Supplemental Material

Supplemental Material. Details of Ultrasound Kidney Imaging

Supplemental Table 1. Intra-class correlations of TKV measurements between 6 possible pairwise comparisons of four different imaging methods

Supplemental Table 2. Characteristics of patient sub-groups scanned by different ultrasound technologists

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Ultrasound scans were performed using Canon Aplio 500 (Canon (formerly Toshiba) Medical Systems Corporation, Otawara, Japan) equipped with a 3.5 MHz mechanical convex 3D-transducer. All technologists were individually trained by the same instructor to acquire renal dimensions as well as TKV using 3D-US. Kidney dimensions were obtained by first aligning the scanning plane along the long axis of the kidney to measure its length. If the extreme ends of the kidney did not fit within the image display, the lengths were measured using a panoramic function, which allowed for sequentially aligning sections in the same plane, thus showing the entire length. The scan plane was then changed to perpendicular to the organ and moved along the organ to find the widest renal dimension. The transverse dimensions were acquired ensuring the two were perpendicular to each other. TKV by ultrasound-ellipsoid was assessed using the ellipsoid formula ($4\pi abc/3$, where a, b, and c are the orthogonal semi-axis lengths. Volumetric data was obtained with the technologist centering the 3D transducer along the long axis of the kidney during respiratory suspension while an automated sweep was generated through the organ. Care was taken to include the entire renal volume or as much of it as possible within the acquisition volume. Using the scanner's software, the renal boundary was manually segmented by the sonographer on reconstructed transverse images through the kidney, generating a 3D reconstructed contour of the organ along with its calculated volume. In patients with very large kidneys, the extreme ends of the kidney may have been excluded from the acquired volume and no estimation of this lost volume was attempted. The US scans were performed by 5 different technicians specifically trained for 3D-US. The 5 technicians had 48, 33, 28, 24, and 9 patients, respectively, and were all blinded to the disease stage of each patient. The patient distribution per technologist solely relied on the schedules of the technologists.

Supplemental Table 1. Intra-class correlations (ICC) of all measurement methods

Comparator groups		ICC	95% Confidence Interval
MRI manual segmentation	**MRI ellipsoid**	0.989	98.5 to 99.2
	Ultrasound ellipsoid	0.957	94.1 to 96.9
	3D ultrasound	0.939	91.6 to 95.6
MRI ellipsoid	**Ultrasound ellipsoid**	0.948	92.8 to 96.2
	3D ultrasound	0.928	90.2 to 94.8
Ultrasound ellipsoid	**3D ultrasound**	0.980	097.3 to 98.6

Supplemental Table 2. Characteristics of patient sub-groups by different ultrasound technologists

Characteristics	Technologist				
	A (n=48)	**B (n=33)**	**C (n=28)**	**D (n=24)**	**E (n=9)**
Age (years)	43 ± 13	39 ± 13	48 ± 14	48 ± 15	49 ± 20
Sex (M:F)	1:1.53	1:1.29	1:0.75	1:1.18	1:0.43
Height (meters)	1.68 ± 0.11	1.71 ± 0.10	1.72 ± 0.08	1.69 ± 0.09	1.70 ± 0.08
BMI	27.0 ± 6.1	25.6 ± 3.6	26.1 ± 7.5	24.6 ± 3.8	26.93 ± 2.5
TKV (mL)	908 [482-1679]	764 [584-1118]	1261 [751-1757]	712 [483-986]	1030 [544-1621]
eGFR (mL/min/1.73m^2)	82 ± 27	86 ± 18	68 ± 25	84 ± 28	68 ± 26
CrCl (mL/min)	106 ± 42	96 ± 42	88 ± 34	94 ± 31	74 ± 28

BMI: body mass index; eGFR: estimated glomerular filtration rate; TKV: total kidney volume; CrCl: creatinine clearance.
TKV was presented median [IQR]; all other variables presented as mean ± SD.