# PLASTINATION TECHNIQUE FOR MUSEUM SPECIMENS

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***Abstract:*** The museum specimens are commonly stored in formalin solution and create problems like transportation shrinkage and discoloration of the specimens. Formalin irritates sensitive mucous membranes and irritates allergic reactions in the skin. To overcome these difficulties a new technique of Plastination of Dr. Gunther Van Hagens has been followed to check the suitability of the procedure and to introduce it in Pakistan. It is concluded that the procedure is simple, easily reproducible and only worthwhile if practiced regularly.

## Introduction

Even today it is most common practice that the Anatomical, Pathological and other Biological specimens are preserved and stored in 10% formalin solution or in Kayserling solution for the purpose of display and future study.

These preserving solutions evaporate constantly from their containers and vapors of formalin irritate the corneal and nasal mucosa of the users. Also, sometime formalin invokes allergic reaction in the skin. The preservators being in liquid phase, create problems during their transportation. Moreover, these preservators produce excessive shrinkage and discoloration of specimen.

To overcome these problems Dr. Gunther Van Hagens of Germany tried some individual rubber polymers or their mixtures to plastinate Biological specimens. On success, later on, he started marketing the chemicals of unknown formulae for the purpose of tissue plastination. He has mentioned the technique of plastination, in the form of a book-let, under the heading "Heidelberg Plastination Folder 1985", available from him on the purchase of substantial quantity of plastination chemicals.

Plastination is a new method for the preservation of perishable biological specimens, especially for soft, putrifiable one with high water content, for example whole organs like brain, heart, liver, lung, kidney, muscle and joint specimens and body slices in the field of Anatomy and Pathology.

After plastination the specimen is no more required to be placed in liquids. It can be kept as dry on the shelves for indefinite period. As there are no more vapours of formalin from the plastinated specimen, it can be studied more easily. It is unbreakable, original human body tissue, for superior and cheaper from plastic models and can be transported or handled safely.

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## Plastination Technique and Nomenclature

The method of plastination of specimens is not much different from Paraffin Section Technique, which is used for Histopathology. Plastination is carried out in several steps, namely, (1) Fixation, (2) Dehydration, (3) Forced Impregnation and (4) Curing. Particularly fixation of tissue and dehydration are exactly the same as for paraffin section technique. After complete tissue dehydration, the specimen is not cleared in xylene, rather it is directly impregnated with polymer and later it is cured with a gas cure material.

During the process of plastination the tissue water and part of tissue fat is replaced by a polymerizable resin. The polymer used for plastination is marked as "Biodur". In this technique three types of "Biodur" have been used. Biodur S10 stands for a polymer consisting of a liquid silicone rubber and has a medium viscosity. "Biodur S3" indicates a hardener, which is an oily liquid containing some week organic acid and "Biodur S6" designates a gas curing liquid which contains silicate.

The chemicals for the purpose of forced impregnation and curing can be obtained from the following address: —

Biodur Heidelberg, Jahnstrasse 8,
D-6900 Heidelberg, West Germany.

The purpose of present study was to check the feasibility, suitability and economy of the technique in our country and to introduce it in Pakistan.

## Materials and Method

In present study 4-5 mm thick slices of brain and a dissected human heart were plastinated. These specimens were already stored in 10% formalin solution, in the museum of Anatomy department of Ayub Medical College, for the last five years.

After removing from formalin jars, the specimen was washed in running tap water for about eight hours. The washed specimens were given two changes (24 hours each) of 70% Ethyl Alcohol. Similarly, specimens were dehydrated with two changes (24 hours each) of 95% Ethyl Alcohol. Further dehydration was carried out with two changes (24 hours each) of pure Acetone.

For the purpose of impregnation, prepared the mixture of Biodur S10 (Silicone Rubber Polymer) and Biodur S3 (hardener) in a ratio of 99:1 respectively and transferred the dehydrated specimen in a big jar containing above mentioned mixture. To immerse the specimens completely with mixture and to avoid floating of the specimen, a stainless steel wire gauze was dipped in the container of mixture above the specimen.

Placed the whole assembly in an air tight box, fitted with the pipe of a vacuum pump. Tightened the screws of air tight box and switched on the vacuum pump to obtain an atmospheric pressure of 17 mm Hg. In this way impregnated the specimen with Biodur Polymer mixture with the help of vacuum pump, on for 24 hours.

Drained out the excess of mixture from the specimen for approximately two hours.

After completing the impregnation, the specimens were cured in the following manner. Placed a small quantity (approximately 20-30 ml) of Biodur S6 (hardener) in the bottom of a desiccator. A wire gauze was placed in the desiccator to make temporary floor to accommodate the specimens and to avoid direct contact with gas curing liquid. Placed the specimens on the wire gauze in the desiccator and covered its lid.

Checked the specimens for hardness and sickness repeatedly. After six hours removed the non-sticky and relatively hard specimens from the desiccator and placed them in an air tight container to dry for 24 hours.

## Conclusion

The technique of plastination invented by Dr. Gunther Van Hagens, followed in this study is simple and can be carried out easily in any Histopathological laboratory. The technique is suitable only if it is practiced regularly, i.e. if at least one specimen is plastinated per week. Otherwise it is cheaper to by plastinated specimens from Heidelberg.

## Discussion

Brain slices and dissected heart were plastinated almost two years back. No putrefaction or deterioration occurred in the tissue. Even today the specimens have their original colour and all the Anatomical details are well preserved inspite of the fact that the specimens have passed through the hands of hundreds of students for the purpose of study.

The technique for plastination of tissue is almost similar to paraffin section technique. In this study the specimens plastinated, were obtained from display jars containing 10% formalin solution. There is no hard and fast rule for the duration of fixation and dehydration. Generally smaller specimens, like slices 4-5mm thickness, need short time, while large specimen like whole brain, liver, kidney and joints need longer duration for fixation and dehydration.

The specimen was washed freely with tap water to remove excess of fixative from the tissue which otherwise, might interfere with subsequent steps of technique.

To avoid shrinkage of tissue, dehydration was carried out in ascending series of Ethyl Alcohol and the tissue was completely dehydrated with pure Acetone. In this technique acetone was used not only for dehydration but also as a volatile intermedium which is miscible with alcohol on one hand and Biodur polymer on the other. The Acetone has high vapor pressure and low boiling point as compared to Biodur Polymer which has low vapor pressure and boiling point offers an opportunity for the easy removal of intermedium (Acetone) from the tissue and impregnation with Biodur polymer.

Forced impregnation with polymer is carried out slowly so as to allow polymer solution to penetrate inside the specimen where the volatile intermedium (acetone) changes to gaseous phase and is removed (pumped out or boiled off) easily from the tissue.

In order to bring about complete polymerization of Biodur S10 in the tissue, the specimen is treated with a gas cure Biodur S6. This liquid evaporates and its vapours polymerize the Biodur S10

in and outside the tissue.

The procedure used to plastinate the specimen, in this study, is a modification of a more complicate method mentioned by Dr. Gunther Van Hagens in his Heidelberg Folder of 1985. Plastination technique is an open arena to probe into it.

## REFERENCES

As the technique is new, the only available reference is being given: —

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