

Long-Term Outcome of Kidney Transplantation in Children According to Type of Transplantation in Mashhad, Iran

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Abstract

Background and Aim: Kidney transplantation is the preferred treatment modality for end-stage renal disease (ESRD) in children. Despite its benefits and advances that have been accomplished, pediatric kidney transplantation remains a challenge in terms of achieving a satisfactory outcome. We sought to evaluate the outcome of pediatric kidney transplantation in Mashhad.

Methods: Data were acquired retrospectively from children below 18 years old who underwent kidney transplantation in three main hospitals of Mashhad from 2000 to 2014. After obtaining written informed consent from parents, data were collected using a questionnaire and analyzed with the SPSS software.

Results: Of 52 children, 51.9% were boys and 48.1% were girls with a mean age of 13.3 ± 4.3 years. Among them, 8 (15.4%) children received transplants from relative live donors, 16 (30.8%) from non-relative live donors, and 28 (53.8%) from deceased donors. The most common etiology leading to ESRD in these children was reflux nephropathy in 18 (34.6%) patients. After a 5-year follow-up period, the graft survival rate was 69.2% with infection being the most common cause of transplant rejection. Moreover, 13.5% of children died, mostly due to surgical complications.

Conclusion: We found that to increase the survival rate of pediatric kidney transplantation in Mashhad, first the surgical methods should be enhanced as they were recognized as the most common cause of death. In addition, infection control in children, as the most common cause of transplant rejection, should be improved.

Keywords: Kidney; Transplantation; Child.

Conflict of interest: The authors declare no conflict of interest.

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Introduction

Kidney transplantation is the treatment of choice for most children with end-stage renal disease (ESRD). Its benefits include improved growth and an increased chance of survival, social adjustment, and quality of life (1, 2). There are some key differences between pediatric and adult transplantation. Organ

failure in adults is mostly due to acquired diseases, while most children have congenital malformations or hereditary diseases (3). The prevalence of chronic kidney disease (CKD) is estimated at 16.8 per million children, and the rate of kidney transplantation in Iran is 7.2 in million children (4).

As reported by a 25-year single-center cohort study from 1989 to 2013 at Dr. Shariati Hospital, Tehran, Iran, the mean 1-, 5-, 10-, and 20-year graft survival rates were 90%, 81%, 62%, and 62%, respectively. The median graft survival time was 14.5 years (5). The survival outcomes among pediatric kidney transplant recipients have significantly improved owing to enhanced surgical techniques, immunological management, infection control, cardiovascular care, and immunosuppressive medications (6, 7). However, although the outcome of kidney transplantation in children has improved, low recipient age is still a risk factor for graft failure, impaired growth, and inferior neurodevelopmental outcomes (3). Kidney transplantation has some complications. Infections are the most common complications, which sometimes lead to graft loss or even death (8). Other complications include delayed graft function (DGF), surgical complications (lymphocele, hematoma, urinary leakage, and urinary bladder obstruction), transplant rejection, hypertension, and metabolic complications. Furthermore, some renal diseases such as focal segmental glomerulosclerosis (FSGS), hemolytic-uremic syndrome (HUS), and membranoproliferative glomerulonephritis (MPGN) may relapse in the transplanted kidney, which may lead to graft loss (8). Pediatric kidney transplantation is performed in Mashhad, but there is a lack of information about its complications and outcomes. Therefore, this study was performed to evaluate the outcomes of kidney transplantation in children in Mashhad from 2000 to 2014.

Methods

This retrospective study was conducted on children below 18 years of age who underwent kidney transplantation in Mashhad, Iran from 2000 to 2014. The data of each patient were collected in a checklist that included demographic information, the disease leading to transplantation, type of transplantation (live dependent donor, a dead body, or live independent donor), renal transplantation function, creatinine level, transplantation complications, patient's age at the time of transplantation, and the long-term outcome. The checklist was completed by the children's parents with the assistance of a nurse working at the dialysis center. The data were then analyzed using the SPSS software.

Written informed consent was obtained from children's parents, and they were assured that they could leave the study at any time. Patients who presented to other centers for treatment follow-up and those who did not have sufficient information to follow up on transplant survival were excluded from the study.

All the steps of this study were approved by the Ethics Committee of the Mashhad University of Medical Sciences.

Results

Fifty-two children were enrolled in the study, including 27 (51.9%) boys and 25 (48.1%) girls. The mean age (\pm standard deviation) was 13.3 ± 4.3 years (range: 9-18 years). Thirty-two patients (61.5%) underwent transplantation in Imam Reza Hospital, 13 patients (25%) in Ghaem Hospital, and 7 patients (13.5%) in Montaserieh Hospital. Furthermore, 94.2% of children received hemodialysis before kidney transplantation, and 5.8% received peritoneal dialysis. The etiology leading to ESRD in children is listed in Table 1.

Table 1. Etiology of ESRD in children

| Etiology | N | Percentage (%) |
|--|----|----------------|
| Aplasia/hypoplasia/dysplasia | 1 | 1.9 |
| Reflux nephropathy and Prunebelly | 19 | 36 |
| Chronic hemolytic syndrome | 4 | 7.7 |
| Interstitial nephritis | 2 | 3.8 |
| Obstructive uropathy | 5 | 9.6 |
| Congenital nephrotic syndrome | 4 | 7.7 |
| Medullary cystic disease | 1 | 1.9 |
| Chronic glomerulonephritis | 4 | 7.7 |
| Polycystic disease | 5 | 9.6 |
| Familial nephritis | 2 | 3.8 |
| Cystinosis | 1 | 1.9 |
| Focal segmental glomerulosclerosis (FSGS) | 4 | 7.7 |

The most common etiology of ESRD was reflux nephropathy.

Regarding the donor type, 8 (15.4%) received transplantation from relative live donors, 16 (30.8%) from non-relative live donors, and 28 (53.8%) from deceased donors. Furthermore, 80.8% of the donors were male and 19.2% were female with a mean age of 23.35 ± 10.86 years (range: 1-42 years). As shown in Table 2, 10 patients (19.2%) were diagnosed with primary complications after the transplantation, and 42 patients (80.8%) did not have primary complications.

Table 2. Prevalence of early complications in children

| Complication | N | Percentage (%) |
|---|----|----------------|
| Acute rejection | 5 | 9.6 |
| Acute tubular necrosis (ATN) in early phase (cold ischemia) | 2 | 3.8 |
| Infection | 3 | 5.7 |
| No complication | 42 | 80.8 |

The graft survival rate five years after the transplantation was 69.2%. The transplant rejection etiologies are provided in Table 3.

Table 3. Outcome of kidney transplantation in children

| Graft loss | N | Percentage (%) |
|---------------------|----|----------------|
| Acute rejection | 5 | 9.6 |
| Chronic rejection | 1 | 1.9 |
| Infection | 9 | 17.3 |
| Other complications | 1 | 1.9 |
| No rejection | 36 | 69.2 |

In terms of immunosuppressive medications, 38 patients (73.1%) received cyclosporine, mycophenolate mofetil, and steroid regimens, and 14 (26.9%) patients received tacrolimus, mycophenolate mofetil, and steroid regimen. Seven out of 52 patients (13.5%) died. The cause of death was infection (one case out of seven, 14.3%), acute

pulmonary edema (14.3%), complications of surgery (28.5%), encephalitis (14.3%), heart disease (14.3%), and fungal peritonitis (14.3%).

Discussion

Kidney transplantation is the best desired treatment for children with ESRD (9). However, a study in Iran found that only less than half of these children stand a chance of having a kidney transplant (4). Patient and transplant survival has improved due to surgical advances, preoperative and postoperative care, and immunosuppressive drugs (10, 11). A study found that genetic and socio-cultural factors could be the reasons for the higher prevalence of kidney transplantation and CKD in boys (12). Longshan et al, Otukesh et al, and Harambat et al. found that more than 50% of the children were boys, which was similar to the present study (13-15).

In Iran, pediatric kidney transplantation began in 1985 in Labfi Nejad Hospital, Tehran. In a study of 278 children who had a kidney transplant in Labafi Nejad Hospital between 1985 and 2003, all children received a live-donor transplant, of which 12.5% were relative donors (16).

The donor sources vary depending on religious, cultural, and ethical factors (14). In several countries, most transplants are from live donors (17, 18), some countries use deceased donors (13, 15), and other countries use both sources almost equally (19-21). In our study, most of the patients had a deceased-donor transplant, which is not consistent with previous reports in Iranian children (14, 16).

According to several studies, the most common etiologies of ESRD in children are congenital or inherited abnormalities and glomerulonephritis (7, 22). In a study by Naderi et al. on 314 pediatric kidney transplantations, the most common cause of kidney disease that led to ESRD was congenital anomalies of the kidney and urinary tract followed by glomerular diseases (5). In the present study, the most common cause of ESRD was reflux nephropathy followed by obstructive uropathy and polycystic disease. A nationwide Iranian study showed that the 1-, 3-, 5-, 10-, and 15-year graft survival rates were 88.7%, 80%, 72%, 59%, and 45%, respectively (14). Another single-center study showed a 5-year graft survival rate of 56% (23). In the present study, the graft survival rate was 69.2% five years after transplantation.

Unlike our study where infection was the most common cause of graft loss, Naderi et al. and

Harambat et al. found chronic rejection as the most common cause of graft loss (5, 19). In a study of 553 patients in France, Allain- Launay et al. reported a mortality rate of 3.1% with the highest causes being infection and malignancy, respectively (24). However, Kute et al. found a higher mortality rate (27%) and reported that infection and cardiovascular diseases were the most common causes of death (25). The mortality rate of our patients was 13.5%, and unlike studies of Allain-Launay et al. and Kute et al., surgical complications were the most common cause of death, indicating that the surgical techniques of kidney transplantation should be improved in Iran.

Our study was limited in some aspects. The sample size was small, and due to the lack of kidney transplant patient registry in our country, this study was limited to only three hospitals in Mashhad.

Conclusion

The present study, which examined the outcome of kidney transplantation in children, showed that the survival rate of patients and transplantation was 86.5% and 69.2%, respectively. To improve the outcome in these patients, surgical complications, as the most common cause of death in this study, should be reduced. On the other hand, infection should be controlled in these patients because it was found to be the most common cause of transplant rejection. Although the patient and graft survival rates have improved, further advances are still required to increase the long-term graft survival rate.

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Conflict of Interest

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