Editorial
Digital Pathology: Prospects and Challenges

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Digital Pathology (DP) has emerged as a transformative force in modern medicine, enhancing the diagnostic process through advanced computational techniques. The application of digital pathology in cancer research has identified various cancer domains where DP efforts have been focused, revealing the potential of knowledge resources to convert text data into actionable clinical insights. DP can aid in the development of predictive models by integrating unstructured data with structured datasets. By uncovering relationships between variables that contribute to cancer outcomes, these models can assist clinicians in tailoring personalized treatment plans. The diversity of DP extends to its application in identifying biomarkers, aiding in drug discovery, and assessing patient responses to therapies, ultimately improving patient care. The integration of DP tools into digital pathology workflows streamlines the diagnostic process, reducing the risk of human error and enhancing the precision of diagnoses.[1]

The evolution of digital pathology has transformed traditional pathological examinations, which continue to be the gold standard for cancer diagnosis. While pathologists have historically depended on morphological assessments of biopsies, recent advancements in computerized methods have enabled mitosis counting, tumor infiltrating lymphocytes (TILs) nuclei detection, segmentation, and classification, reducing human intervention and improving diagnostic accuracy. These computerized techniques are especially important in grading different cancers, such as brain, breast, cervix, lung, and prostate cancers, as they offer dependable second opinions, reducing interobserver variations and traceable clinical information.[2]

Whole slide imaging (WSI) and telepathology have gained popularity, enabling diagnostic histopathology on digital images and addressing the drawbacks of conventional microscopy. Recent reviews showcase significant advances in telepathology technology, demonstrating diagnostic accuracy on paring with traditional methods. Additionally, economic analyses highlight the advantages of incorporating telepathology into standard diagnostic practices, considering the availability of essential technology and limited human resources. It also has the potential to address the global shortage of histopathologists.[3]

Challenges remain in achieving comprehensive analysis of whole slide images and ensuring high-content imaging with diagnostic biomarkers, despite advancements. Future trends in digital pathology will likely aim to address these limitations, improve telepathology integration, extensive incorporation of artificial intelligence (AI) to effectively support cancer diagnosis and prognosis. Digital pathology (DP) is rapidly advancing, fueled by technological progress and the need to optimize pathological workflows. The Global Burden of Diseases,

Injuries, and Risk Factors Study (GBD) 2019 underscores the growing global injury burden, highlighting the importance of efficient diagnostic methods, including DP, to tackle healthcare challenges.[4] In central India, a survey of histopathologists indicated strong support for telepathology (TP) and DP, with 98 professionals recognizing the need for these technologies. Although only 34 are currently utilizing digital photomicrographic images, the potential for educational and consultation purposes is considerable, signaling a shift toward digital solutions in pathology.[5]

Whole slide imaging (WSI) eases the transition to digital pathology (DP) by digitizing histological slides, which decreases time and improves diagnostic accuracy with the integration of artificial intelligence (AI). This technology enables pathologists to examine samples more efficiently, reducing interobserver variability in diagnoses.[6] Nevertheless, challenges like operability and the handling of large file sizes continue to pose significant obstacles to widespread adoption.

A review of scanning technologies highlights a variety of applications and limitations in the digital pathology field. There are numerous microscopes and scanners available, from high-capacity closed systems to smaller, versatile models that can be manufactured through 3D printing.[7] Although these innovations offer opportunities for improved accessibility and cost-effectiveness, the implementation of digital pathology in everyday practice necessitates continuous training and support for pathologists. As the discipline progresses, it will be essential to tackle these limitations to fully leverage the advantages of digital pathology in clinical environments.

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