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INVITED COMMENTARY

Adult kidneys shrink to fit paediatric recipients

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Size mismatch between donor and recipient in solid organ transplantation can add significant morbidity and mortality to the recipient [1]. However, owing to the scarcity of both deceased donors, as well as suitable living donors, discrepancies between the size and weight of the donor, compared with the recipient, are often a necessity if solid organ transplantation is to proceed in a particular individual.

In renal transplantation, size differences have for many years been overlooked. Indeed, the recognition that external compression on the vasculature of the renal allograft can lead to graft loss is a relatively recent addition to the clinical literature [2]. The incidence of this so-called renal allograft compartment syndrome is thought to be between 1% and 2% worldwide, although it is felt to be underdiagnosed from the available literature [3]. Paediatric patients with end-stage renal disease are best managed where possible with renal transplantation, with proven survival, health, growth, quality of life and educational benefits [4,5]. These often inherently small recipients, because of their young age and the effects of renal disease on growth, rarely receive a small for size graft. The majority receive either an adult live donor kidney from a parent or close relative, or a deceased adult donor kidney from the general population.

Pape *et al.* [6] advocated that paediatric renal allografts be placed into paediatric recipients, with paediatric allografts doubling in size over a 5-year period, in addition to an improved GFR when compared with children who received an adult-sized graft. However, the opposite findings were reported from a retrospective single-centre analysis by Goldsmith et al, identifying no difference in graft function or survival in a group of low-weight paediatric recipients receiving adult-sized or paediatric donor renal allografts [7].

It has been previously shown that adults receiving an adult live donor kidney increase the kidney volume at 1 year by over 27% and that the combination of a female donor and male recipient resulted in the fastest increase in allograft volume [8]. The report by Muramatsu *et al.* [9] in this issue of Transplant International has specifically looked at the changing kidney volume and glomerular size of 47 paediatric renal transplant recipients, all weighing less than 15 kg at transplantation. The authors utilized CT scans of both the live

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donor, as well as that of the recipients pre- and post-transplantation to measure change in renal allograft volume and abdominal cavity volume. In addition, glomerular size was measured and compared between implant biopsy and at the 1-year protocol biopsy in each case.

Muramatsu's findings showed that unlike adult recipients, these small paediatric recipients showed a significant reduction in renal allograft volume at 1 year by 17%. Similarly at the microscopic level, glomerular size also showed a significant reduction when compared with the implantation biopsy.

There are a number of important messages from this publication. Firstly, despite a mean increase in height of the recipient cohort by 8.6% at 1 year and a 20.5% increase in weight, the renal allograft volume decreased in over 85% of cases. Likewise the glomerular size also decreased in over 84% of cases, mirroring the overall decline in eGFR over the same time period. However, the authors state that the change in renal allograft volume had no negative impact on short-term renal function.

Importantly 44% of renal allografts were placed in an intraperitoneal position, the remainder being extraperitoneal and over 90% of the series were anastomosed directly to the recipient's aorta. Despite these techniques, it would appear from Muramatu's work that these changes are physiological, although influenced by both the recipient's abdominal cavity volume, as well as by their weight gain post-transplantation.

Practically size differences will persist between the adult donor and paediatric recipients. Careful surgical technique to avoid renal allograft compartment syndrome, coupled with optimum pre- and post-transplant care, to avoid or minimize growth retardation, would appear to positively influence renal allograft volume from this careful retrospective analysis. Having a large donor renal volume may remain beneficial to the small paediatric recipient, as decline in volume appears to be largely unavoidable in the majority of cases, although further studies may add to our knowledge in this area, particularly as recipients transition to adulthood.

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