KIDNEY CANCER

A model for the masses—3D printing of kidney tumours

A new study published in *Urology* describes how accurate models of patients' kidneys, including their malignancies, have been constructed using 3-dimensional printing technology.

Jonathan Silberstein and colleagues, from Tulane University School of Medicine, produced kidney models for five patients diagnosed with enhancing renal lesions.

Each patient had a customized model made using images from the routine preoperative cross-sectional CT imaging they had undergone. Computer software was used to convert slices of the CT scan into layers, which were then printed on top of one another. A translucent resin was used to illustrate healthy parenchyma and a red hue was added to the resin to indicate the *in situ* tumour.

Patients, trainees and surgeons were able to handle and inspect the models before surgery and surgeons also used the models as a reference tool during surgery. The authors comment that these models could promote nephron-sparing surgery and retention of healthy parenchyma,

as surgeons gain a better understanding of the dimensions and position of a tumour in relation to normal tissue and vital structures. Models will also assist patients in discerning the rationale behind this technique. Furthermore, these models are potential educational tools. Trainees who felt the model showed an increased understanding of the characteristics of the tumour, and it is hoped that the models will assist in surgical training.

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The models were positively received by patients and their families, who said that they gained improved understanding of the size, location and intended surgery. Silberstein and colleagues note that many patients only have a limited understanding of their renal mass, and that these models could be used to improve their comprehension of their condition and the goals of any intervention.

Limitations were noted by the authors and in editorial comments by Elsamra and Kavoussi—primarily that the success of these models is dependent on their accuracy, and also that making the model as true to life as possible, with materials mimicking tissue and all structures represented, would vastly improve their application. The group is currently working on addressing these issues.

"We have some prototypes made with flexible materials that might allow surgeons to practice their resection on an identical model to their patient," explains Silberstein. "We are very excited about these projects, the technology and this novel use of the technology to improve our patients' outcomes, their understanding of their disease and our trainees' education."

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Original article Silberstein, J. L. *et al*. Physical models of renal malignancies using standard cross-sectional imaging and 3-dimensional printers. *Urology* doi:10.1016/j.urology.2014.03.042