



## Extended Research Article

# Variation within and between digital pathology and light microscopy for the diagnosis of histopathology slides: blinded crossover comparison study

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## Plain language summary

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## Plain language summary

Pathologists use a microscope to examine tissue samples, called light microscopy. This enables them to make the diagnosis, give information on treatment and provide prognosis to clinicians. The reports made by pathologists are interpretations of what the slides are showing, and this can be extremely difficult, so differences in interpretation between pathologists occur quite often. Asking colleagues' opinion on cases is one of the best ways of recognising and reducing these differences in interpretation. Digital pathology is a process of converting microscope slides to computer image files.

Digital pathology allows some advantages to pathologists, namely: to move cases easily between pathologists, for example to get a case seen by the next available pathologist who can report it, to view the cases at any location, for example work from home or report cases for a distant laboratory with a shortage of pathologists, to confer easily with multiple colleagues on difficult cases, and to rapidly check diagnoses made on previous samples the patient may have had. As a result, digital pathology could potentially lead to safer more efficient working.

In order to use digital pathology in practice, we need to know pathologists produce equivalent reports as compared to light microscopy.

This study compared light microscopy with digital pathology in examining 2024 samples from breast, gastrointestinal, including cancer screening samples, skin and kidney.

Most samples recruited (80%) were routine, but at least 20% of cases were challenging cases.

Pathologists worked in teams examining the same series of cases twice once through light microscopy and once through digital pathology with viewings separated by 6 weeks and the order randomised.

Differences in reports were arbitrated to establish if they would have changed treatment (significant) or not (insignificant). Pathologists reviewed all the significant differences to decide the ground truth. Statistical analysis measured the agreement between light microscopy and digital pathology in comparison to a reference point of 98.3% agreement derived from a previous study.

The results show an agreement overall of 99.95%. Specialty groups showing: breast 99.4%, gastrointestinal 99.96%, skin 99.99% and renal 99.99%. Cancer screening cases showed overall agreement was 98.96%, and in breast 96.27% and large bowel 99.93%.

In comparison to ground truth, the differences between pathologists were similar with light microscopy and digital pathology. Analysis showed the differences detected occurred in entities known to produce differences in interpretation between pathologists.

The study shows that pathologists give equivalent diagnoses when using digital pathology as they would using light microscopy. The differences detected are those you would expect to see in any event due to interpretable nature of examining these samples.

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## This article

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