

Article

# Integrated teaching using histopathology and clinical correlates to teach histology to medical students

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**Abstract:** In modern education, innovative techniques and updated technology are essential tools for effective teaching. As the medical field advances, new teaching methods and modalities are necessary to generate interest and provide practical learning experiences. Histology is a crucial component of medical education, and a thorough understanding of both the theory and slide recognition is necessary for medical students. This study aimed to investigate the intervention of Basic Pathology into Histology and its impact on First MBBS students' response. The study involved 81 students from SKIMS Medical College in the Department of Anatomy and Pathology, who were administered a questionnaire. The results showed that students appreciated the integration of pathological perspectives with normal histology and found the combined approach useful and relevant. The study highlights the importance of practical teaching methods and the need for continuous improvement in teaching and assessment methods in medical education.

**Keywords:** Virtual microscopy; Low power; High Power; Inflammation; Malignant; Benign; Microanatomy; Slide; Microscope; Magnification; Histopathology.

## 1. Introduction

**E**ducation is the cornerstone of progress, and its effectiveness can be measured by the outcomes it produces. The success of teaching is directly proportional to the achievements of the students. The delivery of disciplined and qualitative teaching is essential for achieving the desired outcomes. To keep up with the changing times, updated technology and innovative techniques are fundamental tools for modern teaching approaches. Medical faculty involved in teaching lay more emphasis on histology than was previously done. In addition, many questions are asked from histopathological perspective also. Frequently asked questions on identification of various slides showing pathologies like acute inflammation, chronic inflammation, benign growths as well as malignant growths with clinical scenarios are common now. One such approach is the integration of Basic Pathology into Histology, which is gaining prominence due to its practicality and relevance in medical education [1].

Histology is a subset of Anatomy that focuses on the microscopic study of tissues and organs. It is a vital component of medical education, and its importance cannot be underestimated. To gain a comprehensive understanding of Histology, students need to be well-versed in both its theoretical aspects and the recognition of tissue slides. The transition of teaching from conventional to a more clinically oriented teaching necessitates the integration of teaching and both students and teachers are more inclined to adopt this pattern in future. In higher centers virtual biomedical universities, e learning is set up as a basic module of teaching integrating subjects[2].

The changing landscape of medical education demands a more practical approach to teaching, where newer techniques and modalities are tested to generate students' interest. This article sheds light on the response of First MBBS students to the integration of Basic Pathology into Histology, which represents a newer teaching approach. The article examines the effectiveness of this approach and its impact on the students' perception of Histology.

## 2. Methodology

The study was conducted on First MBBS students of SKIMS Medical College in the Department of Anatomy and Pathology. The study population comprised 81 students who were administered a questionnaire to assess their response to the intervention of Basic Pathology into Histology.

Prior to administering the questionnaire, the students were explained the procedure and due consent was obtained. The students were then asked to identify normal slides using a microscope, and those who could identify the normal slides were chosen for the study. The pathological slides used in the study were procured from the Pathology Department of SKIMS, and the Pathology faculty member demonstrated the slides to the students, providing an opportunity for the students to ask questions and freely interact.

The distinguishing feature of the pathological slides shown to the students was the acute inflammatory cells in the slide of acute appendicitis and the chronic inflammatory infiltrate or lymphocytes in the slide of chronic Cholecystitis. The purpose of demonstrating these slides was to emphasize the importance of recognizing the significance of Histology and Hematology practicals, where students are required to recognize these cells.

No assessment was conducted for these conditions, and the students were informed that no questions would be asked from histopathology. The students were given an opportunity to ask any questions, following which a questionnaire was administered to assess their response. The questionnaire was designed to evaluate the usefulness and relevance of the combined approach.

The methodology used in this study allowed for a practical demonstration of the intervention of Basic Pathology into Histology, providing students with a hands-on learning experience. The use of a questionnaire allowed for the assessment of the students' response and feedback on the usefulness and relevance of the approach.

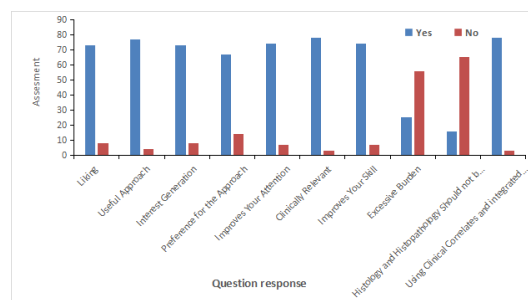
## 3. Results

The students were assessed objectively. They were asked initially to note down what they liked and what they disliked as far as teaching only normal histology and combined Histopathology are concerned, see Table 1. The students were explained at the onset, that the study was not directed to know how many of them can make a correct diagnosis from pathological slides. The fear and apprehension was reduced by encouraging and defining them to know the impact of combined teaching. From the results we could conclude that students are of the view that integration is important and needed. Students like being taught pathological perspectives along with the normal histology. The usefulness of the combined method was appreciated by the most, see Figure 1. The interest of the students was seen to increase with teaching both normal and abnormal. The relevance of studying in this manner was found to benefit as reported by students. It was also seen that it would finally improve the skill related to the use of the subject. The only negative thing is that many students found that it would burden them excessively. As far the generation of interest is concerned, it was seen that most students found that such type of combination increases their interest in studies. This seems to be an important factor as anything that increases or improves the interest of a student in studies is bound to produce fruitful results. If students find subjects boring their interest and performance would naturally decrease. The statistical difference in the opinion of the participants has been shown in Tables 2 and 3.

Placing MCQs which are diverse and can make a student to think or promote rationale thinking make it more interesting and further the positive impact of such integration. This makes the study friendly, more conceptual oriented and better to the liking of students. In addition the use of clinical scenarios, image based questions, integrating visual with non visual content was found to be liked by majority and the trends in future would be more towards integration of Medical subjects not limited to histology and histopathology only.

**Table 1.** Integrated Histology and Histopathology questionnaire

Assessment	Yes	No
Liking	73	8
Useful Approach	77	4
Interest Generation	73	8
Preference for the Approach	67	14
Improves Your Attention	74	7
Clinically Relevant	78	3
Improves Your Skill	74	7
Excessive Burden	25	56
Histology and Histopathology Should not be mixed	16	65
Using Clinical Correlates and integrated teaching helps	78	3



**Figure 1.** Representation of students response to questionnaire

**Table 2.** Demonstrating statistical difference

t-Test: Paired Two Sample for Means	Yes	No
Mean	63.5	17.5
Variance	528.2778	528.2778
Observations	10	10
Pearson Correlation	-1	
Hypothesized Mean Difference	0	
df	9	
t Stat	3.164439	
P(T<=t) one-tail	0.005734	
t Critical one-tail	1.833113	
P(T<=t) two-tail	0.011468	
t Critical two-tail	2.262157	

**Table 3.** Demonstrating statistical difference

ANOVA: Single Factor						
Summary						
Groups	Count	Sum	Average	Variance		
Yes	10	635	63.5	528.2778		
No	10	175	17.5	528.2778		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	10580	1	10580	20.02734	0.000293	4.413873
Within Groups	9509	18	528.2778			
Total	20089	19				

## 4. Discussion

Histology is a fascinating branch of Anatomy that relies heavily on visual aids to convey information to students. Its emphasis on detailed images that are not visible to the naked eye often sparks students' interest. The importance of histology and histopathology has increased with the latest changes in assessment modalities and examination patterns, where more image-based questions (IBQs) are being included. Therefore, an integrated approach that includes new technologies such as virtual microscopy and virtual slides is highly desirable [3,4].

The use of such innovative techniques not only aids in learning but also helps in assessment [5]. However, despite the rapid shift towards e-learning and virtual teaching methods, the value of basic microscopy in teaching cannot be ignored [6]. Conventional teaching methods still hold value and cannot be excluded entirely [7]. Virtual histology and histopathology centers have been established in developed institutions to aid students [8]. MP3-based audio and video can also be utilized to enhance histology and pathology teaching [9].

Although trends in pathology have changed drastically, many histopathologists still rely on conventional methods [10,11]. In our study, we used traditional teaching methods. The students were first asked to identify the slides of the appendix, and those who could correctly identify the normal slide were then shown the slide of acute appendicitis. The pathologist then provided a clinical scenario to the students. The same process was followed for the slides of the gallbladder, where students were asked to identify the slide of chronic cholecystitis after correctly identifying the normal slide.

It is important to note that histology is a microanatomy that involves the scientific study of the structure of tissues and cells. Although histological teaching is typically done using powerpoints, real-time microscopy is preferred to better simulate the way in which students are taught. As histology is an image-based subject, studying it is crucial for students to score well and pass exams as a significant percentage of marks are allocated for histology, as per the latest curriculum.

Histology practicals are a new experience for students initially.

The normal histology of the appendix reveals that it has:

- Mucosa
- Submucosa
- Muscularis mucosa
- Serosa

The mucosa is similar to the large intestine except that:

- The crypts are shorter
- The crypts are fewer
- The crypts are more branching
- The goblet cells are fewer
- The submucosa is infiltrated with lymphocytes and lymphatic follicles

The normal histology of the gallbladder reveals:

**Mucosa:** This consists of simple columnar epithelium overlying a typical lamina propria.

**Muscularis:** This is a layer of smooth muscle fibers underlying the lamina propria.

**Adventitia and Serosa:** Like the retroperitoneal organs of the tract, the outer layer of the gallbladder consists of both an adventitia that attaches it to the liver and a typical serosa that covers its free (peritoneal) surface.

Salient features of the gallbladder distinguishing it from intestines are:

- Tallest columnar
- Highly folded irregular and branched mucosa
- No villi
- No goblet cells
- No crypts
- No compact muscle in the form of inner circular outer longitudinal.

The difference in histology and histopathology was demonstrated to the student.

The distinguishing feature as demonstrated to the student in slides was the acute inflammatory cells in the slide of acute appendicitis [12] and the chronic inflammatory infiltrate or lymphocytes in the slide of chronic cholecystitis [13].

While teaching histology, emphasis was also laid on the general conditions affecting a particular organ system and the clinical relevance of the same. Examples of the appendix were Appendicitis, perforation of the appendix, and Appendicular carcinoid. This gives students an idea that the appendix is clinically relevant, and additional ideas of what are the important conditions associated with the appendix. In a similar manner, examples of the gallbladder were Cholecystitis and Adenocarcinoma of the gallbladder. This gives students an idea that the gallbladder is clinically relevant, and additional ideas of what are the important conditions associated with the gallbladder.

Experience with the microscope [4] cannot be replaced. One has to make subjects more clinically relevant. Though newer approaches in teaching are useful from a student's viewpoint. Interest in histology can prompt a student to take Pathology as a career. Peer-assisted learning would be encouraged, and this methodology can apply to groups of students as well [14].

This was followed by an integrative session of Latest Curriculum questions on the Topics.

Example of the types of questions is given below. The focus was on integrative, innovative teaching and concept building.

**Example 1.** A MBBS student is demonstrated a slide. There were presences of Normal Lymphoid aggregations in the slide. It is most likely a slide of:

- a) Duodenum
- b) Ileum
- c) Gall bladder
- d) Liver

**Example 2.** The Histology teacher is taking Histology Practical's. A slide is of Lymphatic tissue with lots of crypts. It is most likely a slide of:

- a) Thymus
- b) Ileum
- c) Tonsil
- d) Spleen

Such examples prompt a student to think and make right assessment. This reduces the concept of cramming and ensures concept building. As such latest methods like virtual microscopy and virtual slides may supplement along with online courses. This would be time friendly as well. The introduction of varied types of assessment in the form of true false, reason assertion, Multiple choice questions, Matching questions, Extended Matching questions are an added source which can be used to supplement the already existing assessment pattern which in itself is an aid to teaching and learning.

## 5. Conclusion

In conclusion, the changing preferences of medical graduates have brought about a shift towards newer and more innovative teaching methods. The integrated approach to teaching is now favored as it is more convenient, applicable, time-friendly, and creates interest among students. This approach leads to better understanding, skill development, and improved examination performance. It is important to introduce this concept at an early stage in the medical curriculum. Both students and teachers recognize the benefits of the integrated approach and its superiority over the dissociative teaching approach of the past. Ultimately, the goal of teaching is to assimilate knowledge and skills for the benefit of society, and fragmented teaching is no longer preferred as it leads to confusion, disinterest, and failure to achieve desired results. Therefore, the integrated approach should be adopted as the standard in medical education.

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