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Commentary: Heart transplantation listing for children with significant renal insufficiency: The need for a paradigm shift

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Dani and colleagues[1] from Cincinnati review the Organ Procurement and Transplantation Network/United Network for Organ Sharing Registry with focus on pediatric patients (younger than age 18 years) with significant renal insufficiency (defined as having a estimated glomerular filtration rate <40 mL/min/1.73 m^2 and/or being on dialysis) at time of listing for heart transplantation (HTx) (n = 318) or combined heart–kidney transplantation (HKTx) (n = 109). They found that those listed for HKTx were more likely to undergo transplantation than those listed for HTx (66% vs 54%; $P = .005$) and more likely to be alive at 1 year after listing (69% vs 51%; $P = .029$). Moreover, they found that 1-year survival following transplantation was superior for those who received HKTx than those who received HTx (86% vs 66%; $P = .001$). However, within the HTx group, those who had improved renal function at time of transplantation had superior survival compared with those who continued to have significant renal insufficiency at time of transplantation. In those with improved renal function at time of transplantation, 1-year survival following HTx was 89%, comparable to those who received HKTx. Given the superior waitlist and posttransplant survival with HKTx, the authors concluded that pediatric patients with significant renal insufficiency should be initially listed for HKTx, and that HTx alone should be performed in those who demonstrate recovery of renal function during the waitlist period.[1]

CENTRAL MESSAGE

Paradigm shifts regarding early mechanical support and combined heart–kidney transplant for children with significant renal insufficiency is necessary due to poor waitlist and posttransplant survival.

This is definitely an important topic that involves a very challenging patient population. Renal insufficiency is most commonly the product of persistent low cardiac output secondary to the cardiac pathology. The recovery of renal insufficiency depends on the duration of insult and the ability of heart failure management to improve the low cardiac output state. Similar to other reports in adults, the authors have shown that persistent significant renal insufficiency is associated with increased waitlist and posttransplant mortality.[1] The authors' recommendation that pediatric patients with significant renal insufficiency should not undergo HTx alone and rather should be listed for HKTx is similar to other reports in adults.[2,3] These thoughtful recommendations from the authors make sense given our incessant efforts to optimize outcomes and donor utilization.[4] HKTx is associated with longer waitlist duration that might be due to the combined organ need, but more likely reflects that these patients were more stable and thus placed lower on the transplant waitlist. The morbidity associated with the second organ surgery (ie, kidney) and the extra time on waiting list is obviously the price that a patient pays, and maintaining patient stability during that extra time might be challenging in sicker patients. Nonetheless, HKTx might still be the better option for these patients considering the associated

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improved survival. If patients demonstrate improvement of the renal function while on the HKTx waitlist, consideration for HTx alone could be discussed.

A few questions arise: Can we identify pediatric patients who are likely to continue to have persistent renal insufficiency early on and subsequently outline a better defined criteria for HKTx listing? Should we have a lower threshold to utilize mechanical circulatory support in these patients with significant renal insufficiency with the hope to improve their low cardiac output state and enhance their renal recovery? and, If mechanical support is utilized, should we wait for end organ recovery (including kidneys) before listing for transplantation? At our institution, we examined risk factors for persistent significant renal insufficiency in pediatric patients listed for heart transplantation. We found that patients with severe renal dysfunction (estimated glomerular filtration rate <30 mL/min/1.73 m^2), or those on dialysis were more likely to continue to have significant renal insufficiency. Patients who needed mechanical ventilation at time of listing, those who received extracorporeal membrane oxygenation support, and those with hepatic dysfunction were also at risk. On the other side, those who received mechanical circulatory support other than extracorporeal membrane oxygenation were more likely to demonstrate improved renal function at time of transplantation. Therefore, in patients with the above-listed associated risk factors for persistent renal insufficiency, early mechanical support should be considered to improve cardiac output and consequently end-organ function, including the kidneys, liver, and lungs. Such an approach of timely mechanical support might obviate the need for kidney transplantation. The prospect and rate of improvement of renal function depend on the extent of damage to the kidneys before establishing improved cardiac output with mechanical circulatory support. However, there is evidence that such an improvement might be evident within a few weeks from judicious initiation of mechanical circulatory support.[5,6] Although associated with further increase in wait time until receiving a transplantation, postponing listing until evidence of end organ and overall patient recovery is becoming an increasingly justified pragmatic approach among pediatric cardiac centers that might be associated with better posttransplant recovery and superior survival.[7] Whether or not such an approach would allow time to determine candidacy for HKTx versus HTx alone at time of listing is undetermined. However, in patients with severe renal dysfunction such as those with estimated glomerular filtration rate <30 mL/min/1.73 m^2 or on dialysis, and those with other significant risk factors, initial listing for HKTx seems like a wise approach.

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