



Resident Forum

Medical illustration – Fusion of art, technology, and medical education

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INTRODUCTION

An illustration is a visual representation of a text that decoratively depicts the facts or description. The illustration eases the readability of the text. Most medical facts can be easily explained using medical illustrations rather than describing them in words. It represents an idea of a presenter in the form of images, flowcharts, models, or animations, and so on.^[1,2]

The medical illustration has a long history. Aristotle (384–322 BC) used papyrus scrolls to write his pictorial works. Leonardo da Vinci (1452–1519) produced 750 drawings of cadavers. Andreas Vesalius wrote a series of seven books, *De Humani Corporis Fabrica Libri*, in 1543. His drawings are historically displayed on the walls of most medical schools worldwide. Frank Henry Netter (1906–1991) produced nearly 4000 illustrations using gouache paints and illustration boards.^[2,3] Over a period, the journey of medical illustrations has been revolutionized due to the advancement of printing media, computers, digital drawing software, and hardware. The field of medical illustration is wide and interesting. It gives the opportunity to communicate effectively. Scientific knowledge is essential for creating a medical illustration.

USES OF MEDICAL ILLUSTRATIONS

There are numerous uses of medical illustrations, a few of them are as follows:

- 1) Publications of textbook, journals, and e-books
- 2) Web content
- 3) Patient education
- 4) Medical education
- 5) Interactive learning
- 6) Cell phone health applications
- 7) Museums
- 8) Film and television
- 9) Augmented and virtual reality.

ADVANTAGES AND DISADVANTAGES OF MEDICAL ILLUSTRATIONS

For each fact, there are always advantages and disadvantages.

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Advantages of medical illustrations

1. They save time in explaining the desired fact
2. They are an effective way of communication
3. They can be preserved in electronic media for a longer time and can be reproduced as per the need
4. They are suitable for transmission through electronic media to a wider audience.

Disadvantages of medical illustrations

1. The creation of a good illustration consumes lot of time
2. Illustrations can never replace clinical patient examination
3. Illustrations cannot replace practical procedures such as suturing a wound
4. Creation of illustration requires knowledge of art and software
5. Cost for professional medical illustration may be high. The software may need subscription cost.

TYPES OF MEDICAL ILLUSTRATIONS

The medical illustrations can be grouped as narrative, decorative, informative, and conceptual.

Narrative illustration

These give an idea about the entire book or process. These are useful as the cover page of a book, medical magazine, or main illustration of a brochure or website. It is an umbrella of the entire topic.

Decorative illustration

These utilize designs to simplify or exaggerate the topic. They are more useful for attracting the attention of the audience or reader. They are made in a less scientific manner, for example, affected ugly part of a beautiful face to show cancerous changes in smokers.

Informative illustration

These utilize the facts to be represented. These are more scientific and the most used in textbooks and scientific literature. They summarize facts that require space and create a message.

Conceptual illustration

These are created from an idea over the content. The images are created using reality to simplify the subject, for example, line diagrams of dissected cadaveric parts.

All the groups mentioned above have overlapping domains. To classify, an illustration in a specific group may sometimes be difficult. Illustration includes photographs, drawings, diagrams, and flowcharts. They may be black and white, colorful, two-dimensional, or three-dimensional.

PROCESS OF CREATION OF MEDICAL ILLUSTRATION

Pre-concept factors

The factors to be considered for medical illustration [Figure 1]:

- Purpose of illustration
- Audience or readers for whom it is created
- Mode of display such as print media, painting, electronic media, computer- or cell-phone-based applications, and so on
- Selection of colors: The colors should be selected carefully to depict the human body structures scientifically.

Selection of a topic

For drawing the medical illustration, selecting the topic and understanding the need is important. It involves the following components [Figure 1]:

- The topic should be read carefully with pre-topics and post-topics that are covered. For example, showing the

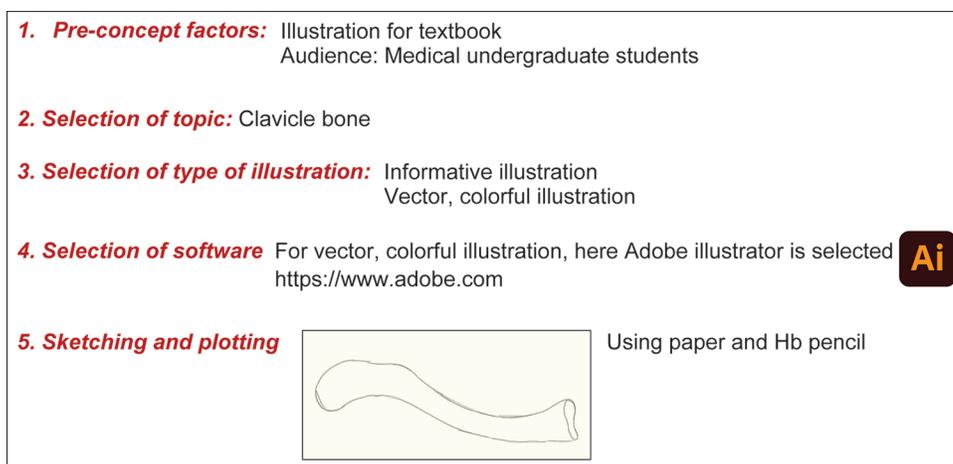


Figure 1: Planning of medical illustration.

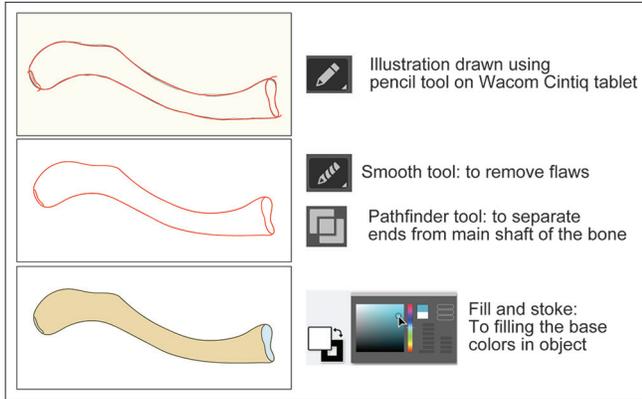


Figure 2: Drawing medical illustration using illustrator software.

passage of contents of an indirect inguinal hernia, the topic can be supported with an illustration of inguinal canal, and further, it may be followed by illustration showing surgical correction of the hernia.

- Audience: Before starting the drawing, the audience should be known. For example, illustrations for postgraduates will be more complex than for undergrads.
- Color scheme: The color scheme has scientific coding that needs to be followed. For example, RBCs in red color can be used. Similarly, to show RBCs with oxygenated hemoglobin bright red and with deoxygenated hemoglobin, blue (purple) color can be

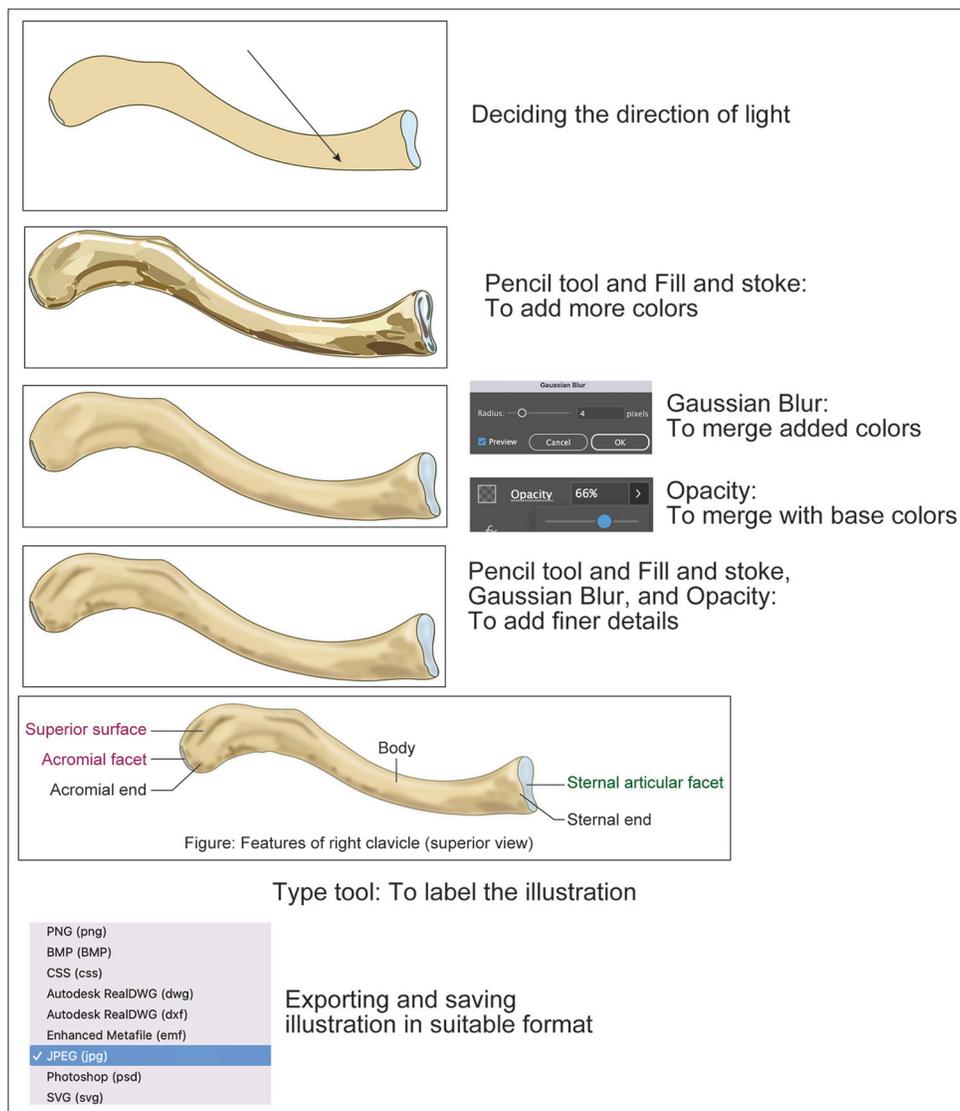


Figure 3: Adding details in illustration.

used. Follow the same color scheme throughout the entire document.

Selection of type of illustration

Suitable type of illustration needs to be selected based on the topic, use (cover page, poster, and webpage), audience, and data. The illustration can be raster or vector. The examples of two types of illustrations derived from the same text are shown in [Figure 1].

Selection of software

The raster illustrations can be drawn using Adobe Photoshop, MacPaint, PC paintbrush, painted, and so on. The vector illustrations can be drawn using Adobe illustration, free hand, MacDraw, Expression, and so on. Software such as canvas and CorelDraw are useful for creating raster and vector images. All these software have pros and cons over each other.^[4-7]

Sketching and plotting

Based on the points mentioned above, rough sketching can be prepared.

Drawing illustration

Using suitable software, rough sketch is converted into a final illustration. During drawing the illustration, the focus should be kept on the following points [Figure 2–5]:

- Three-dimensional effects
- Line, shape, tone, color, scale, and empty space to enhance the effects.
- Space of illustration is divided into positive space which is occupied by the illustration, and negative space which is unoccupied space surrounding the illustration. Both have their significance in making illustration effective.
- Text in illustration should have proper font style, readable font size, and suitable contrast, shadow, and texture to elevate the illustration.

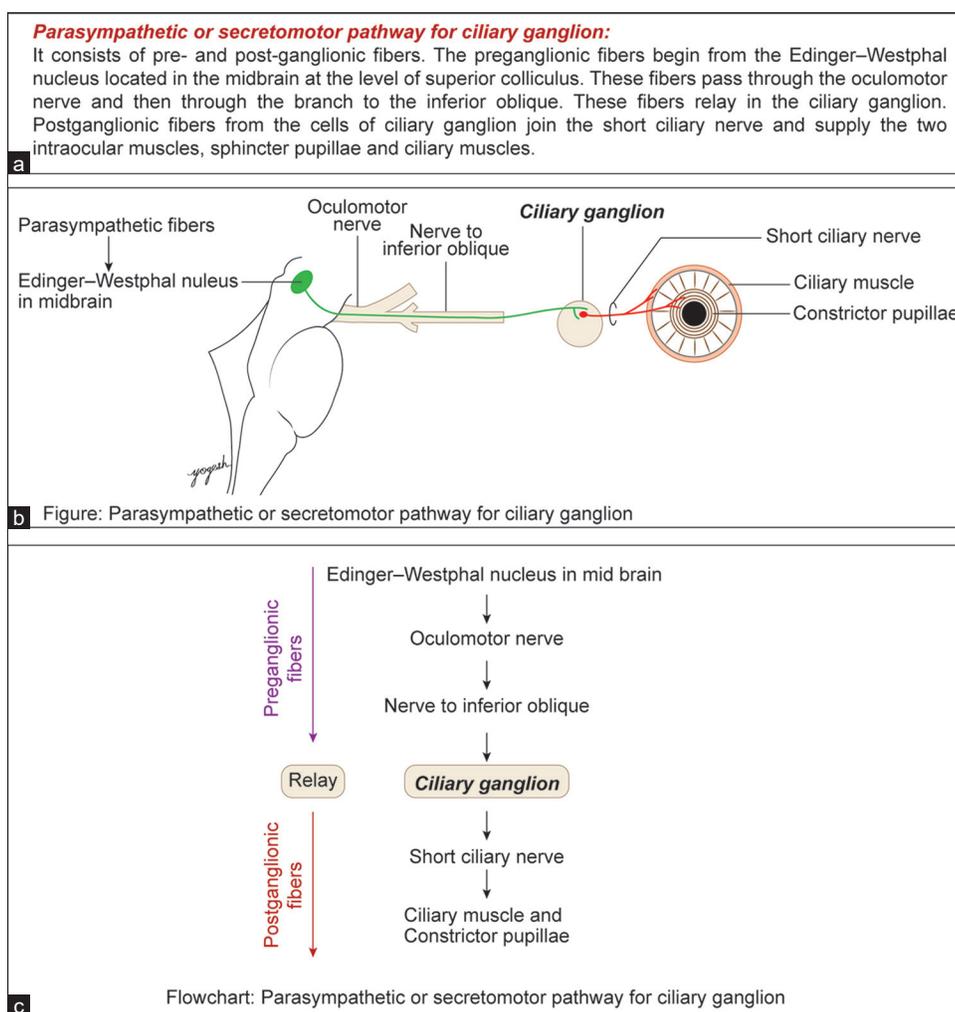


Figure 4: Example for preparation of medical illustration. (a) Text selected for the preparation of medical illustration. (b) Schematic representation of the text. (c) Flowchart representation of text.

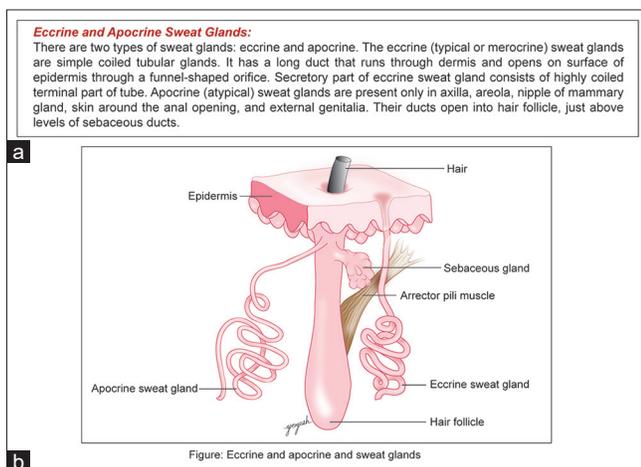


Figure 5: Another example for preparation of medical illustration. (a) Text selected for the preparation of medical illustration. (b) Diagrammatic representation of the text (Image courtesy: Textbook of Human Histology, Yogesh Sontakke, 1st Edn. CBSPD, Delhi, India).

- Simplicity in the illustration makes it suitable for most of the audience.

Review and feedback

To obtain the proper feedback, give the illustration to colleagues and few participants from the audience group. Check the perfectness of the transmission of the intended message. Obtain both positive and negative feedback. Analyze the feedback carefully and modify the illustration saving the original one. Repeat the process of feedback until a satisfactory result is obtained. Always keep in mind the illustration is for audience, and they should understand the given message. The illustration should depict the written text. It should not be ambiguous.

ETHICS AND COPYRIGHT

The medical illustration should not be misleading or unnecessarily exaggerating the facts and should not hurt the emotions of the audience. It should not defame or convey the wrong message to the audience. Care should be taken while using patient photographs. The individual's identity should never be disclosed, and it can be masked whenever possible and should be published with written consent from the patient.^[8] Do not copy the illustrations; recreate them with inputs of new ideas. Copyrighted illustrations should be

published only after obtaining written permission from the owner, who may be a publisher or artist.

CONCLUSION

Medical illustrations and the art behind them are an integral part of medical education. Various factors need to be considered while creating the illustration, ranging from pencil drawing to software-based image creation, for public awareness to undergraduate teaching.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

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