Brief Research

Embracing Online Virtual Microscopy and Web Conferencing for Pathology Residents in Thailand: A Paradigm Shift in Pathology Education in The Midst of COVID-19 Pandemic

Charinee Kantasiripitak[1], Thiyaphat Laohawetwanit[1, 2]

Abstract

Pathology residents and pathologists used digital pathology, a web conferencing software, and an online game-based learning platform during an online seminar held by the Royal College of Pathologists of Thailand during the COVID-19 pandemic. They had satisfactory performance and viewed these technological advances as potential modalities for pathology education.

Keywords: Digital pathology, Residents, Education, Disruption

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[1] Division of Pathology, Thammasat University Hospital, Pathum Thani 12120, Thailand
[2] Chulabhorn International College of Medicine, Thammasat University, Pathum Thani 12120, Thailand
Corresponding author: Thiyaphat Laohawetwanit, Chulabhorn International College of Medicine, Thammasat University, 99 Moo 18 Klong Luang, Pathum Thani 12120, Thailand Email: thiyapat@staff.tu.ac.th

Introduction

Digital pathology (DP), also called virtual microscopy (VM) or whole slide imaging (WSI), is the practice of pathology using digital imaging. Virtual images of the whole histological glass slide are generated by slide scanners using different optical objectives. These digital slides can be either uploaded to a server or viewed by specific software.[1] VM allows better tissue orientation through navigation, labeling, and annotations. Conventional light microscopy (CLM) cannot achieve the features mentioned above. As a result of these advancements, VM is regarded as a method equivalent to CLM for educational purposes.[2] In addition to educational aspects, DP offers several opportunities, including pathological diagnosis and research in computational pathology. However, data on the adoption of DP for postgraduate education is minimal.

The COVID-19 pandemic has dramatically affected postgraduate pathology training worldwide. Such an unprecedented event has accelerated the adoption of DP and video conferencing in pathology education. Online virtual microscopy, a web conferencing software, and an online platform that could boost audience engagement were used in an online educational seminar for anatomical pathology residents organized by the Royal College of Pathologists of Thailand during the pandemic. This study aims to assess participants' performance and perceptions of applying these technologies for educational purposes.

Methods

Participants

Participants were anatomical pathology residents and practicing pathologists in Thailand who attended the telepathology session.

Selected cases

Four cases with challenging histopathological features from archives of the Division of Pathology, Thammasat University Hospital, were selected. The representative sections of such cases were scanned using Pannoramic 250 Flash III (3DHISTECH Ltd., Budapest, Hungary).

Teleconference

Two weeks before the educational session, digital slides with brief clinical histories were distributed to attendees. Participants could view the digital slides by the integrated web viewer. The interactive seminar was held using a web conferencing software (Zoom; https://zoom.us) and an online game-based learning platform (Zeetings; https://www.zeetings.com) to enhance audience engagement. Participants and presenters could simultaneously view the digital slides via the shared screen while using Zoom. Histomorphology, provisional diagnosis, differential diagnosis, and immunophenotype were discussed before rendering the definite diagnosis.

Performance and satisfaction assessment

The study was divided into three parts: participant characteristics, performance assessment, and satisfaction evaluation. At the end of the session, participants were asked to complete the survey questions with a five-point Likert-style scale from 1 to 5 (1 = strongly disagree, 2 = disagree, 3 = not sure, 4 = agree, and 5 = strongly agree). Some participants also provided additional feedback.

Statistical analyses

Data on participant characteristics, participants' performance, and perception of the teleconference were summarized using descriptive statistics (means, percentage, and standard deviation). Statistical analysis was conducted using Microsoft Excel software for Windows 10 (Microsoft Corporation, Washington, USA). Data are presented as numbers, percentages, and means ± SD.

Results

Participants viewed digital slides via the integrated web viewer (Figure 1). A total of 100 participants attended the teleconference. Of the participants, 59 (59%) answered the questionnaire regarding their characteristics, 34 (34%) completed the knowledge-based questions, and 50 (50%) completed the survey questions. Most participants were pathology residents (n = 49, 83%). Baseline characteristics of participants were shown in Table 1.

Table 1 Participant characteristics [n = 59]

Participant characteristics	Number (%)
Total participants	59
Status	
1st year resident	16 (27.1)
2nd year resident	13 (22)
3rd year resident	20 (33.9)
Practicing pathologist	10 (17)
Location	
Residence	30 (50.8)
Hospital	29 (49.2)
Geographical distribution	
Bangkok	28 (47.5)
Khon Kaen	12 (20.3)
Pathumthani	4 (6.8)
Chiang Mai	3 (5.1)
Songkla	2 (3.4)
Did not answer	10 (16.9)

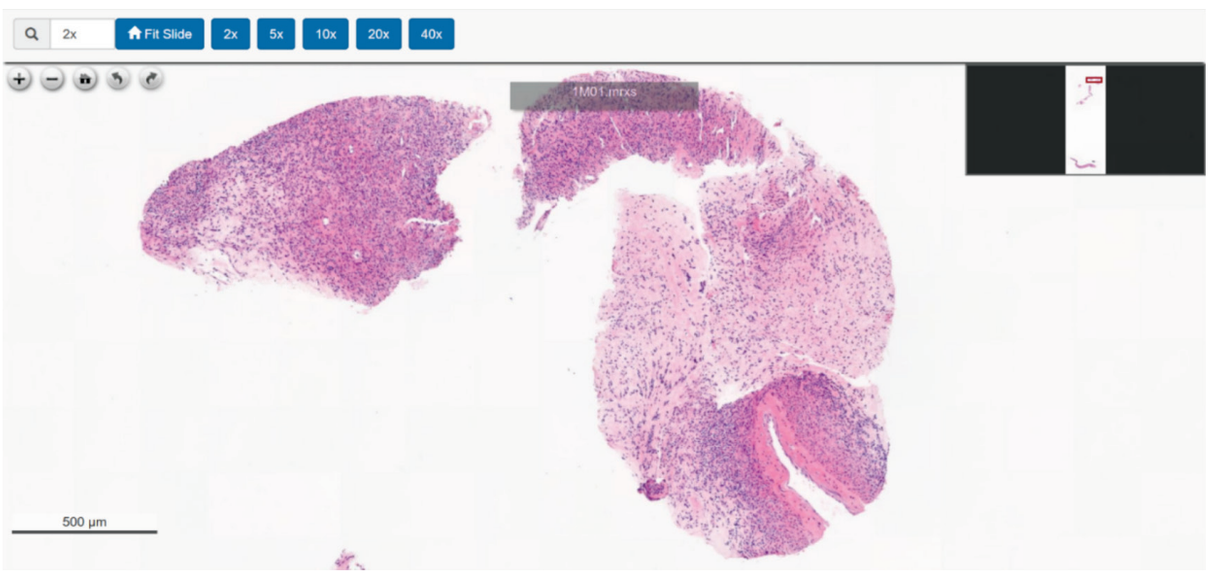

Figure 1 EBV-associated smooth muscle tumor, scanning magnification. The overall tissue architecture could be easily appreciated by the scanning magnification. The navigating thumbnail (top right) is also useful for tissue orientation.

The overall performance was satisfactory (n = 34). A total of 31 (91.2%), 34 (100%), 33 (97.1%), and 24 (70.6%) participants could render the correct definite diagnosis of infantile myofibromatosis, EBV-associated smooth muscle tumor, medullary thyroid carcinoma, and epidermodysplasia verruciformis, respectively (Figure 2). Almost all participants gave appropriate provisional diagnoses, differential diagnoses, and immunopanels for each item.

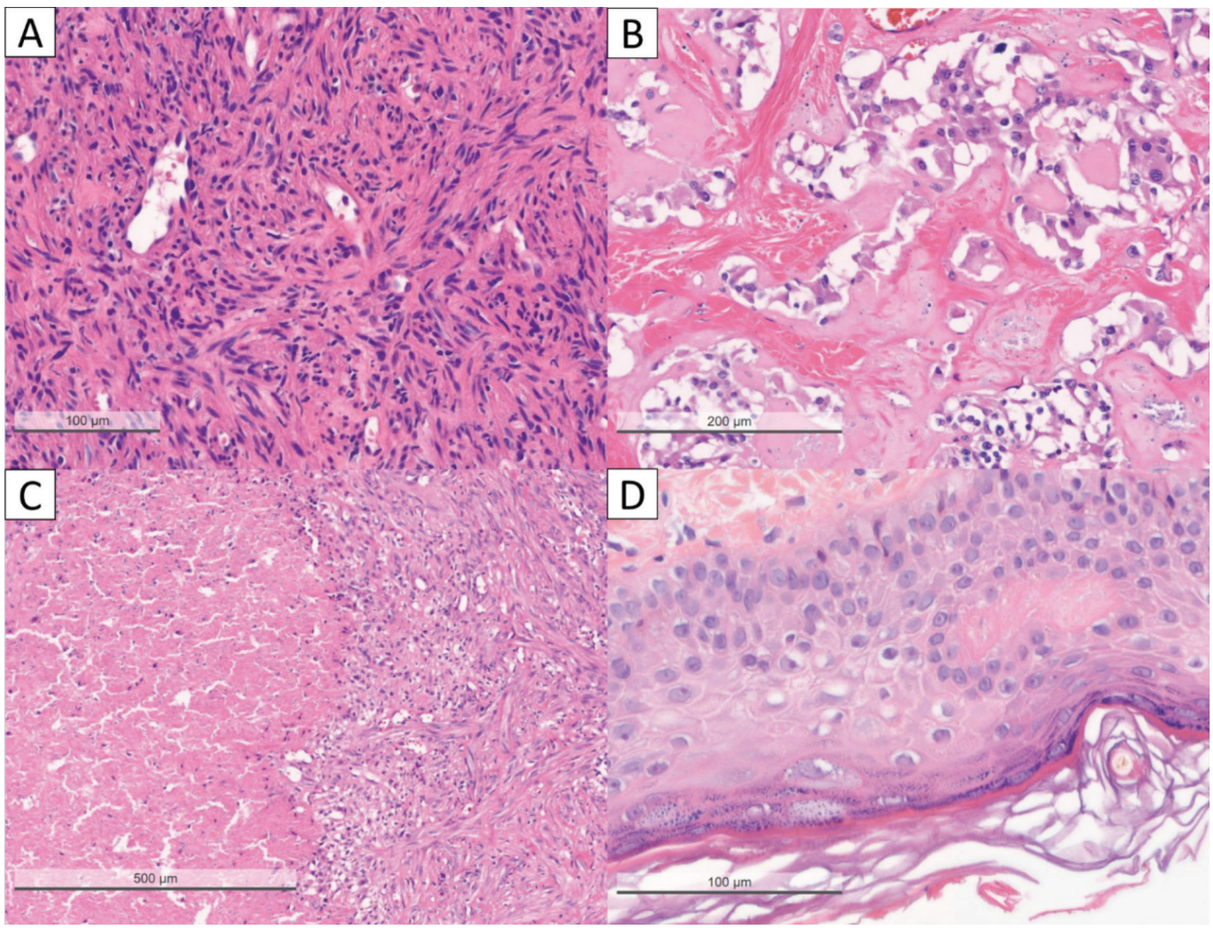

Figure 2 Representative photomicrographs of four selected cases taken from digital slides. (A) EBV-associated smooth muscle tumor; (B) Medullary thyroid carcinoma; (C) Infantile myofibromatosis; (D) Epidermodysplasia verruciformis.

Participants' perception of telepathology, including online virtual microscopy, web conferencing (Zoom), and a game-based learning platform (Zeetings), was shown in Table 2. Most participants preferred the portability of digital slides (mean: 4.8 on the five-point Likert-scale), giving anonymous answers in Zeetings (4.7), seeing virtual slides on the web-based platform (4.6), easy-to-use online virtual microscopy (4.4), and using Zoom and Zeetings in the following web conference (4.4). Overall comments and feedbacks from participants were satisfactory. The selected cases were appropriate and worth discussing. Reasons for any immunostains should be emphasized. The participant capacity should be more than 100 since several practicing pathologists could not join the session.

Table 2 Participants' perception of telepathology, including online virtual microscopy, web conferencing (Zoom), and a game-based learning platform (Zeetings) [n=50]

Survey questions	Mean ± SD
1. It is easy to use online virtual microscopy and access the image server.	4.4 ± 0.9
2. I prefer seeing virtual slides on the web-based platform to downloading them with corresponding software to the computer.	4.6 ± 1
3. The quality of the image of digital slides is similar to that of physical slides.	4.0 ± 1
4. I like the possibility of accessing digital slides anytime, anywhere on any device.	4.8 ± 0.6
5. Case discussions during teleconference can improve my thinking process.	4.1 ± 0.8
6. Using Zoom with Zeetings is an effective method to learn a systematic approach in pathology.	4.2 ± 0.8
7. Zeetings is an excellent online game-based learning platform.	4.1 ± 0.9
8. I feel comfortable giving anonymous answers in Zeetings.	4.7 ± 0.7
9. Zoom and Zeetings should be used in the next teleconference.	4.4 ± 0.8

Discussion

There has been regular DP use as a part of a teleconference held every quarter for several years in Thailand. Such a web conference is a part of the anatomical pathology residency training program. Participants are pathology residents and pathologists from several institutions in Thailand. During the session, several cases are discussed by residents and expert pathologists. In the era of the COVID-19 pandemic, attending such a web conference is different from the past. Instead of staying together in a meeting room of each institution, participants have to use their own electronic devices to join the live meeting via the given link. Our study showed that several anatomical pathology residents and practicing pathologists from several hospitals in Thailand attended the session, and the overall participants' performance and perception were satisfactory.

In terms of residency training, VM offered some benefits and features that CLM was unable to. First, VM could provide standardized training for pathology residents.[3, 4] Second, diagnostic errors could be analyzed by tracking with virtual slides.[5] Third, VM could be used as a tool for performance-based competency assessment of residents.[6] However, residents at institutions not equipped with WSI systems may require further training before sitting in a wholly digital examination.

A recently published systematic review showed that data on the performance and preference of residents regarding the use of VM was relatively limited. According to previous studies, VM and CLM groups had comparable performance without a statistical difference, and CLM was more preferred to VM.[7] Regardless of the performance or preference of residents, VM's use is present in the certification examination in the US and Canada.[7] The performance of residents completing examinations using digital slides was comparable with that of glass slides; however, they were uncomfortable with DP.[8]

There were several drawbacks to this study. First, the major drawback was that this study represented a single event. More convincing data can be acquired if the data is collected from a series of online educational seminar sessions. Second, the maximum number of participants (n = 100) was limited by the web conferencing software's capacity. Third, participants tended to be anatomical pathology residents and practicing pathologists familiar with DP, resulting in selection bias. Last, the number of cases discussed was only four. Such a small number of cases was not enough for a validation study. Further studies are required to validate whether Thai pathologists can render the correct pathological diagnosis using digital slides. To the best of our knowledge, the present study is the first to evaluate the performance and satisfaction of DP for the educational purpose of anatomical pathology residents and practicing pathologists in Thailand.

DP and web conferencing are regarded as potential interactive learning-teaching tools for anatomical pathology residents. Regardless of their preference, these next-generation pathologists should be familiar with DP. Adequate exposure with a competent level of VM operation can be accomplished during residency training programs.

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Conflict of interest None declared.

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