Zinc Oxide Eugenol Impression Pastes
-A Study of an impression material-

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It is not necessary to explain how important the impression taking is in prosthetic works. By the development of the dental sciences, several impression materials are using in every clinic and those are improving day by day. On the other hand, a newly impression materials are studying and testing in laboratories to materials themselves, but more convenient in taking impression.

Now we can get the following impression materials in the open markets, and use them for taking impressions practically in our clinics: Those are,

1) modeling compounds
2) plaster of Paris
3) alginates
4) zinc oxide-eugenol impression pastes, and
5) others

To have the best impression in the practice of prosthetic works, it is sure, depend upon not only the impression material itself, but the dentist's skillful manuplations. And it is the most important and fundamental procedure for a suitable and satisfactory construction, because the accurate and fine impression will be based for such admirable works. For this step, he the dentist should study the impression materials and how to conmaterials and how to use it better. Some of the dentists insist the plaster wash on the previously taken impression with modeling compounds is the best, and some others use the zinc oxide-eugenol impression pastes as their adequate impression material.

I have clearly no idea, writing this article, to give some prejudices for anyone. I just thought it is necessary to recognize its properties with the components before using. Or not, we couldn't get the best impression which we request effectively.

Here I would like to discuss about the zinc oxide-eugenol impression pastes only, particularly about the properties of the materials, including the components and the setting times which should be cared of using them.

Famous products of zinc oxide-ougenol impression pastes are as follows :

1) S.S.W. Imp. Paste; by The S.S.White Dental Mfg. Co.
2) Kelly's Imp. Improved; by Kelly-Burroughs Lab., Inc.
3) Kerr Imp. Paste; manufactured by Kerr Mfg.Co.
4) Others

Composition of the pastes

There are many kind of such products, zinc oxide and eugenol impression pastes in the markets, and those are made with their own remedies. Most of the products did not unveil their components.

The materials were in two forms :

1) powder and liquid;
   The powder presumably containly zinc oxide and rosin and the liquid content being eugenol and rosin.
2) pastes ;

The essential ingredients being the same except extended to as zinc oxide paste and eugenol paste. The components, naturally, are not only zinc oxide and rosin or eugenol and rosin, but are also made up of other materials such as accelerating substances, retarding substances that gave more smoothness to the paste.

And the properties are varified according to each components and by manufacturers. Here, we should know the quality of pastes before using.

Generally, for the example, the accelating substances are in paste "A" whose main components are zinc oxide and rosin so whenever to reduce the setting time, then it is enough to increase the quantity of paste "A". However, in a few products such as "Kerr Impression Pastes" are not so, that is, the accelating substances are not in paste "A", but in paste "B".

Each product studied and made his charocteristic pastes, and the ingredients are usually not announced. The menufacturer only gave an "instruction" to use the product.

Some of the compositions of the Pastes are following : These are not included the materials to paste form.

Rx I :

Powder(zinc oxide~80%, rosin~19%, magnesium chloride~1%)

Liquid(oil of cloves or eugenol~56%, gum rosin~16% olive oil~16%, liseed oil~6%, light mineral oil~6%)

Rx II :
Powder(zinc oxide~69.0%, white rosin~29.3%, zinc acetate~1.0%, zinc stearate~0.7%)
Liquid(eugenol~35%, olive oil~15%)

Rx III :
Powder(zinc oxide~70.25%, hydrogenated rosin~29.40%, zinc acetate~0.35%)
Liquid(eugenol~85%, olive oil~15%)

Method of use

In Korea, we can get some products which are consist of two tubes of pastes. Whereas no ZOE impression material of powder and liquid found in markets yet, it is naturally omitted here.

Taking the same lot of pastes on the glass slab, Fig.3, those will be mixed and spatulated with a stainless steel spatula, generally. In practice, we should control the mainpulation according to the products and especially in Korea according to the over-dued products which has been disintegrated.

After the moderate mainpulation, it will put on the tray and inserted in the month.. In other words, the initial setting impressed. After the initial set, the material is not fluid enough to permit the development of an exact mold. To removing the tray from the oral cavity, should be done recognizeing the mean with the optimal moment to remove the impression. The satisfactory impression with it might have request a good drill, however, it does not mean "Very difficult".

Setting Time

Zinc oxide can be made to react with eugenol to produce a reasonably hardness. By such a chemical action, the impression is taken, and it will be with-drawn from the mouth after the final setting.

Initial setting time represents the time at which the paste begins to set and can no longer be manipulated.

Final setting time is the time, from the start of mixing until the Vicat needle either does not penetrate the surface of the set paste perceptibly, or penetrates the mass in a minimum amount.

The setting time of this impression materials is not constant; it could be increase or reduced

1) by the zinc oxide/eugenol ratio
2) by spatulation time
3) by temperature

4) by addition of distilled water
5) by the products
6) by the date of manufactured

according to my experiences.

1) Of the Zinc oxide/Eugenol ratio :
   Except for the material of III(Kerr Impression Paste) as the quantity of paste containing Zinc oxide(paste A) is increased in the relation to the quantity of paste containing eugenol(paste B) the final setting time is reduced, as it is aforementioned in this article. It might due to the existence of accelerating substances in which side the paste of A or B. The setting time of 3:2 is reduced nearly half of 1:2
   If the products are good, the ratio 3:2(A:B) might be satisfactory for clinical work in using the products II & Others(For paste I the optimum proportion was 5:2)

2) Of spatulation time :
   According to the report of Vieira *2, the spatulation time influenced to the initial and final setting time : the more reduction in final setting time;, and the relationship varies inversely between the mixing time and the initial setting time(in case of paste II, it is not so influenced) The moderate spatulation time is one minute compare with 30 seconds or 2 minutes.

3) Of temperature:
   There is a direct relation between increased temperature and the speed of solidation: Vieira noteed in his article, i.e.,
   "As the temperature is raised, both the initial and final setting times are diminished:". *2
   In the material II(Kelly's product) may be contained a thermoplastic substance moderately for the plasticizing temperature. So the impression with the Kelly's paste should be cooled during the setting and immediately after the impression is made, as is done with modelling compound.

4) Of humidity:
   Humidity is one of the positive factor in the acceleration of setting time, according to the report of Wallace and Hansen *4.
   The humidity in the operating room, or on the slab, and the spatula might be concerned in setting time. When water is added in small quantities, the setting time of zinc-phosphate cements can be accelated. In using paste II, it will be advisable to add a little water. In these

tests, the stickness ended before the final setting time.
In brief, it is not advisable to add water or to use instruments affected by humidity, unless, for the determined pastes,(the crucial quantity of 0.04c.c. of distilled water is added to 5gm. of paste which has been prepared under the experimental conditions described and in a 3:2 zinc oxide/eugenol ratio)

5) Of components
Except the main components, there can be put in each quantities other materials such as accelating substances, retarding substances, and binder substances, etc..
Those components will influenced the setting time, too. For example, to add a small amount of metalic salts accelated the setting time.

6) particle size
The smaller grains will set quicker than others.

7) Of manufactured date
Whereas no products in Korea and no sufficient import of this impression materials from foreign countries, we a re usually apt to use the products which were made quite long ago or which were stocked roughly. At those cases, we should pay attention particularly. Or not, the impression might be useless; because, as an example, the material would be begun to set(the initial set) unexpectedly before inserting the tray into the patient's mouth.

Control of the Setting Time.

Using the pastes, it is not as easily controlled by operators as in the setting time of 'plaster of Paris'. However it could be controlled by which above several factors affecting the setting time within a certain limit.

Summary and Comments.

1) It is sure the zinc-oxide and eugenol impression materials are very adequate in the practical prosthetic works. In other word, those impression materials are used as a corrective lining on a preliminary impression in the practice of the restorative dentistry.

2) Those pastes are consist of two tubes(or powder and liquid): One tube is filled with a paste containing the active ingredient, zinc oxide, and the other tube contains the eugenol in a paste form, too.
   An or both pastes are added some inert oils or inert substences.

3) It is necessary to know the properties of pastes before using, because there are other materials such as accelating sustences, retarding substences, binder substences, and a component for giving smoothness, except the main materials. And those are varified by their components and their proportions of the materials and by their manufacturers.

4) The setting time of these pastes are controlable within certain limits by: The zinc oxide and eugenol ratio, spaturation time, temperature, addition of distilled water, and products or manufactured date etc..

5) The two pastes are mixed together in the proportions, and the mixture is spread over the preliminary impression. After the moderate manipulation, it will put on the tray and inserted in the mouth.

6) The impression should be withdrawn after the paste has hardened by a chemical action of zinc oxide and eugenol. Lack of stickiness does not mean the final setting. Final setting time came later the lack of stickiness, in general.

7) The impression does not relax or yield. The pastes are superior in their constancy than modeling compounds. In using the Kelly' s paste, the taken impression
should be cooled during the setting and immediately after the impression is made, as an exception.