MED-PHOENIX: JOURNAL OF NATIONAL MEDICAL COLLEGE

ORIGINAL ARTICLE

ASSESSMENT OF ACRYLIC-COLORED GROSS SPECIMENS AS VISUAL AIDS IN HUMAN ANATOMY LABORATORIES: AN EXPERIMENTAL APPROACH TO MUSEUM PREPARATION

Sunil Shrestha[1], Nitasha Sharma[2], Saru Bhattrai[2], Ajay Shah[2]

[1]Department of Anatomy, National Medical College Teaching Hospital, Birgunj, Nepal

[2]Department of Anatomy, Universal College of Medical Sciences, Bhairahawa, Nepal

Date of Submission : March 24, 2025

Date of Acceptance : March 28, 2025

Date of Publication : August 6, 2025

Correspondence to:

Mr. Sunil Shrestha

Department of Anatomy,

National Medical College and Teaching Hospital, Birgunj, Nepal.

Email: sunilmanshrestha@gmail.com

Phone: +977-9803911259

ORCHID: 0000-0002-3094-5035

Citation:

Shrestha S, Sharma N, Bhattrai S, Shah A. Assessment of Acrylic-Colored Gross Specimens as Visual Aids in Human Anatomy Laboratories: An Experimental Approach to Museum Preparation. Medphoenix. 2025;10(1):47-52.

DOI:https://doi.org/10.3126/medphoenix.v10i1.82636

Conflict of interest: None, ***Funding:*** None

Publisher: *National Medical College Pvt. Ltd.*

MedPhoenix - Journal of National Medical College (JNMC); 2025,10(1), available at www.jnmc.com.np

ISSN:2631-1992 (Online); ISSN:2392-425X (Print)

ABSTRACT

Introduction: *Human anatomy is an integral aspect of the curriculum in the first and second year of the medical educational programs in Nepal. A visually appealing and inventive anatomical color museum can help a medical student's interest in anatomy education. Therefore, the objective of this research is to establish acrylic colored anatomy museum prototype for instructional purposes for medical students.*

Materials and methods: *9 anatomically distortion-free specimens from arterial embalmed cadavers were chosen from the department of anatomy of Universal College of Medical Sciences in Bhairahawa, Nepal, which were ethically approved by UCMS/IRC/034/23 for use in research and teaching purpose.*

Results: *The observational photographic result of colored gross specimen was obtained showing colored specimen of Heart, Lungs, Liver and Kidney. The acrylic coloring technique applied to the wet specimen enhances understanding of the physical characteristics and gives the specimen a shimmering appearance that helps to create museum within limited budget.*

Conclusion: *The acrylic colored specimen is simple cost-effective technique which has great importance in teaching learning process of human anatomy.*

Keywords: *Acrylic Color, Anatomy Museum, Color Anatomy Specimen, Color Specimen, Museum Specimen*

INTRODUCTION

Human anatomy is an integral aspect of the curriculum in the first and second year of the medical educational programs in Nepal. A visually appealing and inventive anatomical museum can help a medical student's interest in anatomy education. Once a specimen has been fixed, it must be colored and labelled to provide a better vision of needed structures and suitable placement in the museum.[1]It is imperative that medical education make use of scientific advancements, Projectors, 3-D (Dimensional) viewing capabilities, 3-D holograms, and anatomical mannequins must be used to educate anatomy for future generations that live in a fully digitalized society. Anatomy will undoubtedly become more computerized in the future. However, the conventional methods of dissection, plastination, and model construction will always hold a special position in all anatomy museums.[2]

Colorizing specimens at anatomical museums is essential for distinguishing distinct structures such as arteries, veins, nerves, muscles, ligaments, tendons, and other structures. For preservative-fixed specimens sealed in jars, tactile differentiation is unachievable. In addition to the use of various coloring chemicals, methods for color restoration with maximum long-term efficacy in terms of age and cost-effectiveness are being established.[3]Dissection, prosecuted pieces, models, pictures, computer simulations, and numerous imaging modalities are the most effective ways to study anatomy. Colored gross anatomy specimens are also useful aids

in anatomy instruction for a medical student and are greatly advanced and enhanced by a beautiful and cutting-edge color anatomy museum. The students learn a lot about the normal anatomical components as well as the differences in the distribution of nerves, arteries, muscles, etc. with the aid of wet-colored specimens. To enhance visualization and better understanding of the necessary structures after fixation, it is crucial to color and label the specimen for the teaching and learning process.[4,5]

Therefore, the goal of this project is to establish a colored anatomy museum prototype for instructional purposes for medical students. The colorful gross specimens should be created to serve as active learning tools in laboratories that can support the general curriculum for medical anatomical education rather than just being used for exhibition.

MATERIALS AND METHODS

Anatomical distortion-free gross wet specimens from well-arterial embalmed cadavers were obtained for acrylic painting from the Department of anatomy of Universal College of Medical Sciences [UCMS], Nepal. The total sample size of study includes 9 specimen. This study has been approved by the Institutional Review Board of UCMS [UCMS/IRC/034/23]. The coloring chemicals used on the wet specimen were readily accessible in stores acrylic paints, turpentine oil, and various-sized painting brushes were used. After the coloring of specimen, to identify the effectiveness of the colored specimen safety handling, stability in formalin, clarity, viewer's perception, color distinction, and overall comprehension is checked.

The steps for preparing wet colored specimens are as follows & described in figure 1:

- Dissected organs used as wet specimens were first identified and photographs were taken before coloring
- The selected wet specimen was now given time to properly dry at room temperature for a period of two to three days.
- After drying, acrylic paint colors were chosen, and those structures that dry first, such as vessels and nerves, were painted with particular colors as specified in a Netters atlas 8th edition, and then other structures were painted correspondingly, and turpentine oil was used to clean the brush.
- The specimen was allowed to cure for 5-6 hours before applying another coat of the same paint and meticulously checking for missing paint areas.
- The specimen was then allowed to thoroughly dry for 1 to 2 days.
- Finally, color coding for labelling was completed, and specimens were maintained in a glass jar with a 10% formalin solution supported by a marble stone, glass rod, and transparent plastic water bottle.
- Finally, the jar is covered with a lid and sealed with cello tape.
- Now, the colored photographs were taken to compare between the two specimens before and after. The specimen photograph was taken after 2 months.

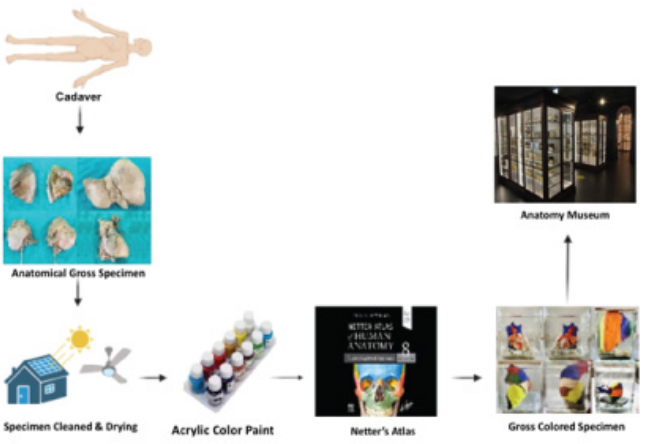

Figure 1: Schematic diagram showing process of acrylic color painting for color museum preparation

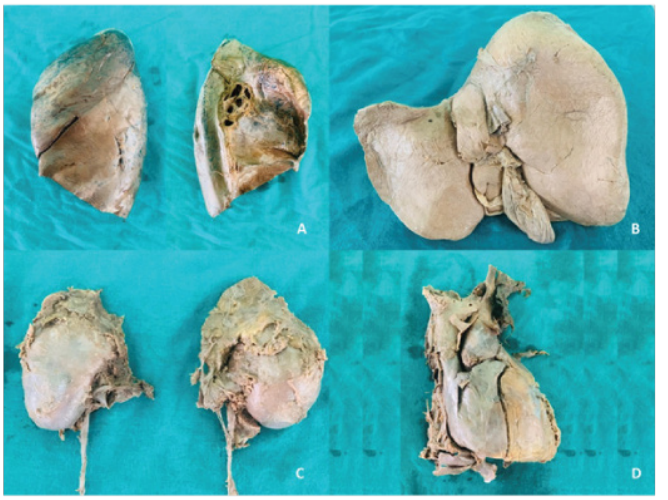

Figure 2: Showing gross specimen obtained from embalmed cadaver for color museum specimen preparation.

2-A: Lungs, 2-B: Liver, 2-C: Kidney, 2-D: Heart

RESULTS

Anatomical distortion-free gross specimens obtained from embalmed cadavers from the department of anatomy of UCMS, Nepal, approved by IRC was shown in figure 2. The observational photographic result of colored gross specimen was mentioned in figure 3-8 showing colored specimen of Heart, Lungs, Liver and Kidney. The production of the color museum specimen was possible after the specimen was carefully cleaned and mounted without causing any damage. According to Netter's Atlas of Human Anatomy, Eighth Edition, the major anatomical viscera are appropriately identified and colored.[6] No color leakage or mixing was seen when they were mounted with clear plastic bottles, stones, and glass rods and stored in 10% formalin for two months. But specially in figure 8 specimen for posterior relation of liver, some parts of color get detached from the surface was also observed. It was discovered that the specimen was easier to understand than the one without color, and it was simple to recognize the connections between the various structures and impression. The fact that the materials are nontoxic, easily handled, and widely available in stationery stores further proves how accessible and cost-effective the preparation for the anatomy museum was. The coloring technique applied to the wet specimen enhances understanding of the physical characteristics and gives the specimen a shimmering appearance. The effectiveness for teaching learning process between non colored and acrylic colored specimens was described in table 1.

Table 1: Qualitative comparison between non colored and acrylic colored specimens

	Parameter assessed	Non colored	Acrylic colored
1	Comfort in coloring	None	Excellent
2	Safety/ Handling	Good	Average
3	Acceptability of the method	Excellent	Good
4	Stability in 10% formalin	Yes	Yes
5	Cost effectiveness	Yes	No
6	Clarity of specimen	No	Yes
7	Viewer's perception	Good	Excellent
8	Aesthetic look	Good	Excellent
9	Color distinction & 3D relations	Average	Excellent
10	Overall comprehension	Good	Excellent
11	Self-learning approach/ Educational value	Good	Excellent
12	Museum specimen	Good	Excellent

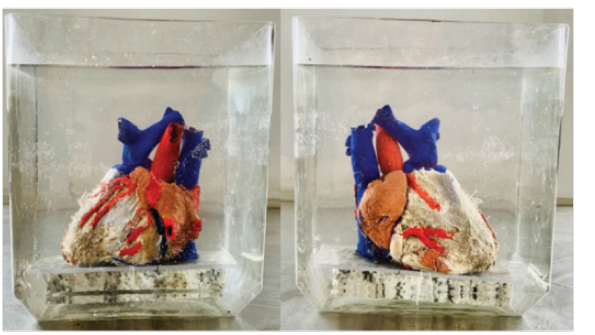

Figure 3: Showing Colored arteries and veins of heart from right lateral and left surface

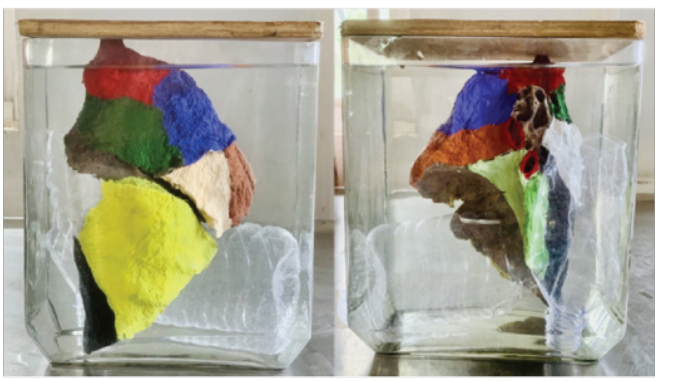

Figure 4: Showing bronchopulmonary segment of anterior and posterior surface of right lungs

Figure 5: Showing bronchopulmonary segment of anterior and posterior surface of left lungs

Figure 6: Showing Couinaud's classification of hepatic segment

Figure 7: Showing relations of anterior surface of kidneys along with arteries and veins

Figure 8: Showing relations of postero-inferior surface of liver

DISCUSSION

The gross specimen always adds great value and importance on teaching learning process on human anatomy practical sessions. But as teacher, color specimen attenuates great importance for teaching process which further enhances and stimulation of long-term visual memory.[7] Different researchers have used color painting technique such as calamine oil paint, albuminous paint, silicone etc. but acrylic color paint which is cost friendlier, easily dry out and its availability in local market causes favorite for the anatomy and gross anatomy specimens' painters. The above statement was also supported by Kaur N et al. The researcher also explained that use of acrylic paint causes clarity of the specimen & use of transparent nail polish prevents running of color in the mounting fluid.[1,5]

The well labelled specimen according to color used in netters atlas also provides asthetic value supporting teachers and making specimen attractive during demonstration to student leading to better understanding during prosection.[8] The current study was also supported by researcher Mogali SK et al explained that multicolored 3D models are less realistic as compared to plastinated models but variations cannot be studied in such type of models.[9] Some other researchers such as Suganthy J claimed that color plastinated modes are better than acrylic color painted specimen due to patchy coloring[10] which was also observed in our research figure no 8 of Posterior inferior relations of liver which may due to

improper drying of the gross specimen before painting or due to placement of specimen in mounting fluid before drying of color. The research conducted by Kamath V et al thought aligns to our research as researcher agrees that gross specimen should not only used to display in museum but they should be design in a such way which can be used in active learning. Such as color museum specimen which can be used both in display and in daily teaching learning process. The researcher also claimed that in future anatomy will be more digitalized but models, dissections and plastination are very special for anatomy museum preparation.[2] The study of Dennis JF et al also concluded that when model and specimens where used during prosection, the student are more active in teaching learning process and perform better in practical assesments.[11]

Therefore, Acrylic color technique is simple cost-effective technique that can be performed under room temperature. The storage of wet specimen is quite easy on 10% formalin without color fading was observed. This create student enthusiasm towards color model anatomical specimen and better understanding the relations and structures.

CONCLUSION

The acrylic colored specimen is simple cost-effective technique which has great importance in teaching learning process of human anatomy. The different colored used in different part aids visual knowledge and helps to store in long term memory. The colored present in the specimen can preserved by keeping in 10% formalin solution for longer period of time. Yes, we all researchers and anatomist also agree that anatomy subject is moving towards the world of digitalization and different new digital board, instruments are invented for teaching and laboratory exercises but use of colored gross specimen, dissections, plastinated models are also equally important to study the variations and to generate bonafide anatomist. This can only be ensured by creating color museum specimen for the future generations.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

ACKNOWLEDGEMENT

We would like to express our gratitude to Kamal Kandel and Dr Laxmi Bhattrai.

REFERENCES

1. Prabhu LV, Divya Premchandran D, Vadgaonkar R, B.V M. A novel method for coloring and labelling specimens in the anatomy museum. Int J Anat Res. 2015 Jun 30;3(2):1165–7

2. Kamath V, Asif M, Bhat S, Avadhani R. A prototype of digitalized anatomy museum with a scientific design. MOJ Anat Physiol. 2016 Apr 23;2(3):69–75.

3. Potaliya P, Ghatak S. Augmenting the visual display of museum specimen using fabrica acrylic colors and its better restoration. Indian J Anat. 2016;5(3):269–73.

4. Jain LK, Babel H, Vijay N. New technique to mount specimen in the formalin filled jar for anatomy museum with almost invisible support. Int J Cur Res Rev. 05(12):45–50.

5. Kaur N, Agarwal RK, Khajuria S, Harsh, Saini H. Technique for preserving colored wet specimen in anatomy museum. Int J Anat Res. 2017 May 31;5(2.2):3824–8.

6. Netter FH. Netters Atlas of Human Anatomy: A system Approach. 8th ed. Philadelphia: Elsevier;

7. Shrestha S, Yadav P, Mahat S, Shrestha S. Simple acrylic color technique for the preparation of wet specimen in anatomy museum. J Karnali Acad Health Sci [Internet]. 2020 Feb 15 [cited 2025 Mar 14];3(1). Available from: https://www.nepjol.info/index.php/jkahs/article/view/27732

8. Garsa V, Ghalawat N, Rathee SK, Kant R. Teaching anatomy using colored models. Int J Appl Res. 2017;3(6):282–4.

9. Mogali SR, Yeong WY, Tan HKJ, Tan GJS, Abrahams PH, Zary N, et al. Evaluation by medical students of the educational value of multi-material and multi-colored three-dimensional printed models of the

upper limb for anatomical education. Anat Sci Educ. 2018;11(1):54–64.

10. Shanthi P, Francis DV, Suganthy J. Colour plastination – A valuable tool for medical education. J Anat Soc India. 2015;64(2):152–4.

11. Dennis JF, Creamer BA. To touch or not to touch: evaluating student laboratory outcomes of hands-on versus visual examination of prosected cadavers. Educ Sci. 2022;12(8):519.