Current management issues of immediate postoperative care in pediatric kidney transplantation

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The number of pediatric kidney transplants has been increasing in many centers worldwide, as the procedure provides long-lasting and favorable outcomes; however, few papers have addressed the immediate postoperative care of this unique population. Herein, we describe the management of these patients in the early postoperative phase. After the surgical procedure, children should ideally be managed in a pediatric intensive care unit, and special attention should be given to fluid balance, electrolyte disturbances and blood pressure control. Antibiotic and antiviral prophylaxes are usually performed and are based on the recipient and donor characteristics. Thrombotic prophylaxis is recommended for children at high risk for thrombosis, although consensus on the optimum therapy is lacking. Image exams are essential for good graft control, and Doppler ultrasound must be routinely performed on the first operative day and promptly repeated if there is any suspicion of kidney dysfunction. Abdominal drains can be helpful for surveillance in patients with increased risk of surgical complications, such as urinary fistula or bleeding, but are not routinely required. The immunosuppressive regimen starts before or at the time of kidney transplantation and is usually based on induction with monoclonal or polyclonal antibodies, depending on the immunological risk, and maintenance with a calcineurin inhibitor (tacrolimus or ciclosporin), an anti-proliferative agent (mycophenolate or azathioprine) and steroids.

KEYWORDS: Child; Intensive Care; Kidney; Postoperative Care; Transplantation.

An interdisciplinary approach that includes urologists, pediatric nephrologists, pediatric intensivists and specialized nurses is required during the perioperative period to provide close follow-up and to prevent and treat the potential clinical and surgical complications commonly found in these patients. Herein, we aim to describe the management of these patients in the early postoperative period, thereby demonstrating a practical approach that can increase the success rate of pediatric kidney transplantation programs and decrease their morbidity rates.

INTRODUCTION

Kidney transplantation is the gold standard treatment for pediatric patients with end-stage renal disease (ESRD). Transplantation provides better survival, lower morbidity and better quality of life compared with dialysis therapy for this patient population (1). Although improvements in the surgical technique and in the immunosuppressive drugs have increased the graft survival rate (2,3), there are still some issues regarding the best management, particularly for younger children, during the postoperative period. Several studies have addressed the surgical aspects and immunosuppressive therapies for children who are candidates for kidney transplantation (4); however, little data concerning the immediate postoperative care of these transplanted patients has been published thus far.

POSTOPERATIVE CARE

The immediate postoperative care for children after kidney transplantation should occur in pediatric intensive care units. In addition to general pediatric perioperative care, the specific fluid, electrolyte and hypertension management in the first 24-48 hours after the transplant procedure requires close attention from this specialized team, particularly for small children. The fluid management starts by replacing the daily insensible losses (approximately 400 ml/m² of the body surface area) for the next 24 hours with dextrose and sodium solution. The urinary output volume should be monitored and replaced hourly with the same volume of saline, Ringer’s lactate solutions or bicarbonate solution.
Electrolyte disturbances can be anticipated and prevented by closely monitoring (4-6 hours on the first day) the serum electrolyte levels (5). When hyponatremia occurs, it can be corrected by changing the replacement solution to 2/3 of saline, Ringer’s lactate or bicarbonate solution (according to serum bicarbonate levels) plus 1/3 dextrose solution. The urinary sodium composition measurement can help guide the concentration of sodium in the replacement solution. Because of the volemic and high urinary output volume changes that occur, calcium, magnesium, potassium and phosphate must commonly be replaced (6).

In children with residual diuresis from native kidneys, special attention is required because a malfunctioning or nonfunctioning transplanted kidney can be overlooked.

The systolic arterial blood pressure should be above 100 mmHg to provide adequate perfusion of the allograft in the first 24-48 h of intensive care. If additional crystalloid or albumin infusion is not enough to reach this blood pressure and/or the central venous pressure is >5-10 cmH₂O, vasopressor, usually dopamine, should be initiated. In this setting, mechanical respiratory support may be needed to avoid pulmonary congestion symptoms by maintaining higher arterial and central venous pressures, particularly for small children who have received adult allografts (6).

Arterial hypertension is also frequently observed during this immediate postoperative period and may be related to liberal fluid management, immunosuppressive drugs (e.g., calcineurin blockers), high doses of corticosteroids or previous arterial hypertension. Calcium channel blockers are safe and effective for blood pressure control at this time, as they can reverse the vasoconstrictive effect of calcineurin inhibitors (7).

Intravenous dipriven is routinely used for pain control, and opioids can be added if the pain remains. Analgesia and sedation can be performed with continuous intravenous infusions of fentanyl and midazolam while the patient is on mechanical ventilation.

Antibiotics are normally administered during the perioperative period to prevent wound infections. Dosing commonly begins with cephalexin, which is substituted with co-trimoxazole. Co-trimoxazole is maintained to provide proper treatment. The current treatments for acute cellular rejection include steroid pulses or an infusion of T-cell-depleting antibodies, while antibody-mediated rejection requires, in general, thymoglobulin.

Tacrolimus has been shown to improve graft survival when compared with cyclosporine, and low doses of tacrolimus remain effective at reducing long-term calcineurin inhibitor nephrotoxicity. Although steroid minimization strategies are attractive for children because they could improve growth outcomes without increasing acute rejection or lowering graft survival rates, limited long-term follow-up data are available (13).

Early renal allograft rejection can cause delayed graft dysfunction, and a kidney biopsy is important to confirm this diagnosis and to determine the types of rejection to provide proper treatment. The current treatments for acute cellular rejection include steroid pulses or an infusion of T-cell-depleting antibodies, while antibody-mediated rejection is managed with plasmapheresis, intravenous immunoglobulin and specific, adjustments in immunosuppression.

**AUTHOR CONTRIBUTIONS**

Torricelli FC and Watanabe A wrote the manuscript. David-Neto E critically revised the manuscript for intellectual content. Nahas WC critically revised the manuscript for intellectual content and supervised the study.

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