

AI DETECTS MISSED SMALL RENAL MASSES ON SINGLE PHASE CT | S3A-SPGU-3

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***Purpose:** Radiologists can miss incidental small renal masses (SRM's) on a single-phase CT. The purpose of this study was to evaluate the performance of a UNet based lesion segmentation model on SRM's missed by radiologists.

***Methods and Materials:** We trained nnUNet v2 model on 1155 (radiologist annotated portal or nephrographic phase images) of which 489 were from the public domain C4KC-KiTs training set from the Cancer Imaging Archive and the rest were from our centre. The model was a cascade of a low-resolution 3D followed by a 3D full resolution classifier with 5-fold cross-validation. We retrospectively reviewed a dataset of 222 small renal masses to identify cases that had prior imaging with a missed SRM, and a prediction was run on these cases. This retrospective study was approved by our research ethics board and informed consent was waived.

***Results:** Eleven cases (5% miss rate 11/222) were identified where a radiologist missed an SRM. Our model missed four cases (2% miss rate 4/222) equating to a 64% reduction (p value = 0.02) in miss rate. On lesion level analysis, 14 lesions were missed by the radiologist. Our model missed only 4 lesions, with a sensitivity of 71% (10/14). Lesions missed by our model included 3 SRM's incorrectly categorised as cysts and one tiny 6 mm central endophytic lesion. The model detected an additional 3 lesions which were not SRM's. The 3 false positive lesions were subcentimeter cysts that demonstrated long term stability. Average time interval between the baseline CT where the lesion was missed by the radiologist and follow up imaging where the lesion was first reported was 23 months. The average interval size change of the SRMs during this period was 0.8 cm/year. 3 patients had SRMs that rapidly increased in size within a short time interval with a significant delay in their diagnosis. The model detected all 3 of these high-risk masses on the baseline CT.

***Conclusions:** Our study demonstrates that a UNet model can detect missed SRM's with a sensitivity of 71%. The model reduces the miss rate of incidental SRM's from 5% (11/222) to 2% (4/222), a 64% reduction (p value = 0.02). Further multicentre data set testing on missed SRM's is planned.

***Clinical Relevance/Application:** A UNet classifier shows strong potential to help reduce observational miss rates for incidental small renal masses.

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