J Pathol Inform

Editor-in-Chief:
Anil V. Parwani , Pittsburgh, PA, USA
Liron Pantanowitz, Pittsburgh, PA, USA

OPEN ACCESS
HTML format

For entire Editorial Board visit : www.jpathinformatics.org/editorialboard.asp

Commentary

What is new in the evaluation of diagnostic digital cytopathology in cervicovaginal smears?

Marilyn M. Bui[1,2], Corinne L. Stephenson[2]

[1]Departments of Anatomic Pathology, Moffitt Cancer Center, [2]Oncological Sciences, Cell Biology and Pathology, Morsani College of Medicine at University of South Florida, 12902 Magnolia Dr, Tampa, FL 33612, USA

E-mail: *Marilyn M. Bui - marilyn.bui@moffitt.org
*Corresponding author

Received: 20 May 13 Accepted: 06 June 13 Published: 31 July 13

This article may be cited as:
Bui MM, Stephenson CL. What is new in the evaluation of diagnostic digital cytopathology in cervicovaginal smears?. J Pathol Inform 2013;4:18.

Available FREE in open access from: http://www.jpathinformatics.org/text.asp?2013/4/1/18/115874

SUMMARY

The successful integration of digital cytopathology into daily practice presents unique challenges. Whole slide imaging (WSI) of cytologic specimens must provide high resolution images on small cellular areas. Fine focus at high magnification is important for evaluation of three dimensional objects such as hyperchromatic crowded groups in cervicovaginal cytology.[1] The introduction of z-axis focusing in which multiple planes in the z-axis are scanned and incorporated in the final image called a "z-stack" allows for the fine focus functionality required in the subspecialized field of cytopathology.[2] The evaluation of diagnostic digital cytopathology in liquid-based cervicovaginal smears has been limited. A recent study by Wright *et al*., at Weill Cornell Medical College of Cornell University in Houston, Texas attempted to discover the advantages and limitations of WSI in this area.[3]

Seven participants (3 pathologists and 4 cytotechnologists) examined 11 cervicovaginal papanicolaou smears (Thin-Prep and SurePath) which were scanned at ×20, ×40 and ×40 z-stack digital magnifications using the BioImagene iScan Coreo Au 3.0 scanner. The digital images were viewed on a computer equipped with an Intel Pentium 3.44-GHz processor, 1 GB RAM, 64 MB VRAM and a display monitor with 1600 × 1024 pixel resolution. The diagnosis and time to reach a diagnosis were recorded. The results were compared with manually reading the same glass slides. The results showed that accuracy of interpretation and the time to reach a diagnosis was superior with glass slides as compared with all of the digital magnifications. When the different digital magnifications were compared, ×40 and ×40 with z-stack had better accuracy and a shorter time to diagnosis than the ×20 magnification. The authors noted that the ×40 z stack imaging performed better in the diagnosis of endometrial adenocarcinoma and commented on the usefulness of WSI cytology in archiving for storage and future comparison, especially if the specimen was used entirely for ancillary testing. However, due to the diagnostic and technologic difficulties presented by WSI, the authors concluded that WSI in cervicovaginal cytology is not ready for daily screening and diagnosis. This finding is somewhat discouraging considering liquid-based specimens have a smaller cellular area to scan, screen and diagnose, which was anticipated as a promising area of early adoption of digitalization.

COMMENTS

In order to evaluate our readiness for digital cytopathology, one must consider both human and technologic limitations. The main human limitation is lack of familiarity with digital cytopathology. However, the article does not mention if the participants were

Access this article online

Quick Response Code:

Website: www.jpathinformatics.org

DOI: 10.4103/2153-3539.115874

trained to use the digital image viewing software. Lack of sufficient training leads to user frustration and a perception of diminished capabilities when digital slides are compared with glass slides.[4] In terms of technologic limitations, one issue addressed by the authors is poor image quality resulting in longer times to achieving a diagnosis. It should be noted that a slide digitally scanned at low power may still be virtually magnified by the software, though it does so at the expense of resolution. Thus, using virtual magnification on digital slides scanned at ×20 is like using a microscope with a clear ×20 objective and a ×40 objective smeared with a hazy film. It is no wonder, then, that the slides scanned at ×20 digital magnification resulted in lower accuracy and longer times to formulate a diagnosis. However, scanning digital slides at higher magnification and with z-stacking capabilities takes time and produces a large digital file. For example, in this article, the digital file produced from a single Thin-Prep slide scanned at ×40 magnification with 7 z-stack levels was 25 GB and took over 95 min to scan.[3] However, the computer utilized in this study may have been a factor in the length of time needed to scan as well as the "freezing" experienced by the users when viewing the slides. Most new desktop personal computers have between 4 GB and 8 GB of RAM (the random-access/temporary memory used to run programs) while the computer used by the authors had only 1 GB of RAM. However, the issue of disk space is still an obstacle, but one that is steadily diminishing as storage capacity is rapidly increasing.[5] With advances in technology and proper training of pathologists and cytotechnologists, our readiness for digital cytology may be closer than the data in this article suggests.

REFERENCES

1. Wilbur DC, Black-Schaffer WS, Luff RD, Abraham KP, Kemper C, Molina JT, *et al*. The Becton Dickinson FocalPoint GS Imaging System: Clinical trials demonstrate significantly improved sensitivity for the detection of important cervical lesions. Am J Clin Pathol 2009;132:767-75.
2. Khalbuss WE, Pantanowitz L, Parwani AV. Digital imaging in cytopathology. Patholog Res Int 2011;2011:264683: 1-10.
3. Wright AM, Smith D, Dhurandhar B, Fairley T, Scheiber-Pacht M, Chakraborty S, *et al*. Digital slide imaging in cervicovaginal cytology: A pilot study. Arch Pathol Lab Med 2013;137:618-24.
4. Henderson-Jackson E, House J, Lloyd M, Dhillon J, Ahmad N, Hakam A, *et al*. Digital cytology: Are we ready yet? J Am Soc Cyto. 2012;1:S122-3.
5. Pantanowitz L, Sinard JH, Henricks WH, Fatheree LA, Carter AB, Contis L, *et al*. Validating whole slide imaging for diagnostic purposes in pathology: Guideline from the college of American pathologists pathology and laboratory quality center. Arch Pathol Lab Med 2013 [Epub ahead of print].