AN ARTIFICIAL INTELLIGENCE APPROACH TO AUTOMATED GLOMERULAR ANNOTATION AND COUNTING IN DIGITAL RENAL BIOPSYES

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Introduction In recent years digital pathology is evolving into the standard of care for the histology laboratory workflow; allowing remote reporting of cases, improved record keeping, and accountability in reporting (1). Digital pathology allows us to bring quantitative and advanced analysis to the histopathology field.

Machine learning has been implemented to segment features of whole slide images (WSI), with a U-net architecture (2) accurately segmenting glomeruli, tubuli and interstitium (3). Here we create a workflow for automated glomerular annotation and deliver number and shape of glomeruli metrics to the pathologist.

Materials and Methods Anonymousised Haematoxylin and Eosin (H&E) stained, archival diagnostic paediatric renal biopsy samples from Great Ormond Street Hospital were imaged on an Aperio CS2 slide scanner at 40x magnification. Glomeruli were manually annotated using ImageScope software and image patches (2048 × 2048) with annotation masks saved to the training database which was used to train a U-net model.

A pipeline was developed using Python to take WSIs, export tiles which feed the trained U-net to generate predictions. Prediction tiles are recombined into a mask indicating the presence of glomeruli. This was converted into WSI annotation format using the bounding polygons of positive mask regions.

Results The mean dice score for all test image patches (n=384) was 0.71 for glomerular segmentation. The network identified 106 glomeruli with 8 false positives and 8 false negatives for the testing WSIs (N=3).

The speed of image annotation on a CPU was 13.63±1.31 minutes (mean±SD, n=3); producing annotations for a 18000 × 203000 pixel WSI.

Discussion U-net segmentation of histopathology features in WSI renal biopsies is readily incorporable into the histology pipeline and can be used to produce annotation files before reaching the pathologist. A quantitative glomerular count can improve the reproducibility of reports and lead to a better-informed treatment plan for the patient.

TEACHING IN 2020: THE SHIFT TO VIRTUAL TEACHING AND HOW WE IMPROVED

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Background In 2020 when all non-essential face to face teaching was cancelled, The Graduate Team who deliver the Preceptorship Programme at GOSH faced a huge challenge in their practice. Preceptorship is an NMC and HEE standard for all newly registered practitioners (NRPs), so as we settled into our ‘new normal’ this teaching, including vital tools of reflection and resilience, needed to be completed in a new way. The Graduate Team at Great Ormond Street Hospital had to work flexibly and reshape their preceptorship teaching to work in a digital, distanced world.

Method Based on our previous teaching curriculum and focusing on HEE and NMC standards of preceptorship, we made a programme of condensed study days, delivered using a combination of zoom and independent learning. We asked for feedback throughout the study days, and reviewed all anonymous feedback after each day to continue to improve.

Results Through regular virtual teaching, and feedback provided in evaluations, we found that learners are less likely to interact in a virtual environment, be that due to a lack of equipment or confidence. After reviewing feedback and increasing in confidence with zoom, we added in further opportunities to interact, using the chat and polling functions on zoom, utilising apps like slido and kahoot as well as ‘ice breakers’ to ensure everyone has spoken on camera and introduced themselves before the sessions begin. Our evaluations,