A longitudinal study of kidney structure and function in adults

Dear Editor,

I read the article by Kariyanna et al. [1] with great interest. The authors discussed a relatively neglected issue in clinical nephrology, namely interaction between kidney size and function. The authors drew some important conclusions which, in my opinion, are difficult to accept due to limitations of the study. I will briefly discuss these limitations.

Firstly, the authors used ultrasound to determine kidney size in an obese population, in which the sensitivity reduces dramatically (BMI 30.2 ± 4.9). Ultrasound was also performed by various technicians with different machines. Intra- and inter-observer difference was not controlled in the study which claims that kidneys shrink at a rate of 0.072 cm per year. Ultrasound is not the gold standard as it was suggested which claims that kidneys shrink at a rate of 0.072 cm per hour urine collections, or inulin clearance ideally, would be better. Equations are especially prone to error in elderly and obese patients as applied in this study.

Secondly, the MDRD equation is not the perfect way to calculate the actual glomerular filtration rate. Twenty-four-hour urine collections, or inulin clearance ideally, would be better. Equations are especially prone to error in elderly and obese patients as applied in this study.

Thirdly, it is not evident from the paper what the authors used as kidney size: the maximal longitudinal length of the bigger kidney or the mean of the two? We know size differences between the two kidneys as a variant of normal function. This is because urine excretion rates tend to be more variable compared with serum concentrations [2].

Lastly, a standard rate of atrophy for all aetiologic subclasses of chronic kidney disease seems unreasonable. Severity of the disease changes from patient to patient and various aetiologic subclasses progress at different rates. Thus, a constant atrophy irrespective of the aetiology may be a result of the retrospective study design and relatively small sample size. Al-Said et al. showed that even simple renal cysts may affect kidney size and function inversely [4,5]. However, in the current study, the authors did not mention the status of simple renal cysts in their patients.

In conclusion, it is very difficult to ascertain from this that kidney atrophy occurs independently of the underlying aetiology of chronic kidney disease by such a data set.

Conflict of interest statement. None declared.

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Reply

We thank Dr Solak for his interest in our study [1]. Despite the flaws of the imaging technique and limitations of our study design, we found that among people with chronic kidney disease, kidneys shrink at a small rate. This small rate of fall is more likely to be obscured by introduction of noise, for example due to differences among machines and measurement techniques. Accordingly, poor methods are more likely to bias the study towards the null hypothesis rather than rejecting it. Dr Solak suggests using MRI or CT to assess kidney size instead of renal sonograms. We believe that most nephrologists do not use MRI or CT scans to assess kidney size on a routine basis; evaluation of the kidney size is most commonly performed using an ultrasound. Therefore, we used kidney ultrasound to report our results.

Measured GFR would be ideal to assess progression. However, 24-h urinary creatinine collection may not be more accurate than estimated GFR for evaluating renal function. This is because urine excretion rates tend to be more variable compared with serum concentrations [2].

Using the mean of two kidney sizes would reduce the power of the study. We therefore used a mixed model to evaluate all the data; we nested the kidneys within individuals such that kidneys could shrink or grow differentially within individuals [3].

It is possible that severity of kidney disease and its aetiology have an important influence on progression of kidney size. Despite not being able to discover this relationship, we cannot exclude this notion. Future studies should explore this possibility with larger sample sizes and more robust methods. For now, it would be reasonable to conclude that form and function of kidney go hand-in-hand.

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