Research Article

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Sheet Plastination of Chicks: A New Method to Study Gross Anatomical Sections by Using Local Polyester Resin

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Abstract

Plastination is a method of long-term preservation of biological tissues with a completely visible surface and high durability. Plastinates are devoid of harmful effects like formalin, and they serve as excellent teaching tools in education. In addition, it's an outstanding tool to study cross-sectional anatomy. The plastination technique has three major methods: silicone plastination, sheet plastination with the epoxy method, and sheet plastination with the polyester method.

keywords: plastination; Epoxy, resin method.

Introduction

Plastination is a process of long-term preservation of biological tissues in a dry, odorless, easily handable, and storable manner. It is a cost effective, durable and stable technique. Although it is difficult to prepare a well plastinated specimen, the most promising method to preserve the specimens is an alternative to formalin preservation (1).

The word "plastination" is derived from the Greek plassein, to shape or form: the term is, in fact, a creation of Gunther von Hagens. *Professor Gunther von Hagen* is a German-born physician and anatomist who has preserved human bodies through 'plastination' (2).

The Institute of Plastination, along with Dr. von Hagens, made their first show of plastinated bodies in Japan in 1995, which drew over three million people. Depending on how the body is to be used, materials such as silicone rubber, epoxy resin, or polyester render the body firm, flexible, transparent, or opaque. Once preserved, the bodies are highly durable; they still retain the natural surface structure and, according to Von Hagens, they are in the identical condition they were in prior to preservation, all the way down to microscopic level. Thus, even the microscopic examination can still be carried out (3).

The scientific value of using plastinated bodies and organs in a teaching environment like anatomical courses at medical schools is beyond dispute. The specimens, bodies, and organs are produced by this method in order to be handled by students during examination. Unlike their counterparts 'swimming' in a mixture of fixative and preserving solutions that can only be viewed from the outside, the obtained specimens are easily handled and could be examined from various angles, as well as compared. For example, organs in their normal and pathological states may be examined side by side to illustrate disease processes, such as placing lungs from a healthy individual, a lung cancer patient, and a patient suffering from asbestosis side by side for comparison (4).

Plastination is an unusual method of permanently preserving tissue in a 'life-like' state, in which biological specimens are preserved by replacing the fluids of the body (i.e., fat and water) with synthetic materials. This method produces '*plastic' bodies* or organs that remain very life-like, non-toxic, odorless, dry, and durable and be can handled easily for examination (5).

The purpose of the current work is to reveal the potential utility of sheet plastinated sections by using local polyester resin instead of the very expensive P40 technique. In order to learn and interpret 3D anatomy of complex anatomical regions.

Materials and Methods

The chemicals used in polyester-plastination include:

1- polyester resin 2- acetone 3- formalin 4- polyurethane foam

The basic steps of plastination include; specimen preparation in 10% formalin (fixation and slicing), dehydration, impregnation and curing.

1-Specimen preparation: Ten chicks 7 days old are fixed for two days; after fixation, to section the sample more easily it is placed in a container (wood or cardboard) and covered with polyurethane foam, then left to hardens for 24 hours in freezer (Fig.1). The objective is to cut sections of 0.5cm thickness or less by using meat slicer. (Fig.2)

2-Dehydration: freeze substitution in -25c acetone is the recommended procedure for dehydration of all plastinated specimens (Fig. 3) (2).

Acetone is the best dehydrating agent but it is also is a good intermediary solvent for impregnation. moreover, acetone readily mixes with the resins used during plastination and has a high vapor pressure that aid its extraction from the chick slices. (Fig.4)

3-After completing dehydrations, the slices mounted by local polyester resin after placed at two glasses thin cast (Fig.5) and keep overnight for hardening

4-After 24 hrs. the glass cast removed gently and the resin sheet trimming to be ready for using in laboratory. (Fig.6)

Results and Discussion

With the review regarding this process, we can say that plastinated specimens are an ideal way of preserving biological tissues. It produces a long-lasting, easily handable, non-hazardous, and almost natural-looking specimen, which helps in teaching in various fields of medicine.

It also reduces the need of bodies to prepare new specimens, as they get damaged with repeated handling. Plastinated specimens are also better options to be used in anatomy museums for self-directed studies by students. Not only in anatomy, but these specimens also proved beneficial in other specialties such as pathology, radiology and surgery (6).

The basic advantage of the sheet plastination technique, in this case using epoxy resin, is that it maintains the integrity and topography of a region as a unit in a given plane.

The slices are storable at room temperature. The sections can be stored at room temperature and used subsequently for research purposes. Morphological measurements can be taken easily. The data obtained were compared with high-definition magnetic resonance images (8). According to (6), the only disadvantage found is that epoxy resin sections tend to turn yellow over a period of several years.

Removing the lipid content from the tissue sections before impregnation is an essential step for success with the epoxy resin technique. Acetone, the recommended medium for cold dehydration, is also a good fat-removing solvent. when used at ambient temperatures. The best optical quality in sections plastinated with epoxy resin was achieved when the fat was removed from the tissue by first treating with acetone at ambient temperature and then transferring to methylene chloride to extract further lipids (7).

The specimen is placed in an acetone bath, where the water and fats dissolve and are replaced by acetone. This step is important because the anatomist cannot swap the body's fluids with the polymers that eventually occupy their spaces in the final platinate, but the anatomist can replace the acetone with the final polymers.

Conclusion

With the review regarding this process, we can say that plastinated specimens are definitely an ideal way of preserving biological tissues. It produces semi-transparent images and correlates nicely with radiographs, CT, and MR images. It is a long lasting, easily handballed, nonhazardous, and almost natural looking specimen of very good quality. This helps in the teaching of various fields of medicine. It also reduces the need for bodies to prepare new specimens, as they get damaged with repeated handling. Plastinated specimens are also better options to be used in anatomy museums for self-directed studies by students. Not only in anatomy, but these specimens also proved beneficial in other specialties such as pathology, radiology, and surgery.

Conflicts of interest

The authors declare that there is no conflict . of interest

Ethical Clearance

This work is approved by The Research . Ethical Committee

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Figure 1: Cutting the chick specimens foam cast by meat slicer after fixation

Figure2: The specimen foam cast after cutting

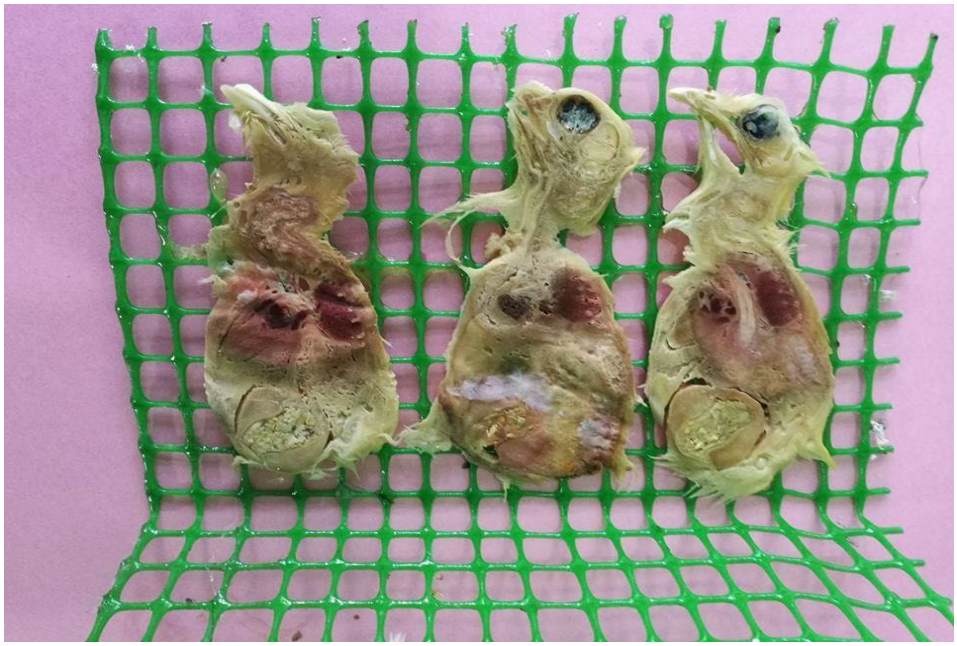

Figure 3: Hold the specimen at plastic mesh for dehydration

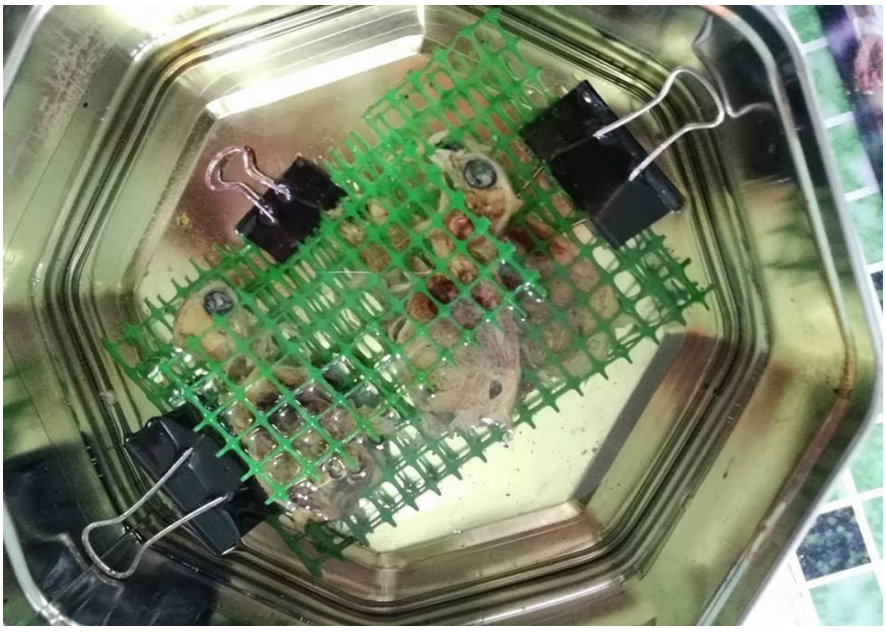

Figure 4: Dehydration step in cold acetone.

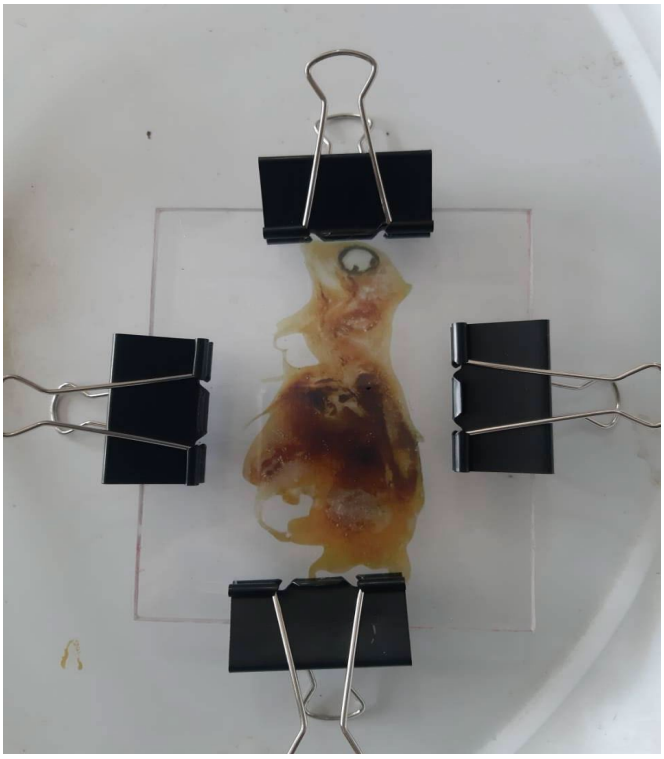

Figure 5: Glass sheet casting filled by polyester resin

Figure 6: Sheet plastinated chick section after removing the glass plates

تحضير شرائح البلستكه في الدواجن: طريقة جديدة لدراسة المقاطع التشريحية باستخدام راتنجات البوليستر المحلية

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الخلاصة

تعد البلستكه اكفا طريقة للحفاظ على الأنسجة البيولوجية على المدى الطويل بصوره واضحة وشفافة تمامًا ومتانة عالية. تخلو عينات البلستكه من التأثيرات الضارة مثل الفورمالين والروائح الغير مرغوبه، وهي بمثابة أدوات تعليمية ممتازة في التدريس. فضلا عن كونها أداة رائعة لدراسة التشريح المقطعي. شتمل تقنية البلستكه على ثلاث طرق رئيسية: البلستكه بالسيليكون، وتحضير الشرائح بطريقة الإيبوكسي، بالإضافة الى طريقة البوليستر.

الكلمات المفتاحية: البلستكة، الايبوكسي، طريقة الراتنج.