

Robotic partial nephrectomy: my experience

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In Juntendo University Hospital, we perform RAPN with our unique surgical concept "The Precision surgery" using computational RAPN simulation to make the surgery more precise and reproducible than before since 2013 (<https://youtu.be/Dw9y-yCoxsl>).

We developed the fundamental imaging platform to extract the renal 3D structures such as renal veins, cyst, urinary tract, with a color-coded manner from the raw patient CT data with FUJIFILM, moreover, we have also established the surgical simulation method which we called as virtual PN. This surgical simulation allows us to evaluate renal vascular-supplied area by mathematical calculation using the Voronoi method to find the most appropriate arterial branch for selective clamping. With virtual PN, the imaging prediction of the tumor cut surface with any margin setting allows us to predict the renal structures which might appear on the cutting bed. Detailed volumetric analyses for quantitative estimates of residual renal volume could be used for the reference of the postoperative renal function. In the real operation was performed according to the precise surgical planning with surgical navigation. Our simulation method has made it possible individual surgical planning for each case as "The Precision surgery" in Robotic Partial Nephrectomy. We have already experienced "The Precision surgery" over 120 cases, and I am going to show a brief presentation of our experiences.

Also, we have worked on the development of surgical education tool for RAPN. Because, it is difficult to achieve the kidney with the tumor in the animal model for operation training, and also the animal organs may cause contamination or infection. We have created the wet training models for RAPN made by poly-vinyl alcohol (PVA) hydrogel. This PVA model allows us to use the electric scalpel and ultrasound probe to identify the tumor margin.