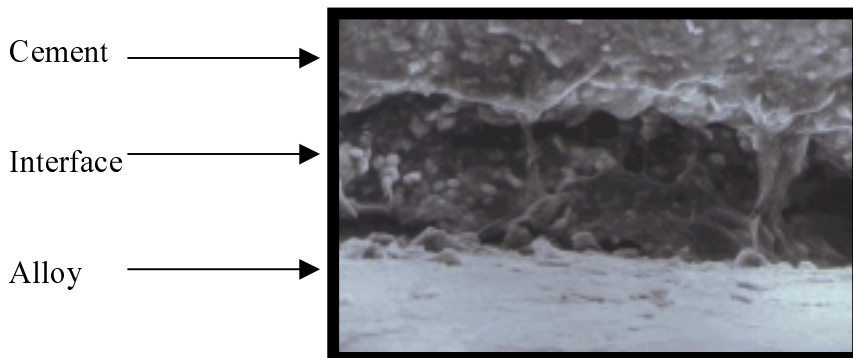
Microscopy:

Of the microphotography obtained went determined the following resulted:

Group 1.

Went observed in this group very notorious interphases.

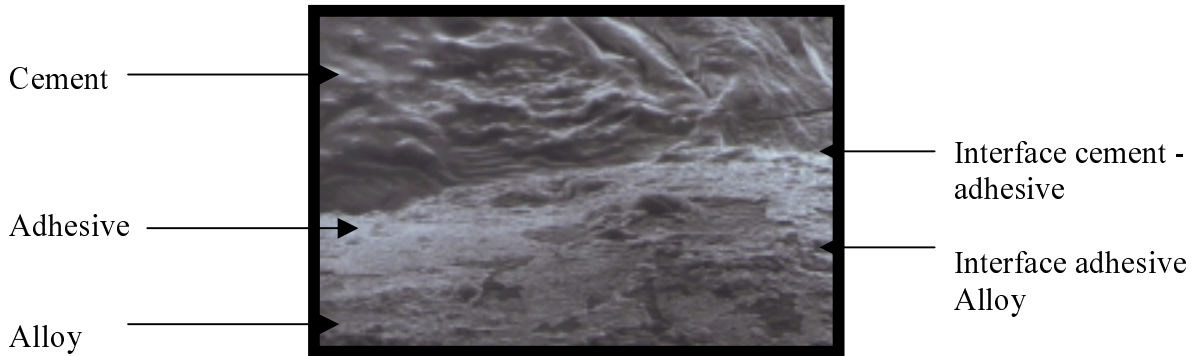
In the microphotography N°1 It was observed cavernous zone very definite formed between the cement and the alloy, values 10 um.



microphotography N°1 x 500

Group 2.

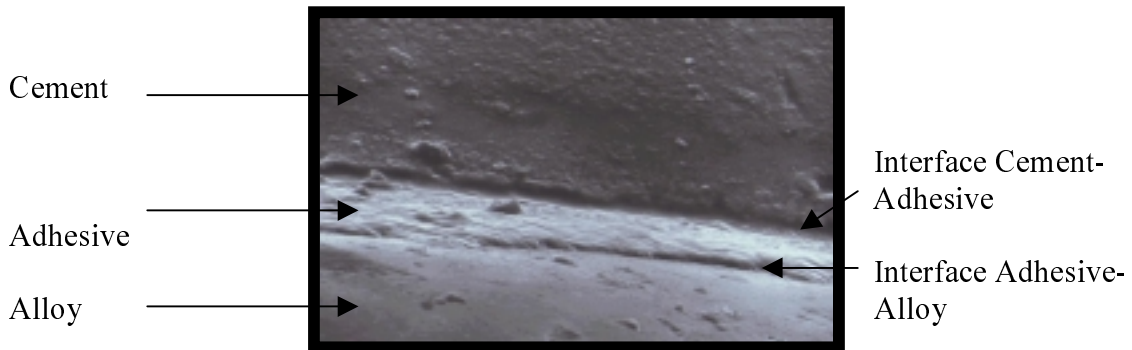
The interfaces observed went least, between adhesive - cement 1.5 um and adhesive - alloy 1 um



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.

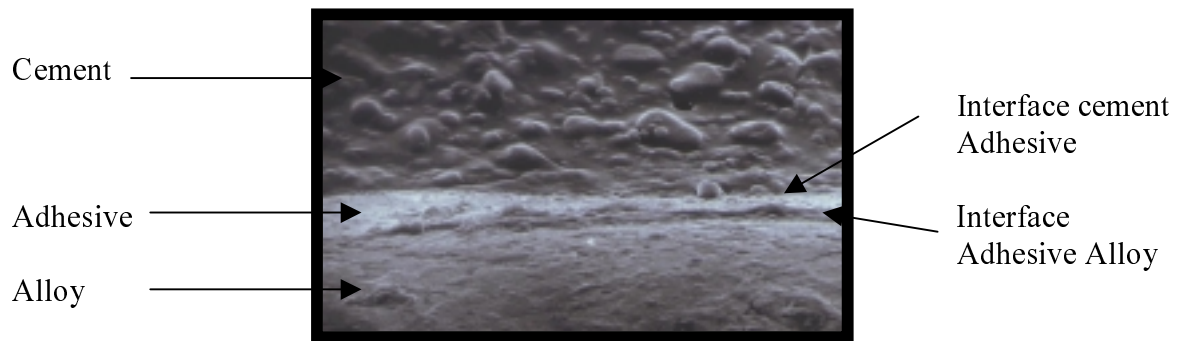


microphotography N°3 x 500

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



microphotography N°4 x 500

Test of adhesive resistance:

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

MATERIALS	Values in MPa
Protec Cem (Vivadent)	4.9 +-0.5
High Q Bond + Prima 97 (BJM)	18.4 +- 2
Relyx ARC + Single Bond (3M)	14.7 +- 3
ABC Dual + Aconditioner (Vivadent)	16.1 +- 3

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 - Aconditionator (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.

Bibliografia:

- 1- BARRACK, G. - Etched cast restorations. A five year review. N.Y. State Dent J. 51:220-222, 1985
- 2- BOWEN,R.J. - Dental Fillings material comprising vinylsilane treatment fused consisting of the reaction product of bisfenol and glycidil acrylate. EUA. Pat 30661122, nov.1962
- 3- BUONOCORE,M.G.A. - A simple method for increasing the adhesion of acrylic filling materials to enamel surface. J.Dent Res 34:849-853, 1955
- 4- COSTA,L.C.R. - Prótese fixa adesiva (retenção com tela). Rev. Ass. Paul. Cir.Dent. 40:416-421, 1986
- 5-CREUGERS,N.H.J. & KAYSER,A.F. - An analysis of multiple failures of resin bonded bridges. J.Dent Res. 20:348-351, 1992
- 6- GODOY.F.G. - et al -Shear bond strength of two resin adhesives for acid-etched metal prostheses. J.Prosth Dent. 6:787-789, 1991
- 7- HOWE,D.F. & DENEHY, G.E. - Anterior fixed partial dentures utilizing the acid etche technique and cast metal framework. J.Prosthe Dent 37: 28-31, 1977
- 8-LIVADITIS, G.T. & THOMPSON ,V.P. - Etched casting : An improved retentive mechanisms for resin bonded retainers. J.Dent Res 47:52-58, 1982
9. Mc LEAN J.W. Glass ionomer cements. Br. Dent. J. 164(7): 293-300, 1988.
10. Mc LEAN J.W. Cementos de ionómero de vidrio. Quintessence Ed. Esp. 4(5): 273-279, 1991.
11. Mc LEAN J.W. Evolución de los cementos de ionómero de vidrio: una visión personal. J. Esth. Dent. Ed. ESp. 5(1): 6- 20, 1995.
- 12- MONDELLI, J. -Ligas Alternativas para Restaurações Fundidas. Ed. Panamericana, 1995
13. SIDHU, T.F. WATSON Failure Mechanism of a New Modified Glass-ionomer Bonding System, , UMDS Guy's Hospital, London, UK, Journal of Dental Research 1997: 76 (5): Irish division, Abstract 22
- 14- ROCHETE, A.L. - Attachment of a splint to enamel of lower anterior teeth. J. Prosth Dent 30: 282-291, 1973
15. WHITE, S. ET AL., Compressive and Diametral Tensile Strengths of Current Adhesive Luting Agents.JPD, Vol 69 No. 6 June, 1993
16. WHITE, S. ET AL., Adhesive Cements and Cementation. CDA Journal, Vol 21, No 6, June, 1993
17. ASSMUSEN, E. ET AL., Adherence of Resin Based Luting Agents Assessed by the Energy of Fracture. ACTA Odontol Scand. 51, 1993
18. WHITE, S. ET AL., In Vivo Microleakage of Luting Cements for Cast Crowns. JPD, April, 1994
19. WHITE, S. ET AL., Physical Properties of Fixed Prosthodontic Resin Composite Luting Agents. Int'l Journal of Prosthodontics. Vol 6, No. 4, 1993 Data Available upon Request.

20.YAMADA, N. KANEMURA, S. INOKOSHI, J. TAGAMI Tensile bond strength and interfacial ultrastructure of a new resin bonding system based on a glass polyalkenoate cement, T, Medical & Dental University, Tokyo, Japan, IADR 1996,Abstract 1920