ORIGINAL RESEARCH PAPER

Anatomy

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# A STUDY ON MAKING MODELS IN ANATOMY

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**ABSTRACT**

**Background:** Traditional anatomy teaching uses wall charts, books, slides, anatomical specimens, and practical anatomy as teaching resources. A complete anatomy teaching system includes a variety of anatomical teaching materials, which includes three-dimensional (3D) model, digital and non-digital models made up of materials available such as mud, clay, wax, ivory, Polymer, plaster of Paris, paper pulp etc. The models available in the market are always costly, low-durable or once damaged cannot be repaired. **Objectives:** The aim of this study was to identify a cost effective, durable material to make 3D models for anatomy teaching which can give a positive impact while using anatomy models in teaching & learning anatomy. **Methods:** The study was done in the department of Anatomy, Assam Medical College, Dibrugarh. The materials used are wood-dust, fevicol, wire/twine thread. net/casement cloth, colouring material-enamel/oil tube, brush, sand paper, putty, varnish, touch wood. These materials are easily available. Models made from the material are light weight, durable, low cost and reparable if damaged. **Results:** Comparing with the models available in the market shows that these models are light weight, durable, low cost and good looking. **Conclusion:** Anatomical models allow the user to move away from the clutter, discomfort, of a cadaveric dissection and can clarify characteristics of an anatomical structure that are not readily apparent in situ. Thus, anatomy education is enhanced and facilitated through the use of accurate anatomical models.

## INTRODUCTION

The use of three-dimensional (3D) anatomical models is ubiquitous in medical education. Medical educators rely on models to depict anatomical structures in a more efficient format than the cadaver. [1] Anatomical models allow the user to move away from the clutter, discomfort, and complexity of a cadaveric dissection and can clarify characteristics or functions of an anatomical structure that are not readily apparent in situ. Models are very useful to explain anatomical relationships and function in structures that may be too small to discern adequately in a cadaver or that are constrained by other structures. Thus, anatomy education is enhanced and facilitated through the use of accurate anatomical models. [2]

Anatomy is an inherently 3D discipline that cannot be fully expressed in the two-dimensional (2D) world, whether in textbooks or in the virtual space. Physical 3D models possess several advantages over virtual and illustrated models as they allow learners to "see with their hands" [3].

The aim of the study is the application of anatomical models in the curriculum is to either enable or enhance student learning. The costs of commercial models can reach thousands of dollars depending on material, size, resolution, and interactivity.

Therefore, the study has been undertaken to find out a low-cost and durable method to make anatomy models in this institute with locally available material.

## MATERIALS AND METHOD:

The present study was carried out in the Department of Anatomy, Assam Medical College & Hospital, Dibrugarh, Assam. The models were made to teach anatomy in small groups. The materials used were

(1) Wood-dust
(2) Fevicol
(3) Wire/twine thread
(4) Net/casement cloth
(5) Colouring material-enamel/oil tube
(6) Brush
(7) Sand paper
(8) Putty
(9) Varnish, touch wood [PHOTO 1]

**Figure 1-** Showing The Materials Used In Model Making

## METHODS:

1. Firstly, the plan of the desired model was made. Then required materials were collected, mainly wood dust and fevicol. Wood dust is always available in any wood factory and can be collected easily. The cost was very cheap.
2. Now, the frame of the model as desired was made. [PHOTO 2].
3. It was lined with net or cloth. [PHOTO 3].
4. A paste of wood dust, fevicol and little water was made.

**Figure 2-** Showing The Frame Of The Model As Desired (optic Cup)

**Figure 3-** Showing After Lining The Frame With Cloth (neural Tube)

5. Coated the lined frame with the paste. [PHOTO 4]
6. Dried it under sun or with the help of dryer.
7. 2nd, 3rd, 4th or more coat might be required.
8. The desired shape was given. [PHOTO 5]
9. Coated with a layer of fevicol to make it tightened.

**Figure 4-** Showing The Coated Lined Frame With The Frame (Optic Cup And Neural Tube)

**Figure 5-** Showing A Model Of Heart After Giving The Desired Shape

10. With the help of knife the desired shape of the model was made.
11. Rubbed it with sand paper to make the model smooth.
12. Put a layer of wall putty to make the surface even.
13. Coloured the model and its different parts as required with the help of brush or sprayer. [PHOTO 6]
14. After drying, it was burnished, then a layer of touch wood was put.

**Figure 6-** Showing The Coloured Model (Development Of Eye)

**RESULTS AND OBSERVATION:**

After the models were made, it was observed that,

- The materials required were easily available.
- They were of low cost compared to commercially available models.
- Models were light weight and could be carried easily to the classroom.
- They were not easily breakable, if broken, could be repaired very easily.
- Irritation of skin from the materials used was negligible.
- Models were impressive and eye-catching.

**DISCUSSION:**

Three -dimensional (3D) anatomy models comprise digital, and non-digital (Physical) models that can be moved into different positions/planes to enable learner to learn the relationship between different anatomical spatial ability also known as spatial visualization ability defined as the ability to mentally structures in space and mentally manipulate objectives in three dimensions. Visual- manipulate objectives in two- and three-dimensional figures, while virtual reality (VR) is a computer-simulated environment that can simulate real world or imaged worlds. Most current virtual reality environments are displayed either as a computer screen or with special stereoscopic displays. [4]

Digital 3D models of anatomical structures can be accessed on a computer, through mobile apps, or through stand-alone interactive workstations (i.e., Anatomage, Touch of Life). The availability of these materials in the gross anatomy laboratory and at study workstations may reduce the need for physical anatomical models or even printed atlases and may facilitate teaching by bringing the material to the dissecting table. However, costs and space requirements for a dedicated interactive 3D imaging system are significant (~$100,000 for an Anatomage table and support media), and as always, the advanced technology is likely to become dated and unsupported over time. The use of iPads and mobile devices reduces the costs, but they depend on the development of apps that have been assessed as to their impact on learning. [2]

The wax anatomical models are created as an alternative to the cadaver to produce a three-dimensional atlas. The Italian models were full of life and American models were lifeless. Handling of wax model may be little difficult than other varieties, since wax can be affected by hot temperature. [5]

The plaster of Paris (POP) is not a very durable material. When mixed with water for preparation it brings about an

exothermic reaction. During this exothermic reaction and the time taken to set, the temperature rises more than $60^{0}$ Celsius. High concentration of Plaster of Paris can even burn the skin. Third degree burn cases have been reported and, in some cases, amputation have to be done. POP is not a very stable compound. If during its stages of preparation, the consistency, curing technique and pouring methods are not kept under constant vigilance, plaster get distorted. The end product upon drying, could shrink and result in a very poor surface finishing. [6]

## CONCLUSION:

Specimen observation and dissection have been regarded as the best approach to teach anatomy. While anatomy textbooks and anatomy atlases provide two-dimensional (2D) static anatomical illustrations, they are of limited value in exposing three-dimensional (3D) dynamics of anatomical structures. Learners may find it difficult to visualize 2D images as 3D and to understand certain aspects of functional anatomy. [4] The use of anatomical models in medical curricula has been reported as effective in teaching and learning anatomy, although the form of the model and its presentation may impact efficacy in learning. At the same time, there was no solid evidence that the use of 3D models is superior to traditional cadaver teaching, still anatomy education is enhanced and facilitated through the use of accurate anatomical models.

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