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A COMPARATIVE STUDY OF: SOLUBILITY, PH AND TEMPERATURE CHANGES TAKING PLACE IN SEVERAL TYPES OF CEMENTS USED IN MODERN DENTISTRY

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SUMMARY:

This article describes certain changes that take place during hardening of several kinds of cements and their influence upon vital teeth and the expected reactions of the patients during treatment. It also reveals the probable reason for failure after fixing crowns and bridges. This study shows that unexpectedly "old- fashioned" cements reveal to certain extent better properties than some of the "up-to-date" ones.

Key words: vital teeth, crowns and bridges

INTRODUCTION:

A large number of luting cements are used in modern dentistry that differ in quantity and quality of composition, chemical structure, physical features, hence – they differ in use. Luting cements are used not only for fixing irremovable constructions, for pads, but also for obturation materials. Since their invention up to the present day these materials have had a long and often bumpy road full of contradictions.

A long time ago in 1785 Sorel created the so called zinc- oxide- chloric cement. Nearly 100 years later, Rostaing and then Flak developed and introduced the zinc phosphate cements, which, after certain improvements, we use today. Another direction in cement development was given by Fletscher who created silicate cements in 1878. In 1968 Canadian biochemist Smith obtained the first polycarboxylate cement by substituting phosphorous acid with polyacrylic acid. And in 1972 Wilson and Kent, by improving the silicate cement, invented the glass ionomer cements, which are probably the most widely used luting cements nowadays. They are also being continuously improved by modifications with resin, photopolymerizing cements were created, etc.

GOALS AND TASKS:

1. To determine solubility of 7 types of luting cements after being kept in artificial saliva environment for 15 days.

2. To determine in laboratory conditions the change in pH level of 7 types of luting cements from the moment of their mixing until their hardening.

3. To study the temperature changes of these cements in the course of changing of their consistence.

MATERIALS AND METHODS:

The following cements were used for the first experiment: “Adhesor”, “Adhesor Carbofine”, “Fritex”- all of them made by “Spofa - Dental”; “Fuji 8” – made by “Shofu”;

“Vivaglass”- made by “Ivoclar - Vivadent”; “Kromoglass”- by “Lascod” and “Photac - Fil”- a product of “ESPE”

All the cements were mixed precisely in the proportions prescribed by the producer. We measured the initial weight using analytical balance “Scaltec” (pic. 1). We decreased the measured weight with the weight of the mixing pad /0.66 g/.

Pic. 1.

After being stored in artificial saliva for 15 days, we took out the pieces of cement, dried them and weighed them again (pic. 2).

Pic. 2.

The results obtained are shown in Table 1.

Table 1.

Cement	Before the experiment	After the experiment	Difference	Percentage
Adhesor Carboxy	0.81g	0.63g	0.18g	22.22%
Adhesor	0.86g	0.80g	0.06g	6.98%
Fritex	0.45g	0.32g	0.13g	28.88%
Fuji VIII	0.21g	0.15g	0.06g	28.57%
Vivaglass	0.36g	0.21g	0.15g	41.66%
Kromoglass	0.48g	0.38g	0.10g	20.83%
Photac-Fil	0.26g	0.22g	0.04g	15.38%

Results show that "Adhesor" has the lowest solubility, while the glass ionomer "Vivaglass" is the most soluble. Second in solubility ranks another glass ionomer "Photac-Fil" but in this case it should be noted that unlike all the rest, "Photac-Fil" is photopolymerizing.

For the second experiment we used the same cements. We measured the change in their pH level at the 1st, 3rd and 5th minute after their being mixed. Results are shown in Table 2.

Table 2.

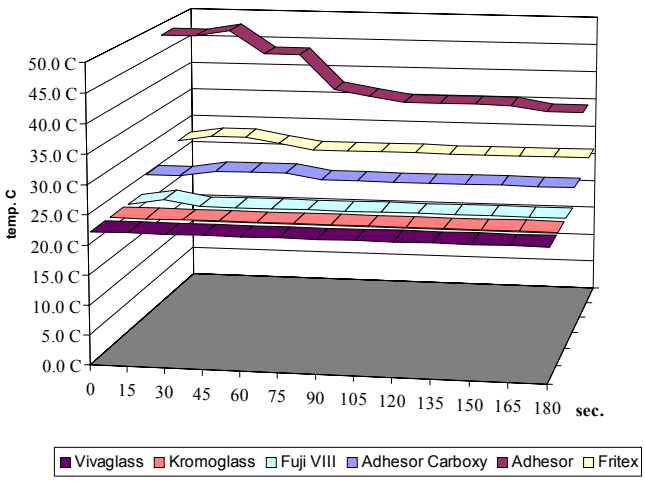
Cement	pH 1 min.	pH 3 min.	pH 5 min.
Adhesor Carboxy	4.83	5.30	6.50
Adhesor	4.50	5.50	5.55
Fritex	5.10	4.95	4.85
Fuji VIII	3.83	3.75	5.50
Vivaglass	3.38	3.32	3.24
Kromoglass	3.76	3.63	3.50

The pH meter we used was "Jenway 3310"(pic. 3)

Pic. 3.

Just like in the previous experiment, best results here were given by products of "Spofa-Dental": "Adhesor" and "Adhesor Carbofine", while lowest pH level was shown again by the cement made by "Ivoclar Vivadent" – "Vivaglass"

The same cements were used for the third experiment. Temperature of the products was taken from the moment of their being mixed until the moment of their hardening at a time interval of 30 seconds, in room environment temperature of 22 C°. Results obtained are shown in the following diagram:



Results show the most intense exothermic reactions occur in products of "Spofa-Dental". Among them, "Adhesor" is first with temperature of 48-49 C°, which could cause denaturation of cell proteins and enzymes.

CONCLUSION:

In conclusion we have to state that changes in acidity and temperature that luting cements undergo from the time of their being mixed until the moment of their hardening are in direct relation with the irritation of peripheral odontoaerial growths of vital teeth and hence to the subjective feeling of pain in some patients. This unpleasant feeling can be suppressed to some extent if a small dose of the powder is added to the fluid and is left for some time. In this way the acid would be neutralized and then the rest of the cement will be added. Thus the subjective symptoms would be reduced to a certain degree.

High solubility, which is observed in some cements in oral cavity environment, could discredit any prosthetic work. In such cases dislodgment of bridge construction would be the smallest problem. Too often, macerating of the tooth pin and carious lesions occur. Of course, it would not be correct to blame luting cements for all the problems. If tooth pins are too short or filed with inadequate incline and the crowns are too big, dislodgment of the construction is inevitable. A certain alternative in such cases could be composite and resin modified glass-ionomer cements.

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