

# Perceptions And Performance of Dental Students Using Conventional And Virtual Microscopy In Oral Pathology

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## Abstract

**Objective:** This study was carried out to analyze the perception and performance of dental students regarding the use of conventional microscopic slides and virtual slides about teaching and learning.

**Material and methods:** Eighty undergraduate dental students who had studied the subject of oral pathology as a compulsory subject at Watim Dental College were invited to participate in the study. Students not willing to take part in the study were excluded. The questionnaires were duly filled and the test was taken by the students using either virtual slides or glass slides. The data was collected and analyzed using SPSS 20.

**Results:** A total of eighty undergraduate students participated in the study. The results showed that dental students had a higher acceptance rate (all P-value<0.001) for cases taught via virtual microscopy and they outperformed in cases shown on virtual slides (p<0.01).

**Conclusion:** In this study, the students preferred teaching oral histopathology via virtual slides over conventional glass slides and it also contributed more to their learning.

**Keywords:** Conventional microscopy, dental students, virtual microscopy, oral pathology

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## 1. Introduction

Dentistry is all about the prevention, diagnosis, and treatment of diseases in the oral and maxillofacial region using medical and dental knowledge. Oral Pathology provides the student with comprehensive knowledge of understanding various pathologies affecting the oral and maxillofacial region.<sup>1</sup> This subject is taught in the 3<sup>rd</sup> year of the BDS program in Pakistan. Traditionally the subject is taught using a theoretical-practical approach. The practical component mostly revolves around diagnosing the histopathological slides related to the topic taught in class with an optical microscope. The importance and utility of an optical microscope cannot be denied but it has significant limitations when it comes to students; students don't find it dynamic and complain of difficulty in manipulating the microscope sometimes.<sup>2</sup> Moreover, the quality of equipment can hinder better learning due to low image quality. Preparing a good quality histological slide for optical microscopy requires a great deal of time and material, physical space devoted to storage, conservation and manipulation and the need for glass replacement due to various reasons such as weather etc.<sup>3</sup> Many dental colleges don't have an extensive set up of preparing histopathological slides, preserving rare

lesion/tumours and hence they usually outsource the slides required for teaching purposes. Students don't have access to conventional microscopes during the self-directed learning time due to the laboratory being occupied with other academic activities.<sup>1</sup> Dentistry is evolving at a rapid pace; various technological advancements have been incorporated into the dental curriculum to improve students' involvement and performance. One such tool is the virtual microscope used in medicine and dentistry.<sup>4</sup> It is now feasible for microscopic glass slides to be transferred into digital virtual slides. The use of a virtual microscopy system provides better quality and more stable virtual microscopic images, and students can effectively learn oral histopathological slides through the virtual slide learning method.<sup>2</sup>

This study aimed at exploring the effectiveness of teaching oral pathology laboratory courses using glass or virtual slides. We also wanted to analyze the perception and performance of dental students in oral pathology regarding the use of glass or virtual slides.

## 2. Materials & Methods

This comparative case study was conducted in the Department of Oral Pathology, Watim Dental College from January 2023 till March 2023. Ethical approval was obtained beforehand from the ethical review committee

at Watim Medical and dental college. A total of 80 dental students who were taught the subject of Oral pathology participated in the study. Students willing to participate signed an informed consent before the study was conducted, students not willing to participate were excluded from the study. The study was divided into two parts; a questionnaire for evaluation of the acceptance rate of using glass slides or virtual slides, followed by an exam to assess students' ability to identify slides using both methods. After collecting and compiling the data, descriptive statistical analysis was done using SPSS 20. The difference in the mean acceptance rates of various investigated items such as students' learning effectiveness was compared between the glass and virtual slide learning methods for oral pathology courses by Student's t-test.

**3. Results**

A total of 80 students, (100% response rate) completed the questionnaire and 60 (75% response rate) completed the exam. With teaching 87.5% of the students thought that virtual slides were a better way for learning oral pathology slides.

**Table-1** Students' perceptions of conventional and virtual microscopy, by number and percentage of questionnaire respondents (N=80)

Items	Conventional Microscopy	Virtual Microscopy
Q1. This method is better for learning	10(12.5)	70(87.5)
Q2. This teaching method is very time efficient	6(7.5)	74(92.5)
Q3. This histopathological image is very clear	32(40)	48 (60)
Q4. This method is more effective in identifying structures	13(16.25)	67(83.75)
Q5. This method is easy to manipulate	3(3.75)	77(96.25)
Q6. This method can stimulate my learning	24 (30)	56(70)

On evaluating the technical aspects 60% found that virtual slides were clearer, 83.75% thought that it also helped them in identifying structure more effectively and 96.25% preferred the ease of manipulation. In addition, 70% of the students stated that virtual slides motivated their learning in oral pathology. (Table-1)

On the knowledge exam, 60 students took the test. In the test cases (1,2 and 3) shown through virtual sides, more than half of the students answered the questions correctly. Whereas in cases 4 and 5 shown via conventional glass slide majority of the students couldn't answer it correctly. However, in case 6 shown on the conventional glass slide half of the students were able to get it right. (Table-2).

**Table-2** Students' performance on the exam using virtual and conventional microscopes (N=60)

Question	Correct answer	Incorrect answer
Case 1 Virtual slide	37 (61.66)	23(38.33)
Case 2 Virtual slide	49 (81.66)	11(18.33)
Case 3 Virtual slide	34 (56.66)	26(43.33)
Case 4 Conventional glass slide	26 (43.33)	34(56.66)
Case 5 Conventional glass slide	18 (30)	42(70)
Case 6 Conventional glass slide	30 (50)	30 (50)

Statistical analysis showed that the mean acceptance rates of these 6 questions regarding the learning of oral histopathology were all significantly higher in dental students using the virtual slides than in dental students using the glass slides (Student's t-test, all P-values <0.001 except for question 3) (Table-3)

**5. Discussion**

Oral pathology undergraduate courses help students understand the pathogenesis, clinical, radiographic and histopathological features of various diseases affecting the oral and maxillofacial region.<sup>1</sup> For excellent learning of oral histopathological slides clear, good-quality representative tissue sections and their histopathological images are of prime importance. Undergraduate students often find learning through conventional microscopy difficult and not very relevant.<sup>2</sup> Hence this study was taken up to analyze the perception and performance of dental students using conventional and virtual microscopic slides.

**Table-3** The mean acceptance rates of 6 questions regarding the learning of oral pathology using either glass or virtual slides.

Mean $\pm$ Standard Deviation			t- value	p-value
	Glass side	Virtual slide		
Q1. This method is better for learning	1.25 $\pm$ 0.437	4.38 $\pm$ 0.491	-20.082	<0.001
Q2. This teaching method is very time efficient	1.075 $\pm$ 0.269	4.4 $\pm$ 0.492	-17.985	<0.001
Q3. This histopathological image is very clear	2.0 $\pm$ 0.893	2.4 $\pm$ 0.878	-1.643	0.103
Q4. This method is more effective in identifying structures	1.63 $\pm$ 0.592	4.35 $\pm$ 0.571	-17.046	<0.001
Q5. This method is easy to manipulate	1.038 $\pm$ 0.196	4.45 $\pm$ 0.499	-21.244	<0.001
Q6. This method can stimulate my learning	1.8 $\pm$ 0.714	3.85 $\pm$ 0.748	-15.225	<0.001

In this study, virtual microscopy was the preferred method in terms of benefits such as easy manipulation, the possibility of image editing better distribution of knowledge. This was reported in other somewhat similar studies.<sup>1,2</sup> Students also perceived that virtual microscopy helped in the identification of microscopic structures in a better way as compared to conventional microscopy. The students were able to mark various structures that triggered specific interests at the same time.<sup>3,5,6</sup>

In a routine practice session with glass slides, the learning is limited to the histopathological aspect of the lesions. However, using the virtual slides less time was required for viewing and identifying the structures, and comprehension of the administered content occurred more rapidly. This was also pointed out in a similar study conducted in Taiwan.<sup>1</sup> In addition, this method allowed more time to review more examples, discuss case reports, view radiographs, and have interactive discussions regarding pertinent clinical information as well. This enhanced students learning in oral pathology allowing more exploration in relatively less time. Such results were shared by various other studies as well.<sup>1,2,7</sup>

The generation of our students is raised in a digital world, they are more adapted and comfortable with a variety of technologies and what better example than the Covid pandemic.<sup>4, 8</sup> Many studies pointed out the need to revolutionize the current curriculum, use

technology to bridge the gap between theory and practice and Oral pathology is no exception.<sup>8-10</sup> This study was conducted at the end of the academic year when students were exposed to learning oral pathology both via conventional and virtual slides and the majority preferred the virtual method. This pattern was seen in similar studies.<sup>1,11</sup>

The result of the class test showed that a large number of students gave correct answers to the virtual slides which demonstrates the potential of this technique and suggests that this method alone is sufficient for students learning oral pathology. This was by many other similar studies.<sup>12,13</sup> Other somewhat studies in teaching general histology have presented conflicting results where there was no significant difference in both methods of microscopy.<sup>2</sup>

There is a positive acceptance rate of virtual microscopy, many worldwide studies have suggested the elimination of conventional microscopy from histopathology and pathology or have shown the intention of doing so in coming years.<sup>7,14</sup> Nonetheless even with the well-established use of virtual microscopy there was some disagreement or some indecisiveness over eliminating the conventional microscopy.<sup>15</sup> However, this study can give insight into the various universities for modifying the undergraduate oral pathology curriculum in Pakistan and make it more acceptable to both faculty and students. Conventional microscopy is still widely used

by institutions due to a dearth of resources as time is required for scanning, storing and transmitting virtual slides which are not yet very practical.

This limitation of the study is that it was conducted at one academic dental institution so the findings may not be generalized to other dental colleges. Further studies like this including other dental institutes will expand the findings and help the Oral Pathologists of Pakistan devise a plan and give recommendations to the universities for curriculum reforms in future.

## 5. Conclusion

This study found that there was a positive perception of virtual microscopy by students and they performed well in their knowledge exam suggesting that this method can play an important role in oral pathology training in dental education. This method influenced students' active participation. Virtual microscopy can progressively replace conventional microscopy in undergraduate dental education. The universities can gradually transform the glass slides into digitalized virtual slides and share them with the affiliated colleges to integrate virtual microscopic images and clinical information about oral diseases to enhance students' learning.

**CONFLICTS OF INTEREST-** None

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**Potential competing interests:** None to report

**Contributions:**

G.S.O - Conception of study

G.S.O - Experimentation/Study conduction

G.S.O, W.U.N, S.I, N.N -

Analysis/Interpretation/Discussion

G.S.O - Manuscript Writing

W.U.N, S.I, N.N, A.A, Z.A - Critical Review

N.N, A.A, Z.A - Facilitation and Material analysis

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