

Estimating renal volume from CT: Is this is easiest way?

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We congratulate Breau and colleagues for demonstrating that there was good correlation between renal volume as measured by two techniques: the ellipsoid method and 3D volume measurement using specialized volumetric software with contrast-enhanced CT scans.¹ The authors found that the ellipsoid method underestimated 3D volume (170 cm³ vs. 186 cm³, respectively), but that almost all were accurate 30%; they also concluded that measuring renal volume is easy and reliable. They also suggested that 3D volume software is not needed for the estimation of differential renal function.

Other authors previously showed that the modified ellipsoid method can be performed quickly with high reproducibility and accuracy.² They showed that the intraclass correlation coefficient (ICC) was higher ($r = 0.95$) in this study. However, we believe that the correlation between observers using the ellipsoid method is somewhat inferior to that of the method using 3D analysis software. Previously, we reported an ICC of 0.995 in donor patients, meaning that renal volume measurement by the 3D analysis software is highly reproducible and accurate.³ We believe that the ellipsoid method can only be used to measure split renal function in renal donors. In patients with renal masses or nonfunctional tissues, such as renal cysts, it is impossible to measure normally functioning renal parenchyma using the ellipsoid method. In addition, the correlation between two estimated renal volume and DTPA kidney scintigraphy was not shown in this study by Breau and colleagues.¹ The question thus remains as to which result is more correlated with renal function.

With advancements and improvements in software and imaging modalities, renal volume can be easily measured

by volumetric analysis using 3D analysis software for CT scans. To our knowledge, several researchers are interested in renal volume measurement, and there have been several reports that renal volume is correlated with glomerular filtration rate and split renal function in donor patients. We reported the usefulness of 3D analysis software for measuring renal volume. Renal volume as measured by the voxel count method was correlated with glomerular filtration rate, and preoperative kidney volume was a significant predictor of delayed renal function recovery in 222 donors after donor nephrectomy.³ We also reported, for the first time, the relationships among kidney volume, renal function and age in normal kidneys using a different program.⁴ Recently, researchers have focused on the importance of renal volume for predicting renal function after radical or partial nephrectomy in patients with renal cell carcinoma. We first reported the prognostic significance of preoperative renal volume for predicting renal function in patients with renal cell carcinoma who underwent radical or partial nephrectomy.⁵ To determine the relative impact of preservation of parenchymal volume on renal function after partial nephrectomy, a volumetric program could be used to measure the volume of functional parenchyma preoperatively and postoperatively after partial nephrectomy in the contralateral and operated kidneys. We believe that the ellipsoid method has limitations in these situations.

Even though renal volume can be measured using different methods, such as the ellipsoid formula, the automated segmentation algorithm, or manual tracing to exclude nonfunctional tissues, there is no established method or program that reflects renal function well in patients with renal cell carcinoma. Prospective study is needed to determine measurements that correlate well with renal function.

Competing interests: None declared.

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