The reason why mother nature provided us with two kidneys: the risks of a congenital solitary functioning kidney

Sir,

Steiger [1] recently described a brief overview on the long-term consequences of kidney donation. Based on the landmark studies by Brenner et al. [2], glomerular hyperfiltration could be expected in individuals that donate a kidney, with long-term sequelae such as hypertension, glomerular damage with albuminuria and chronic kidney disease. Even though glomerular hyperfiltration did take place and albuminuria did present, no difference in survival between kidney donors and control groups was present. As a conclusion, Steiger stated that ‘... nature gave us too much kidney mass for one lifetime ...’ [1].

As briefly mentioned by Steiger, this may be different in other populations than the healthy kidney donors. One such category, for which this is indeed different, consists of individuals that are born with a reduced renal mass, such as those with a congenital solitary functioning kidney. In fact, we recently described that 32% of children with a congenital solitary functioning kidney already show signs of renal injury at a mean age of 8.4 years [3]. Follow-up has shown that ~40% of patients with a solitary functioning kidney were in renal failure at the age of 30 years [4], a massive difference with the prospect for a kidney donor.

How can such a discrepancy be explained? The main reason may be found in the degree of glomerular hyperfiltration. Indeed, animal studies have shown that nephrectomy during nephrogenesis leads to a doubling of glomerular hyperfiltration when compared with nephrectomy at an early adult age (115 versus 47% increase in single nephron glomerular filtration rate, respectively) [5]. This significant doubling of hyperfiltration is highly likely to start the vicious cycle as described by Brenner [2]. As an alternative explanation, the healthy kidney donor is evaluated in such a way that a healthy kidney will remain, whereas the disturbance in kidney development that results in a solitary functioning kidney may also lead to some degree of hypodysplasia in the remaining kidney, causing future health problems. The fact that 52% of solitary functioning kidneys did not show hypertrophy [3], which may be expected in a healthy solitary kidney, may point in that direction. However, the incidence of renal injury in our study was similar in children with and without a hypertrophic congenital solitary functioning kidney (30 versus 33%, respectively; P = 0.79), so we feel that this may only play a minor role [3].

Whatever the cause, being born with a solitary functioning kidney induces a very real health risk starting already during childhood, quite different from being born with two kidneys. Being born with two kidneys is therefore highly desirable, which may be the reason why mother nature did provide us with two.

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Editorial Note: Steiger J. had no further comments on this letter.

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