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Plastination – A Novel Technique For Carcass Preservation for Study of Anatomy

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Introduction

Anatomists are always looking for an alternative to dissection to understand anatomy and also a useful tool to learn anatomy. In this context many alternative methods have been used in this Department which are mentioned below such as Plastination by low cost innovative method, Air dry Lungs, Baloon inflation stomach. Corrosion cast by Denture material, Silicone corrosion cast, Jelly wax sheet Plastination, Taxydermy.

Plastination by low cost innovative method

Materials required :

- Cleaned Specimens
- 5% formol saline
- Acetone 10 liters for each means 30 liters for 3 changes
- Plastination solution (plastic tea cups and thermocol 150Gm+Petroleum Jelly 500Gm) + Chloroform 10 liters makes 15% solution)
- Varnish / touch wood
- Tissue paper or blotting paper

Method :

Preparation of specimens : The specimen which should be plastinated is collected fresh from slaughter house; cleaned properly and washed. Fat, fascia, blood, inner contents from hollow organs should be removed.

- **Fixation :** After cleaning, the specimen in fixed in 5% formal saline solution. The inclusion of saline enhances the preservation of quality as well as colour of the specimens.
- Fixation is done depending upon the size of the specimen for 1 week to 1 month, after fixation the specimen is washed in running water for 5-10 minutes and then the excess of water is removed by blotting.

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Dehydration : Dehydration is removal of water content from the specimen. Dehydration is important because the resin does not dissolve in the water. The resin penetrates into the dehydrated specimen very smoothly. The impregnation technique will be hampered if the water is not removed.

- Water is removed through periodic changes of acetone, 3 changes of acetone is recommended for minimum 7-10 days each at room temperature.
- In the western world, this process is enhanced by using vacuum pump under freezing temperature at -4 to -20 ^{0}C. Because it involves costly equipment, it is not recommended.

Impregnation : The specimen is immersed in plastination solution for impregnation which is carried out for 7-15 days or sometimes 1 month till the impregnation is complete. In the western world epoxy resin is used for the impregnation and is again carried out in a vacuum chamber under cold condition which is again a costly technology.

Curing: In our technique, curing is not practiced where as in the western world S10 or S6 is used as a gas curing. However the specimen is taken out from the resin solution and it is thoroughly cleaned and allowed to dry.

The only difference in the present method is, the specimen becomes hard but it retains its normal morphological characteristics and stored openly for study purpose.

Corrosion cast by Denture material

Materials required

- Heart or Kidney
- Normal saline
- Denture powder
- Cold cure RR solvent
- Asian paint stainer
- Beaker and stirrer
- Syringe (large) needle and thread
- HCI

Method

- Take fresh heart from the animal, wash it thoroughly, and remove all the fat and surrounding tissues with pericardium.

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- Expose the aorta, the abdominal artery and brachiocephalic trunk.
- Flush warm saline (NaCI-0.9%) through aorta.
- After flushing, wash it thoroughly, remove water as much as you can, then incise at the base of the aorta to expose aortic valve.
- Above the aortic valve identify two auricular openings through which the right coronary artery left coronary artery and sometimes circumflex artery arises, flush these coronary arteries with normal saline, and then prepare the denture material.

Preparation of denture material : Take 5 gm of denture material, mix with 10 ml of cold cure RR solvent add few drops of red colour asian paint stainer, mix thoroughly with stirrer till you get honey consistency.

- Collect the solution in to syringe as early as possible, (if you delay, it will solidify), inject this liquid solution in to coronary artery at one side.
- After one side prepare same solution of same volume for second opening, and inject in to the other coronary artery and then keep the heart in same position for some minutes to get the solution partly solidified.
- Leave it for 2-3 hours for complete solidification, then take a beaker put the heart inside and pour concentrated HCL almost $3/4^{th}$ of the heart level, cover the breaker and leave it for one to two days.
- All the tissues will get dissolved in the acid except the coronary artery cast which shows the main artery and its branches.
- Same method is followed for preparation of renal artery, renal vein and renal ureter (kidne, corrosion cast) for artery use red colour vein blue color, ureter green colour.

Precaution : While collecting the kidney we should have enough length of artery, vein and ureter.

Silicone corrosion cast

Materials required

- Lungs with trachea
- Silicone tube
- Silicone gun
- Balloon pump
- HCL

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Method

- Collect fresh lung along with trachea from the slaughter house without any cut, otherwise silicone will leak from cut surfaces, to avoid leakage parenchyma should be intact.
- The lung is washed thoroughly with water so that all contents is removed, then through trachea air is blown with the help of a pump so that all bronchial tree gets dilated.
- After that silicone is injected with the help of a silicone gun, push the silicone gradually into trachea and milk the trachea to push the silicone into the bronchiole and alveoli. One tube of silicone is sufficient for one lung cast.
- After that, hang the lung with trachea overnight so that silicone gets solidified. When solidified silicone will not dissolve in acid.
- To remove the cast the whole lung is immersed in the HCL for two days for the parenchyma get digested. Once all the parenchyma tissue is digested by the acid, only the bronchial cast is left which is washed in running water. Later dried and stored for the study with labeling.
- Bronchial tree has got application for the surgical pulmonary lobectomy.

Jelly wax sheet Plastination

Materials required

- Brain or kidney slices
- Tissue paper or blotting paper
- Acetone
- Jelly wax
- OHP sheet
- Fine needle
- Spirit lamp

Method

- Brain or solid organs like kidney which are fixed in 10% formalin are collected and at various levels ½ - 1 cm slices are made.
- Before making the slices, the organ is kept overnight in deep freezer for freezing.
- The thin slices are washed thoroughly and dried with a tissue paper or blotting paper.

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- Then dehydrated in 3 changes of acetone with interval of 2 days each, so that total dehydration is completed in 6 days.
- At 55-60^{0}C heat the jelly was to melt, it becomes liquid.
- Place the specimen inside the melted jelly wax for 5 minutes.
- Afterwards prepare a rectangular box with the help of a OHP plastic sheet and pour the melted jelly wax inside the box and place the slice in the centre.
- If air bubbles are formed during this process heat a fine needle and put inside the bubble area to remove it. In case the air bubble could not be removed, wax can be reheated along with the tissue to melt and them remount it.
- Leave the wax for a day to solidify.
- Cover the mounted slices by plastic sheet to avoid dust.

Balloon infiltration technique

Materials required

- Stomach or intestine
- Balloons
- Balloon pump
- Thread
- Touch wood / varnish

Method

Collect fresh stomach wash thoroughly with water to remove the contents

- Then the organ is prepared by removing the faseia, fat and other structures adhering to the stomach.
- Rinse the stomach with pure formalin.
- Then fix the stomach in 10% formalin for 1 day.
- Then push the balloon inside through that esophageal or duodenal opening.
- Then inflate the balloon with the help of balloon pump. Make sure that only enough air its blown into the stomach, or else the layer of the stomach starts tearing.
- Once the stomach takes its shape tie the balloon.
- After that, allow the organ to dry in open air.
- Once it gets dried up completely, balloon can be removed through the opening.
- Then the specimen is painted with touch wood for final display.

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Air dry lung specimen preparation

Materials required

- Intact lung with trachea without heart and it should be fresh or from embalmed animal / embalmed cadaver.
- 5L10% formalin solution.
- Air compressor pump with auto switch off.
- Balloon pump.

Method

- Take fresh lung. Blow the lung and inflate till it assumes its normal shape with balloon pump.
- Pour 10% formalin through trachea till the lungs are fully filled up to the brain of trachea.
- Then tie the trachea and fix it in the remaining 10% formalin for 72 hours.
- After that remove the lung from fixative, remove the excess of formalin from the lung and connect it to the compressor pump.
- Close the knob of the compressor pump and switch it on.
- Once the tank is full compressor pump will stop automatically.
- Release the air from the tank which will inflate the lung to its normal size and allow the pump to run continuously for 3 days till the lung gets dried totally.
- Remove the lung and hang it in the museum.

Taxidermy

Materials required

- Animal or human body
- 5% formal saline to submerge the material.
- Mounting plate
- Needle
- Thread
- Cotton
- Fine salt

Method

- Give a mid ventral incision from trachea to base of pelvis

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- Eviscerate the organs and wash thoroughly.
- Smear the body inside with the fine salt and stuff with cotton.
- Give two or three sutures along the length of the incision.
- Dip it in 5% formal saline and leave it for one month.
- After one month take out the specimen, drain the solution.
- Remove the sutures and wet cotton and stuff it with fresh cotton.
- Suture it serially throughout the incision
- Positioning of the specimen according to the needs and to be mounted on the mounting plate.
- Allow it to dry in open air.