CLINICS

REVIEW

Current management issues of immediate postoperative care in pediatric kidney transplantation

Fabio Cesar Miranda Torricelli,[I]* Andreia Watanabe,[II] Elias David-Neto,[III] William Carlos Nahas[I]

[I] University of São Paulo Medical School, Division of Urology, São Paulo/SP, Brazil. [II] University of São Paulo Medical School, Department of Pediatrics, São Paulo/SP, Brazil. [III] University of São Paulo Medical School, Department of Nephrology, São Paulo/SP, Brazil.

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.

Torricelli FC, Watanabe A, David-Neto E, Nahas WC. Current management issues of immediate postoperative care in pediatric kidney transplantation. Clinics. 2014;69(S1):39-41.

E-mail: fabio_torri@yahoo.com.br

*corresponding author

Tel.: +55 11 5533-4900

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.

No potential conflict of interest was reported.

DOI: 10.6061/clinics/2014(Sup01)07

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.

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/m^2 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 hypernatremia 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 cmH_2O, 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 dipyrone 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 cephalosporin, which is substituted with co-trimoxazole. Co-trimoxazole is maintained to prevent urinary infections and Pneumocystis carinii for months. Antiviral prophylaxis against cytomegalovirus (CMV) is recommended based on the donor and/or receptor CMV serological status and the immunosuppression regimen (7).

The abdominal drain is not routinely left in the patient. However, in cases of technical difficulty for ureteral reimplantation or in patients at increased risk of bleeding (e.g., postoperative anticoagulation therapy), the drain can be helpful for early diagnosis and intervention. An increase in the drain output can indicate urinary fistula, lymphorrhea or bleeding. Laboratory exams (i.e., urea, creatinine, potassium and hematocrit) from the drain can help to clarify these situations. Imaging exams, such as Doppler ultrasound and/or computed tomography, can also be helpful in this initial evaluation, aiding in the assessment of renal morphology and peri-renal collections (8). In general, abdominal drains and bladder catheters are left in place for at least 5-7 days; if the postoperative time is uneventful, both are then removed.

Doppler ultrasound is performed at least once in the first 24 hours after the kidney transplantation. In cases of unexplained decreases in the urinary output or worsening arterial hypertension, imaging exams should be immediately repeated, as vascular thrombosis may be present (9).

Young recipient age, young donor age, hypercoagulopathy, previous thrombosis in large vessels or thrombosis in vascular accesses are all risk factors for graft thrombosis, which is a significant cause of pediatric transplant loss. Despite the fact that, because of the aforementioned reasons, many pediatric transplant centers use heparin in the immediate post-transplant period for children at risk of thrombosis, thrombotic prophylaxis has not been established in the literature (5).

The surgeon must regularly check the abdominal wound because dehiscence and local infection are not uncommon events (10). Furthermore, pain and swelling in the transplanted fossa can signify venous thrombosis or, even worse, renal rupture.

IMMUNOSUPPRESSION

Immunosuppressive drug therapies must begin before or at the time of the kidney transplantation. In patients with regular immunological risks, interleukin-2 receptor antagonist is generally used for induction, whereas in patients with high immunological risks, T-cell depleting antibodies are recommended (e.g., anti-lymphocyte preparations, such as thymoglobulin).

The typical maintenance therapy consists of a calcineurin inhibitor (tacrolimus or ciclosporin), an anti-proliferative agent (mycophenolate or azathioprine) and steroids (11,12).

Tacrolimus has been shown to improve graft survival when compared with cyclosporine, and low doses of tacrolimus remain the favored approach to reduce 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.

REFERENCES

1. Goldstein SL, Rosburg NM, Warady BA, Seikaly M, McDonald R, Limbers C, et al. Pediatric end stage renal disease health-related quality of life differs by modality: a PedsQL ESRD analysis. Pediatr Nephrol. 2009;24(8):1553-60, http://dx.doi.org/10.1007/s00467-009-1174-1.
2. Wiwanitkit V. Outcomes and predictive factors of pediatric kidney transplants. Pediatr Transplant. 2013;17(5):498, http://dx.doi.org/10.1111/petr.12099.
3. Nahas WC, Antonopoulos IM, Piovesan AC, Pereira LM, Kanashiro H, David-Neto E, et al. Comparison of renal transplantation outcomes in children with and without bladder dysfunction. A customized approach equals the difference. J Urol. 2008;179(2):712-6.
4. Gulati A, Sarwal MM. Pediatric renal transplantation: an overview and update. Curr Opin Pediatr. 2010;22(2):189-96, http://dx.doi.org/10.1097/MOP.0b013e32833683fd.

5. Goebel J. Renal Issues in Organ Transplant Recipients in the PICU. In: Kiessling S, Goebel J, Somers MG, editors. Pediatric Nephrology in the ICU: Springer Berlin Heidelberg; 2009. p. 247-59.
6. Pape L, Offner G, Ehrich JH, Sasse M. A single center clinical experience in intensive care management of 104 pediatric renal transplantations between 1998 and 2002. Pediatr Transplant. 2004;8(1):39-43, http://dx.doi.org/10.1046/j.1397-3142.2003.00114.x.
7. Seikaly MG, Sanjad SA. Intensive care and immediate follow-up of children after renal transplantation. Transplant Proc. 2001;33(5):2821-4, http://dx.doi.org/10.1016/S0041-1345(01)02204-7.
8. Sutherland T, Temple F, Chang S, Hennessy O, Lee WK. Sonographic evaluation of renal transplant complications. J Med Imaging Radiat Oncol. 2010;54(3):211-8, http://dx.doi.org/10.1111/j.1754-9485.2010.02161.x.
9. Gargah T, Abidi K, Rajhi H, Ben Abdallah T, Chebil M, Lakhoua MR. Vascular complications after pediatric kidney transplantation. Tunis Med. 2011;89(5):458-61.
10. Wszola M, Kwiatkowski A, Ostaszewska A, Gorski L, Kuthan R, Sawicka-Grzelak A, et al. Surgical site infections after kidney transplantation–where do we stand now? Transplantation. 2013;95(6):878-82, http://dx.doi.org/10.1097/TP.0b013e318281b953.
11. David-Neto E, Araujo LP, Feres Alves C, Sumita N, Romano P, Yagyu EM, et al. A strategy to calculate cyclosporin A area under the time-concentration curve in pediatric renal transplantation. Pediatr Transplant. 2002;6(4):313-8, http://dx.doi.org/10.1034/j.1399-3046.2002.02019.x.
12. David-Neto E, Pereira Araujo LM, Sumita NM, Mendes ME, Ribeiro Castro MC, Alves CF, et al. Mycophenolic acid pharmacokinetics in stable pediatric renal transplantation. Pediatr Nephrol. 2003;18(3):266-72.
13. Kim S, Webster AC, Craig JC. Current trends in immunosuppression following organ transplantation in children. Curr Opin Organ Transplant. 2013;18(5):537-42, http://dx.doi.org/10.1097/MOT.0b013e3283651b35.