



The effect of the petroleum jelly on the hardness of Zinc Oxide Eugenol dental cement

Dr. Bassam Afram Hanna . B. D. S., M. Sc. *

Abstract

Dental cement is one of few materials which have been developed specifically for dental use, most of the other dental materials have been borrowed from other environment and then modified to meet the particular requirements of dentistry ⁽¹⁾.

The zinc oxide eugenol is one of the most dental cement that is used as a base material beneath metallic dental restoration and as an insulating temporary filling material and cement temporary crown, it is required to improve the physical properties of zinc oxide eugenol in order to be superior than other cement, notably in respect of its palliative effect on the pulp so the addition of additives such as O – ethoxy benzoic acid (EBA) and polystyrene may increase the strength of ZOE cement ^(2,3,4,5,6,7), such additives may have a deleterious effects on the film thickness and solubility ^(8,3,9).

Zinc oxide are mixed with eugenol the mix sets to a hard cement, it is supplied as a powder and liquid or two pasts system, Simple mixed of these plain two materials harden in the mouth in about 12 hours ⁽¹⁾ but did not have great strength when compared with other types of cements ^(11,12), An attempt to achieve a convenient setting time and strength of cement changing the ratio of base to accelerator has been advocate ^(6,7,13).

So generally recognized or as a company suggestion to improve the handling and physical properties (hardness) of commonly used temporary ZOE cement by combining it with a mixture of semisolid saturated hydrocarbons lubricant of petroleum jelly ⁽¹⁴⁾.

Aim of Study: Comparing (in-vitro) the hardness of Zinc Oxide Eugenol cement before and after adding different amount of Petroleum jelly.

Key Word: Zinc Oxide Eugenol, Dental Cement, Petroleum Jelly.

Materials and method

Three groups of specimen were prepared, the group A consisted of 9 specimens, pure mixture of zinc oxide and hardener (mfd. Golchadent/zeinalist) the mixture consist of equal quantities of both materials according to manufacture instruction.

Group B, 9 specimens contain also equal amount of the zinc oxide and hardener added to it petroleum jelly (Med pharme phdrma and chem..) with an amount of 1.25% (0.62ml) of the mixture quantity.

The group C, 9 specimen contains the same amount of the zinc oxide and hardener added to it petroleum jelly

* College of Medical and Health Technology, Dental Technology Department

with an amount of 2.5% (1.25ml) of the mixture quantity.

In order to have the same specimens with equal diameters, thickness and shapes, a strip of paracetamol tablets was used as a mold. The diameter of the mold is (13 mm), thickness of (5mm), and the volume of (0.5ml). A hypodermic disposable syringe (5ml) of 10 graduations is used as a measure container for the zinc oxide eugenol cement as well as petroleum jelly.

* Working the mixture:

Group A specimens

- 1- The piston was pulled out of the syringe and the cylinder of the syringe was filled with zinc oxide to the level of (5ml), same was done with another syringe for the hardener.
- 2- The content of both of syringe was poured on clean cement slab by pushing the piston of each syringe to the end.
- 3- The mixture was enough to makes exactly 9 samples, thoroughly mixing the two materials exactly according to the specification given by the manufacture.

All 9 small molds were filled avoiding leaving bubbles by putting the mass in the center of the mold and moving it toward the boundaries so that all volume is filled homogenously, then put a glass slide over all of each mold and pressed gently in order to get a flat surface then left on the mold leaving the samples in a dry clean container under 20-25C' for 2 days.

Group B specimens

The amount of ZOE and the hardener is reduced by the same amount of additional of petroleum jelly percentage; addition of 0.6ml of

petroleum jelly removes 0.6ml from ZOE and hardener (0.3ml for each ZOE and hardener).

Group C specimens

The amount of hardener was reduce either as the same amount of addition of petroleum jelly, adding 1.25 ml of petroleum jelly ,and removing 0.6ml from both ZOE and hardener.

* Brinell Hardness Test:

In the Brinell hardness testing machine, a hardened steel ball was pressed into the surface of specimen under a known load, for a definite period of time.

The diameter of indentation produced was measured by means of a low power microscope with a calibrated eye piece.

For dental use a small machine was often used which applies a light load to a small steel ball. This machine is called the micro-Brinell tester .It enable small test piece to be used and is more accurate in lower range of hardness.

Results

A small tungsten carbide ball (5mm) in diameter when subjected to a weight of (300 N) in testing the brinell hardness of a material. The penetration remains in contact with the specimen tested for a (10 sec.) after which it is removed and indentation diameter is carefully measured with a microscopic view of indentation show the diameter of penetration and a ratio of the load applied to the area of the indentation produce the formula of computing the B.H.N. is as follow⁽¹⁵⁾.

$$H Br = 0.102 * 2 * F / \pi D (D \sqrt{D2 - d2})$$

$$F = 300N$$

$$\pi = 22/7$$

D = 5 mm

d2 = Diameter of indentation for each specimen.

Discussion

ZOE cement can be modified to gain wide range of hardness properties simply by adding modifiers such as a petroleum jelly⁽¹⁰⁾, it act as a modifier on a ZOE cement hardness by adding a certain amount (% of weight or volume) to the mixture of ZOE.

By comparing between the statistical result of the hardness of the group A specimen with that of the modified one with petroleum jelly it is recognized that the hardness of group A is highly significant than that of the group B and group C, while the statistical result was significant between group B & C.

The comparison between the mean of hardness of three groups shows that by adding petroleum jelly to the mixture of ZOE will lead to decrease in hardness, A simple calculation of the mean values of the specimen show that when adding 1.25% of petroleum jelly to the mixture of ZOE cement cause a decrease in hardness of about 25% from group A, and when adding 2.5% of petroleum jelly will decrease of about 50% from group A.

This is may be due to the chemical react between the petroleum jelly and the elements of the zinc oxide that may modify the setting reaction and affect on the cohesion force between these elements after setting which affect on the hardness.

Conclusion

It is found that by adding a petroleum jelly to the temporary filling the physical properties of ZOE mixture will be inferior so that it reduce the hardness of the ZOE, it can be conclude that petroleum jelly is not a

practical modifier to be used in dentistry filling.

In this case another study is needed to improve the physical property by adding a biocompatible modifier.

References

- 1- **John N.** Applied Dental Materials. 3rd edition, 1972-1976.
- 2- **Philips R.W, Love D.** The Effect of Certain Additive Agent on the physical properties of ZOE matrix. *Journal of Dental Research* 1961; 40:294-303.
- 3- **Norman Rd, Philips R, Swartz MI.** The Effect of Particle Size on The physical properties Of ZOE Mixture. *Journal of Dental Research* 1964; 43:252-262.
- 4- **Civjan S, Huget E, Wolfhard G, Teal.** Characterization of ZOE Cement Reinforced with Acrylic Resin. *Journal of Dental Research* 1972; 51:107-114.
- 5- **Silvery R, Myers G.** Clinical Study Of Dental Cement , A Study of Zinc Phosphate Reinforced ZOE and Poly Acrylic Acid Cement As luting Agent in Fixed Prosthesis . *Journal of Dental Research* 1977; 56:1215-1218.
- 6- **Jendersen M, Philips R, Swartz M.** A Comparative Study Of Zinc Oxide And Eugenol Formulations As Restorative Material. *Journal Of Prosthetic Dentistry* 1999; 21:176-183.
- 7- **Drauer, McLaughlin R, Huget E.** Aluminum Oxide As Reinforcing Agent For Zinc Oxide Eugenol- Ethoxybenzoic Acid Cement. *Journal Dental Research* 1969; 21:300-309.
- 8- **Wilson A, Batchclor R.** Zinc Oxide Eugenol Cement II study of corrosion and disintegration. *Journal of Dental Research* 1970;49:593-598 .
- 9- **Wilson A, Clinton D, Miller R.** Zinc Oxide Eugenol Cement II Microstructure and Hydrolysis. *Journal of Dental Research* 1973; 52:253-260 .
- 10- **Wilson, Mesley R.** Retentive and Compressive Strengths Of Modified Zinc Oxide Eugenol Cement . *Journal of Dentistry* 2000;28:69-75.
- 11- **Craig R, Peyton F.** Restorative dental materials 5th edition. Mosby,co.1993.
- 12- **Robert G. Craig.** Restorative Dental Material. 1997; 243-245.
- 13- **Anderson J, Meyers G.** Physical Properties Of some Zinc Oxide Eugenol Cement. *Journal Of Dental Research* 1966; 45:379-378 .

14- **Petroleum Jelly** /
www.umm.Edu/Encylarticle/ 00250.-15k .

15- **Craig R.** Restorative Dental Materials.
11th edition. Mosby,co 2002.

Table (1): shown the mean value of the hardness test and the standard deviation of the 3 groups

	Group A	Group B	Group C
N	9	9	9
Mean	1.84714	1.41000	1.02000
Std. Deviation	0.19430	0.11387	0.31491

Table (2): showing the comparison between these 3 groups using student t-test.

Groups	t	p	p-value	c.s.
A&B	4.547	0.003	P<0.01	H.S.
A&C	11.659	0.000	P<0.01	H.S.
B&C	3.098	0.012	P<0.05	S.



Materials used in this study Fig.(1)



Brinell Hardness test Fig.(2)