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New Developments in Digital Pathology Technologies

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Description

Histopathology, a branch of diagnostic medicine, was founded on the visual interpretation of the cellular biology shown in photos. Pathology has changed significantly since the advent of digital imaging, and the new field is now referred to as "digital pathology." Digital pathology will be the next paradigm. Pathology and other biomedical sectors can now store and swiftly share image data thanks to the fourth generation of virtual slide telepathology systems, also known as virtual microscopy and Whole-Slide Imaging (WSI). These cutting-edge digital imaging techniques include full microscopic slides' automatic digitization and computational processing, as well as high-resolution scanning of tissue slides. Additionally, automated image analysis using WSI can extract particular diagnostic aspects of diseases and quantify each component of these features to support diagnosis and offer instructive clinical assessments of disease. In order to successfully leverage the new and growing digital pathology technologies and process and model all the data and information present in WSI, the challenge is to apply information technology and image analysis approaches. The ultimate goal is to assist the intricate workflow from specimen receipt to anatomic pathology report transmission, i.e., to enhance diagnosis by increasing the productivity of pathologists and providing them with fresh data.

Recent years have seen the usage of digital imaging across several medical specialties. As a result of advancements in hardware and software technologies, digital microscopy has gained significance as a diagnostic tool in surgical pathology. For training, primary diagnosis, teleconsultation, and quality assurance, digital slides can be incorporated into current hospital systems and accessed *via* the intranet or internet. Pathologists continue to be drawn to WSI for research, teaching, and diagnostic purposes. Pathology procedures are already being impacted by WSI, but has diagnostic accuracy in anatomic pathology increased.

The use of information technology in pathology for the creation, exchanges, or sharing of information, including data and images, is known as digital pathology. The ultimate goal is to facilitate the difficult workflow from specimen receipt to the transmission of Anatomical Pathology (AP) report. The adoption of standardised diagnostic language and standards as well as the development of digital technologies, including traditional problems of massive data management and image processing, is the two main aspects that will increase accurate diagnosis.

Today, a number of systems offer digital image analysis, which can be used to boost the quantification capabilities of diagnostic pathology. The focus of Image Analysis in Digital Pathology will be on the improvements in diagnosis made possible by WSI processing techniques and the recent research in this field. Pathologists and other medical departments can communicate more easily because to key ideas like data representation, coding, and communication standards. Knowing the fundamentals of data representation can have an impact on a pathologist's everyday practise by streamlining a doctor's workflow, i.e., by determining which variables must be included in pathology reports and how they should be organised. Additionally, pathology services must be recorded using medical coding so that other departments can comprehend them. It is possible to increase workflow efficiency, balance workloads, and enhance image integration in information systems by utilising digital pathology and WSI technologies. Powerful comput-

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er-based algorithms will aid in the integration of all the information that complex, automated, and miniaturised technologies will be able to collect from a tissue sample.

The application of standards and the creation and validation of image analysis tools are the two key factors that will promote the use of digital pathology in clinical practise. The practise of pathology will continue to change as a result of digital pathology, opening up chances for the development and evaluation of novel, more efficient treatments that will benefit patients.

In the foreseeable future, DP unquestionably has a lot of potential for regular histopathology. For first histopathology diagnosis, DP has demonstrated promising outcomes, and this is becoming even truer as AI tools are increasingly included into the digital reporting workflow. However, there are still questions about the current scope of clinically relevant benefits in light of the significant upfront costs increase and difficult to compare hospital and reimbursement settings, which provide a summary of the potential benefits and drawbacks of DP over conventional optical microscopy that we identify. A certain amount of passionate prejudice in favour of DP is unavoidable because a lot of the present work on it is being done by early adopters, some of whom are involved in the creation of associated hardware and software. The current COVID-19 pandemic has clearly given a boost to the field, so more robust real-world data from larger-scale DP implementations can be expected soon. It is apparent that the current COVID-19 pandemic has boosted the field; therefore more reliable real-world data from larger-scale DP implementations can soon be anticipated.