Original Research Article

Virtual microscopy to enhance practical skills in learning pathology among medical students and dermatology residents

K.P.Umadevi[1], J. Govardhan[2*], Arthy Amarnath[3]

[1]Associate Professor, Department Of Pathology, Aarupadai Veedu Medical College & Hospital, Puducherry, India

[2]Associate Professor, Department of Dermatology, Aarupadai Veedu Medical College & Hospital, Puducherry, India

[3]Assistant Professor, Department of Forensic Medicine, Aarupadai Veedu Medical College & Hospital, Puducherry, India

Received: 20-06-2021 / Revised: 23-07-2021 / Accepted: 18-08-2021

Abstract

Introduction: Traditionally, direct inspection of glass slides by light microscopy has been the gold standard for teaching medical students. There are few disadvantages like microscopes are expensive and require storage and maintenance regularly. The main objectives of this study is to assess the effectiveness of projection based images in teaching pathology practical's among second year medical students. **Materials and Methods:** The students are randomized into two groups (A &B) on the basis of Lot. All students will receive the didactic lecture in the class room preceding the study. Group A students will be shown the slides by direct observation in microscope, in batches under guidance of instructor. Group B will receive the same case discussion by projection method. The students will be exposed to both the microscopic techniques by crossover from study group to control group and vice versa. Total of 10 (4 inflammatory and 3 benign and 3 malignant cases). Pre and post-test performance will be assessed based on morphology recognition. Followed by questionnaire identifying the student's favored method. Kirkpatrick's level 1 and 2 will be assessed for the impact of teaching methodology. **Results:** Randomized controlled interventional study, whole slide image and focused area were captured and anonymised and students were given remote access to university computers. This study was conducted at Pathology department, AVMCH & RI, Pondicherry. In our study, 1.619 students and residents observed at pre-DM (Direct Microscopy), 2.7143 students and resident were pre-VM (Virtual Microscopy). 8.5714 students and residents observed at Post-DM (Direct Microscopy), 7.7143 students and residents observed at post-VM (Virtual Microscopy). **Conclusion:** The transformation to teaching histology on the computer may be inevitable. In the future, institutions will not be able to support multi-purpose computer learning centers plus large microscope laboratories, especially if microscopic morphology can be effectively taught via computer. We believe the Virtual Microscope Laboratory and the emerging technology described in this project assists with the transformation in a way that will maintain many of the educational advantages inherent in using a real microscope and glass slides.

Keywords: Kirkpatrick's level, Virtual Microscope, Direct Microscopy.

Introduction

Traditionally, direct inspection of glass slides by light microscopy has been the gold standard for teaching medical students. There are few disadvantages like microscopes are expensive and require storage and maintenance regularly[1].

Slide collections can be difficult, glass slides are fragile to handle by students. To acquire and preserve them is laborious and stain on slides tend fade over a period of time[2].

Virtual microscopy is a technique wherein digital images of microscopic glass slides are obtained on the computer screen. The images can be saved in portable discs and can be used for teaching and assessing the students[3,4].

These images are easy to duplicate and preserve for later use.

*Correspondence
Dr. J.Govardhan
Associate Professor, Department of Dermatology, Aarupadai Veedu Medical College & Hospital, Puducherry, India
E-mail: gopi3333@yahoo.com

Aim

To assess the effectiveness of projection based images in teaching pathology practicals among second year medical students and dermatology residents.

Objectives

1) To assess the effectiveness of virtual microscopic images over direct microscopic observation in understanding histopathology during second year MBBS practical classes and dermatology residents.
2) To obtain the usefulness of Virtual and Direct microscopy by subjective opinions from students.

Materials and methods

Study design

Randomized controlled interventional study, whole slide image and focused area were captured and anonymised and students were given remote access to university computers,

Study setting

Pathology department, AVMCH & RI, Pondicherry

Inclusion criteria

Second year MBBS students and dermatology residents giving consent was included in the study.

Number of groups to be studied

Two groups, control and study group

Sampling population
Fifty One, Sampling technique: Randomization through lot
Topics covered
Non neoplastic (inflammatory) and neoplastic (benign, malignant) disorders

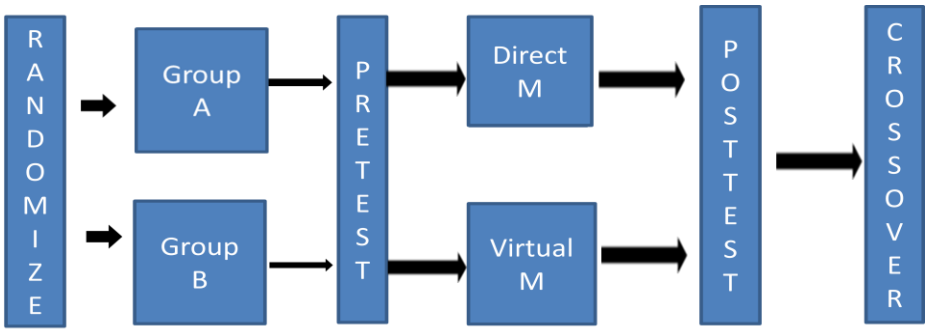

Fig 1: Study design

The students are randomized into two groups (A &B) on the basis of Lot. All students will receive the didactic lecture in the class room preceding the study. Group A students will be shown the slides by direct observation in microscope, in batches under guidance of instructor. Group B will receive the same case discussion by projection method. The students will be exposed to both the microscopic techniques by crossover from study group to control group and vice versa. Total of 10 (4 inflammatory and 3 benign and 3 malignant cases). Pre and post-test performance will be assessed based on morphology recognition. Followed by questionnaire identifying the student's favored method. Kirkpatrick's level 1 and 2 will be assessed for the impact of teaching methodology.

Pre and post-test performance will be assessed based on morphology recognition. Followed by questionnaire identifying the student's favoured method.

Statistical Analysis
The pre and post test scores before and after the intervention will be tested using student paired t-test.

Results
Randomized controlled interventional study, whole slide image and focused area were captured and anonymised and students were given remote access to university computers. This study was conducted at Pathology department, AVMCH & RI, Pondicherry.
In our study, 1.619 students and residents observed at pre-DM, 2.7143 students and residents were pre-VM. 8.5714 students and residents observed at Post-DM, 7.7143 students and residents observed at post-VM.

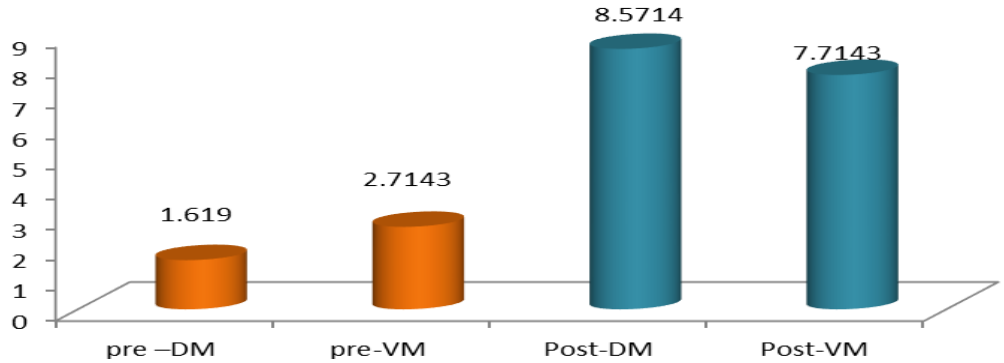

Fig 2: Performance by two methods

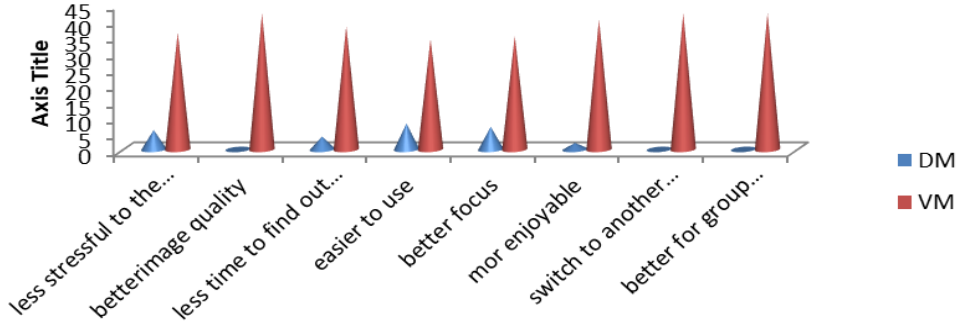

Fig 3: Response to queries

Feedback given from students

- Enjoyed the session
- Very useful
- All the topics should be taught by this method
- Interactive
- Pathology is easy
- We got to know what to focus in the images

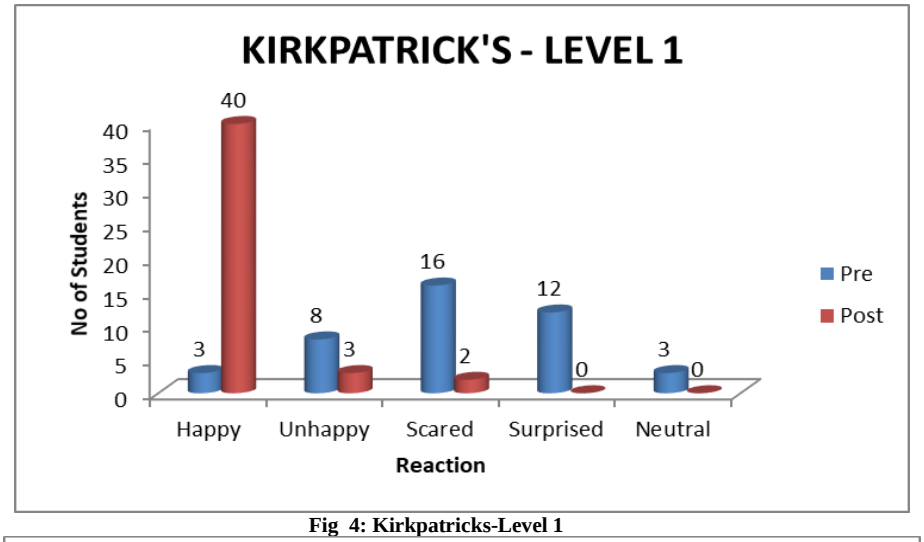

Fig 4: Kirkpatricks-Level 1

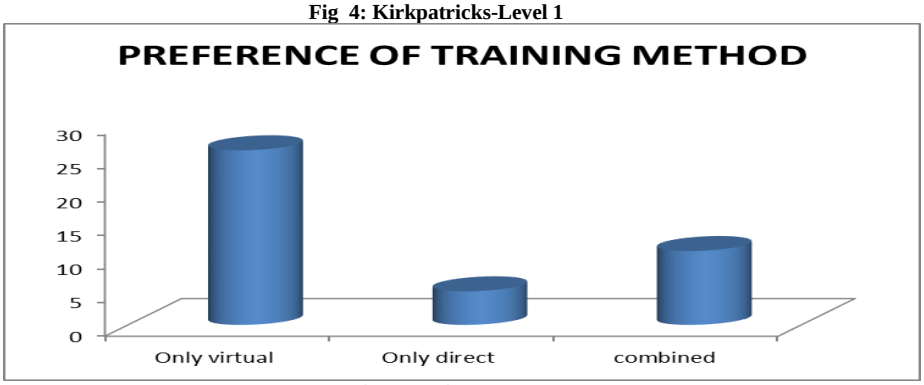

Fig 5: Preference of training method

Limitations

- Virtual microscopy requires expensive digital technology to generate high quality images
- Benefits need to assessed in larger number

Dermatology residents

Nine dermatology residents were included in the study. They were also shown the histopathology slides in the similar method as mentioned previously

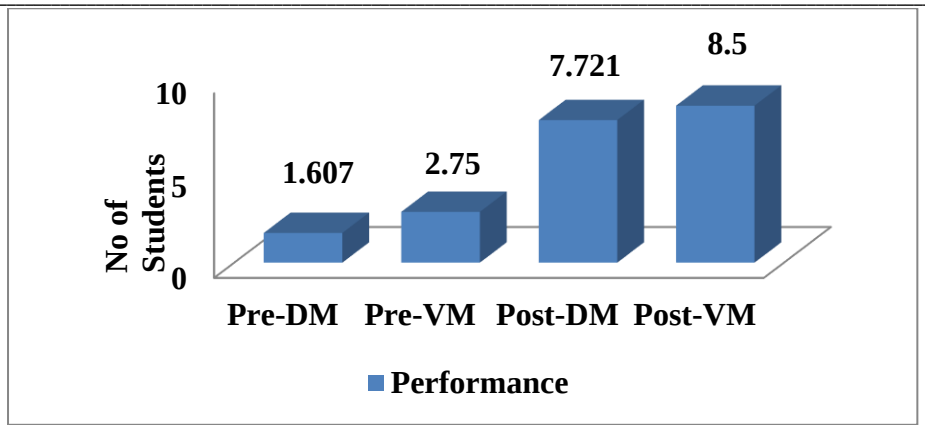

Fig 6: Performance by two methods in Dermatology Residents

Discussion

Virtual microscopy was first introduced into the digital landscape of histopathology almost twenty years ago. Since then the technology has undergone series of evolution prompting its incorporation into the histology and histopathology courses of medical and dental students in many schools and training of some pathology residents[5]. VM technology has also been used in some settings to augment CM in the provision of diverse routine diagnostic surgical pathology services, including quality assurance re-reviews. Yet, many pathologists remain skeptical toward its full integration into mainstream routine diagnostic histopathology as a credible alternative to conventional microscopy [6].The introduction of VM, an adequate alternative to the traditional methods of teaching pathology, can help the students to achieve a satisfactory knowledge of these basic disciplines in these newly reformed curricula. MBBS students and dermatology residents were included in the study. Virtual microscopy is enhancing practical skills in learning pathology among MBBS students and dermatology residents when compared with direct microscopy. For the medical staff, using this tool not only results in a reduction of the work load but also allows obtaining more information about how students learn pathology, how instructive the laboratory classes are, and which slides are of real didactic value for the students[7].

Virtual microscopy imitates the use of a traditional microscope and glass slide. One of the main advantages of this tool for students is that the slides are always in focus, with optimized contrast and adjusted illumination. Indeed, over 70% of the students thought that the navigation with the VM viewer was easier than with glass slides.

Although the initial equipment and software cost for creating VM is high, this new technology has the potential to revolutionize the way individuals teach and learn from microscopic images. With VM, the most representative slides with the best quality material can reassuringly be included in teaching sets. Not only can such materials be easily added to the virtual sets, but compared with glass slides these digital slides will not fade, break. One of the main advantages of VM is the portability (time and location), and ease of maintenance. Finally, this tool may allow reducing or even eliminating the expensive laboratories of microscopy.

Conclusion

The transformation to teaching histology on the computer may be inevitable. In the future, institutions will not be able to support multi-purpose computer learning centers plus large microscope laboratories, especially if microscopic morphology can be effectively taught via computer. We believe the Virtual Microscope Laboratory and the emerging technology described in this project assists with the transformation in a way that will maintain many of the educational advantages inherent in using a real microscope and glass slides.

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Conflict of Interest: Nil Source of support: Nil