Standardized image acquisition and measurement methods yield accurate total kidney volume assessment in polycystic kidneys via CT or MRI

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Introduction
• Total Kidney Volume (TKV) assessment is a valuable tool for predicting renal prognosis and monitoring progression in autosomal dominant polycystic kidney disease (ADPKD)
• Most reports of TKV measurement are based on MRI and time consuming measurement methods that are difficult to obtain outside of research settings or large academic centers
• Bringing TKV measurement into everyday clinical practice requires imaging protocols that are widely available and interpretation methods that are feasible for clinical radiologists

Methods
Introduction
• 30 participants >18 years of age with a known diagnosis of ADPKD participated; diagnosis of ADPKD was confirmed via established diagnostic criteria
• Participants underwent 3 scans: an MRI, a low-dose CT (LD) scan and an ultra-low-dose CT scan (ULD). The ULD was also reconstituted via model-based iterative reconstruction (MBIR) yielding a 4th image set
• The images from the 4 modalities were analyzed with three standardized TKV measurement equations (the ‘Traditional Ellipsoid,’ the ‘Mayo Ellipsoid’ and the ‘Mid-slice Method’) and compared to the gold-standard of MRI manual planimetry
• Accuracy, variation and reproducibility of the different imaging modalities and measurement techniques was assessed

Results
• All imaging modalities (LD, ULD and MBIR) had excellent correlation with the gold standard MRI (Table 2)
• All measurement equations (Traditional-ellipsoid, Mayo-ellipsoid and the mid-slice method) had excellent correlation with the gold standard MRI planimetry
• Variation was within ranges reported in previous analyses of TKV, although unconstructed ULD and the mid-slice method showed higher variability (Table 3)
• Intraclass Correlation Coefficients were >0.98 for all methods, demonstrating high reproducibility
• The standardised measurement methods had interpretation times of 5 minutes compared to 45 minutes for the gold standard planimetry method
• LD-CT had a mean effective radiation dose of 1.73 mSv while ULD had a dose of 0.88 mSv, a value approaching average exposure for an abdominal x-ray series (Figure 3)

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References