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## Effect of Cavitory Antiseptics Prior to Conventional Bonding in Vitro

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### Abstract

The purpose of the current research was to determine whether variation in the application of cavity antiseptics on the enamel surface of third molars prior conventional adhesion impacts or not on the tensile strength of direct restoration of resin. Four groups of 10 third molars were prepared, which were organized as follows: in group A, 2.5% sodium hypochlorite was placed on enamel surface; in group B, 2% chlorhexidine was placed on enamel surface; on group C, chemically pure calcium hydroxide was used; on the control group no antiseptic was used. Results showed the following figures: group A an average of 8.63 Mpa, much higher than the pattern (5.96Mpa); group B an average value for strength of 5.43 Mpa, which is lightly lower than the pattern; group C 3.19 Mpa, much lower than the pattern. It was concluded that the use of disinfectants, mostly sodium hypochlorite 2.5% increases the enamel-resin adhesion strength.

Keywords: Sodium hypochlorite, Chlorhexidine, Calcium hydroxide, Adhesion, Tensile strength.

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### Overall Objective

To determine the effect of cavitory antiseptics after conventional adhesion.

### Specific objectives

To evaluate the resistance to adhesion produced by the group in which 2.5% sodium hypochlorite, 2% chlorhexidine and calcium hydroxide were used. To compare whether there is a significant difference in resistance to adhesion between the control group and those groups given the antiseptic. Check which of all cavitory antiseptics is the most recommended in adhesion

### Introduction

Nowadays, microorganisms are linked to carious processes, being progressive lesions caused by a number of factors such as poor hygiene, eating habits, and even in certain literatures it has been proven that caries are genetic. Seeing the importance of placing chemical substances or

also called cavitory antiseptics before a conservative, aesthetic and definitive restoration in order to eliminate bacteria to be sure that it cannot cause possible secondary cavities. It was decided to carry out this type of study to find the greatest effectiveness and discrepancy between the three agents under study in order to obtain results in which the adhesion to the tooth enamel is greater, thus obtaining a high tensile force. In this sense, the concern to leave the cavitory preparation free of microorganisms to avoid the possibility of reactivation of the carious process after the restoration of the tooth is quite relevant. On top of that, you can't help but consider the importance of a cavitory seal. A faulty seal can lead to contamination and compromise the restorative procedure, regardless of whether or not cavitory cleaning has been performed. This leads us to suggest that cavitory cleaning with the aforementioned solutions could help prevent the reactivation of the carious process and that the few microorganisms that may have remained after the cleaning of the cavity were not enough to cause the progression of caries. This is probably due not only to the removal of the decayed tissue through cavity preparation, but also to the washing of the cavity and the correct sealing of the cavity with the

### **Materials and Methods**

In the present research, a study was developed according to the characteristics and scope of the experimental, in vitro, cross-sectional and comparative results. Experimental: Because there were three groups consisting of 2.5% sodium hypochlorite, 2% chlorhexidine and chemically pure calcium hydroxide and a control group to which the independent variable was applied and the results obtained were analyzed. immediately after obtaining the results of the variables. In vitro: Because the research was carried out on specimens that serve to obtain tensile forces, the conditions of the research being manipulated in a laboratory. Comparative: Because the data were compared according to the independent variant.

The research was carried out at the National Polytechnic School Department of Mechanical Engineering under the direction and supervision of Eng. Víctor Hugo Guerrero, PhD. head of the Laboratory of Stress and Vibration Analysis.

### **Modality and type of research**

The research modality is quantitative, since the data obtained were statistically processed, and consists of collecting and analyzing numerical data.

The type of research is descriptive in that it describes, defines, classifies and summarizes the characteristics of the population.

## **RESEARCH TECHNIQUES**

### **Observation and Diagnosis**

In each patient, the prevalence of gingivitis and other oral pathologies could be observed just by inspecting their oral cavity and the necessary information could be collected for the analysis of the results.

### **Sample for study application**

Due to the characteristics of the population, the sample selection was with values of 32

### **Sample selection for research**

The sample of this project is made up of 31 human third molars, obtained from different dental clinics whose dentists helped in the collection, from the period of October 2013 to February 2014, from which 60 third molars were obtained, according to the exclusion and inclusion criteria and by calculating the sample by means of a statistical formula. 31 pieces were chosen as the number of samples was obtained on purpose.

## DATA ANALYSIS TECHNIQUES

In the present study, there is a qualitative and descriptive modality, the information collected from different sources allows a comparison and relate the results of previous studies with the findings of the current work.

### CONTENT ANALYSIS

#### Inclusion criteria

Third molars.

Healthy teeth.

Teeth without carious processes.

Teeth that have finished their formation.

Teeth without fractures.

Teeth with crowns and full roots.

Teeth with closed apex

#### Exclusion Criteria

Teeth with tooth decay or trauma.

Teeth with restorations.

Fractured teeth.

Teeth with root canal teeth.

Teeth with dental fluorosis.

Teeth that have not fully formed.

### Results and Discussion

In the development of the research, the results were carried out in the universal testing machine THINIUS OLSEN H25 KS, which were in Newton (N) and Mega pascals (MPa). The data contained in a report, prepared for this purpose, with this information with the help of the program, were attached tables and graphs based on the variables and 31 performing the statistical method of the three samples carried out at the National Polytechnic School Department of Mechanical Engineering.

### SAMPLE COLLECTION.

Each of the 31 teeth, specifically third molars, previously extracted due to therapeutic situations such as discomfort, pain, poorly positioned teeth, problems in chewing, orthodontic treatments that are donated for this study, are preserved in saline solution because it has an osmolarity of 280 mosm/Kg and a pH of 7.0, it is sterile, so it is an acceptable means of conservation. in a closed container at 5 degrees Celsius in refrigeration which was controlled with a thermometer so that there is no variation in temperature from its extraction until the laboratory phase is carried out.



### **SAMPLE PREPARATION**

All teeth are subjected to a cleaning process, in order to eliminate any organic element, and mucous membranes, present as remains of soft tissue, with periodontal cures and subsequent prophylaxis of the same, with micro motor, prophylactic brush, pumice stone and washes with drinking water from the triple syringe, since this is strictly controlled and suitable for health containing 1 part per million of chlorine.

### **ENAMEL REMOVAL.**

Three millimeters of enamel were measured from the top with a high-precision caliper, delimiting the dimensions on the surface of the tooth using a marker, the cut was made with a high-speed micromotor and 3M tungsten carbide disc, which was replaced every 4 cuts to remove tooth enamel under constant irrigation with a triple syringe. thus, obtaining a flat surface, which was polished with 60 grit sandpaper.



### **Surface disinfection.**

As a first step for the restoration, it was the disinfection of the surface with cotton moistened with three variants such as 2.5% sodium hypochlorite, 2% chlorhexidine and chemically pure calcium hydroxide to which distilled water was added, to clean, moisten and above all disinfect the surface, reducing postoperative sensitivity and risk of infection. holding it for 15 seconds, the time needed to produce its antimicrobial action on enamel and inhibiting bacterial growth and colonization



**GROUP A:** Samples belonging to this group were placed with 2.5% sodium hypochlorite for 15 seconds on enamel, applied with a cotton swab. The surface of the teeth is washed with drinking water for 10 seconds and dried with absorbent paper for 7 seconds, without drying out the enamel, according to the manufacturer's instructions.



**GROUP B:** In this group, 2% chlorhexidine was applied to the tooth surface for 10 seconds in enamel, applied with cotton swabs. The surfaces of the teeth are washed with drinking water for 10 seconds and dried with absorbent paper for 7 seconds, without drying out the enamel, according to the manufacturer's instructions

**GROUP C** In this group, chemically pure calcium hydroxide was placed on the surface of enamel added with saline solution to obtain an aqueous consistency to be placed for 10 seconds in enamel, applied with cotton swabs. The surface of the teeth is washed with drinking water for 7 seconds and dried with absorbent paper for 7 seconds without drying out the enamel, according to the manufacturer's instructions.



### Sample Pattern

The third molar acts as a pattern, no cleaning agent is placed on the surface. The surface of the tooth is washed with clean water for 10 seconds and dried with paper towels for 7 seconds, without drying out the enamel, according to the manufacturer's instructions.

Placement of the conditioner on the tooth surface.

The tooth surface is conditioned with 3M Batch PHOSPHORIC ACID: N442703 37%, to demineralize and form a microporous surface for 10 seconds in enamel

Application of the adhesive system. Afterwards we used the fifth-generation SINGLE BOND 2 adhesive system of the 3M Batch: N454302, we gently applied two consecutive coats of adhesive to the enamel previously engraved with the help of brush, thinning the adhesive with soft, uncontaminated air for 5 seconds to evaporate the solvents and photopolymerized for 10 seconds, according to the manufacturer's instructions.



Placement of the resin.

We finish with the application of the restorative material resin Z350 XT 3M ESPE BODY color A2 Lot: N415846, using the incremental sealing technique, each layer of approximately 2 mm, with the help of titanium gutta-percher, the resin was placed little by little and thanks to the spiral shape of the eyebolts the resin adapted in a good way at the time of polymerizing it for 30 seconds with an LED light lamp since it only produces wavelength in the desired range It can also be decontaminated as it does not have ventilation filters.

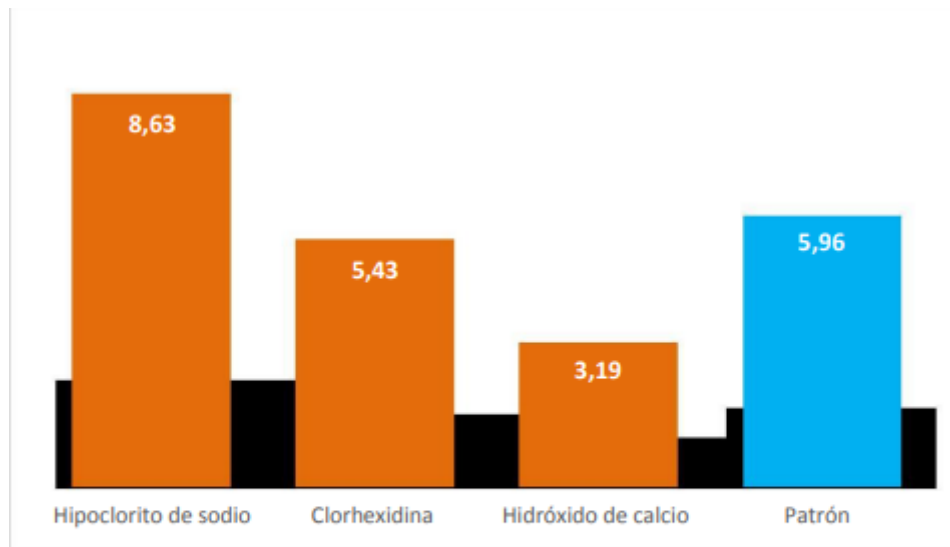
The tensile strength data were delivered by means of a LAEVMAY.07 report by the Stress and Vibration Analysis Laboratory of the National Polytechnic School and can be seen in annex N°1 This information was organized in a database in the statistical package SPSS v 22 in Spanish of IBM. thanks to which it was possible to perform both descriptive and inferential statistical analysis. Measures of position, central tendency and dispersion were estimated for the resistance variable, and then the ShapiroWilk test was developed, which determined that the data of each group presented a normal distribution behavior, since in all cases a p significance was obtained  $>0.05$ . Under this condition, the parametric ANOVA and Student's t-tests could be applied according to the objectives of the research. The results can be seen in the following tables and graphs. Table 1: Descriptive Resistance Statistics by Group

Grupo	Mínimo	Mediana	Máximo	Desviación estándar
Hipoclorito de sodio	7,25	8,30	11,24	1,20
Clorhexidina	3,92	5,48	7,12	0,82
Hidróxido de calcio	1,92	3,05	4,82	1,01
Total	1,92	5,48	11,24	2,48

Fuente: LAEV- MAY.07

Elaborado por: Catalina Suarez

### AVERAGE RESISTANCE PER GROUP



Fuente: LAEV- MAY.07

Elaborado: autor

The group treated with hypochlorite had a mean value of 8.63 Mpa much higher than the standard (5.96Mpa). The chlorhexidine group had a mean resistance value of 5.43 Mpa, slightly lower than the standard value. On the other hand, the group in which calcium hydroxide was used had a value of 3.19 Mpa much lower than the standard.

ANOVA de un factor						
Fuente		Suma de cuadrados	gl	Media cuadrática	F	Significancia (p)
Resistencia (Mpa)	Inter-grupos	149,460	2	74,730	71,354	0,000
	Intra-grupos	28,277	27	1,047		
	Total	177,737	29			

It was observed that the significance of the test was  $p = 0$ , which could conclude that the average resistance of the groups of samples presented between the three disinfectants is different. It was necessary to complement the analysis with Tukey's post hoc test, the results are presented

### Conclusion

When evaluating the resistance to adhesion prior to the application of cavitory antiseptics, it was concluded that the use of the antiseptic affects or modifies the resistance in adhesion.

It was observed that the use of 2.5% sodium hypochlorite significantly improves adhesion resistance compared to the standard sample, the use of 2% chlorhexidine showed no difference in resistance with the control group, and calcium hydroxide shows a lower difference than the control group.

Sodium hypochlorite at 2.5% presents on average a better resistance to adhesion compared to the other antiseptics studied, improving the value of the adhesion obtained by 44.7% in relation to the standard sample.

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