

Perioperative Anaesthetic Management of renal transplanted children undergoing nontransplant surgery

ESSAY

Submitted for fulfillment of
The Master Degree in Anaesthesia and Intensive care

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2009

Acknowledgement

It is a pleasure to express my deepest gratitude to **Prof. Hanaa Abo El Nour Mohammed**, Professor of Anaesthesia and intensive care, Faculty of Medicine, Cairo University. Who very kindly and generously gave me much of her time and experience in helping, guiding and advising me.

I'm deeply indebted and grateful to **Dr. mohamed Walid Awad** assistant Professor of Anaesthesia and Intensive care, Faculty of Medicine, Cairo University for his enthusiastic help, kind supervision and encouragement throughout this work.

Sincere thanks to **Dr. sherif Mohamed Soaida**, lecturer of Anaesthesia and Intensive care, Faculty of Medicine, Cairo University, for his continuous interest, care, endless support, critical review and advice.

ABSTRACT

IS EBV and CMV infection during the posttransplant period of immunosuppression causing lymphoid tissue hyperplasia That is occurred all over the body lymph nodes or within the graft or in the Waldeyer's ring of lymphoid tissue of the oropharynx, which may be a cause of difficult airway management.

KAY WORDS

Perioperative management transplanted

List of Abbreviations

<i>Abbreviation</i>	<i>Long Form</i>
MMF	Mycophenolate mofetil
ESRD	End stage renal disease
DGF	Delay graft function
HLA	Human leucocyte antigen
CsA	Cyclosporine A
FK506	Tacrolimus
CMV	Cytomegalo virus
CCBs	Calcium channels blockers
HDL	High density lipoprotein
ACE	Angiotensin converting enzyme
GFR	Glomerular filtrate rate
BUN	Blood urea nitrogen
Fe_{Na}	Fractional excretion of sodium
ARF	Acute renal failure
NHE-3	Sodium /hydrogen isoform exchanger
KIM-3	Kidney injury molecule
NGAL	Neutrophil gleatinase associated lipocalin
6-MP	mercaptopurines
AZA	Azathioprine
IMPDH	Ionosine 5 -monophosphate dehydrogenase
SRL	Sirlimus
ATG	Anti thymocyte globulin
DNA	Deoxy ribonucleic acid

NFAT	Nuclear factor of activated T cell
FKBP12	FK506 binding protein 12
MPA	Mycophenolic acid
MNA	Malono nitrilamide
DHODH	Dihydro orotic acid dehydrogenase
TNF	Tumour necrotic factor
PTLD	Post transplant lymphoproliferative disease
EBV	Epstein barr virus
NAPRTCS	North American pediatric renal transplantation centers
SRTR	Scientific registry of transplant recipient
WHO	World health organization
CNS	Central nervous system
CT	Computed tomography
MRI	Magnetic resonance imaging
LMP	Latent membrane protein
EBER	Ebstein barr early region
PCR	Polymerase chain reaction
CKD	Chronic kidney disease
USRDS	United states renal data systems
K/DOQI	Kidney disease outcome quality initiative
LVH	Left ventricular hypertrophy
PKD	Polycystic kidney disease
ARPKD	Autosomal recessive polycystic kidney disease
ADPKD	Autosomal dominant polycystic kidney

	disease
CHF	Congenital hepatic fibrosis
HUS	Hemolytic uremic syndrome
HUS+D	Diarrhea associated hemolytic uremic syndrome
HUS-D	Non diarrhea associated hemolytic uremic syndrome
PT	Prothrombin
aPTT	Activated partial thromboplastin time
UPJ	Uretro-pelvic junction
CPAP	Continous positive airway pressure

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Introduction

Because the frequency of major organ transplantation and the length of graft survival is increasing, the population of the transplant children is steadily increasing.

Transplant recipients frequently enter the operating rooms as patients who are acutely ill, chronically unwell, emotionally stressed , acutely and chronically immunocomprised . **(Mark T.K.and David J.P.2004)**

Caring for a child with a transplanted organ requires a through knowledge of the physiological and pharmacological consequences of the transplantation, and of the new diseases (e.g.lymphoproliforative diseases), with the goal of avoiding infection while maintaining adequate immunosuppression.

Preoperative assesement should focus on grafted kidney function which can be assessed by :measurement of creatinine, urea, plasma electrolytes and proteinuria. If the glomerular filtration rate is lower 60ml/min/1,73m, hyperhomocysteinemia is present with the risk of the vascular thrombosis and atheromatosis.

Sequellae of immunosuppression are systemic hypertension, mild renal insufficiency and diabetes mellitus. Longterm complication to immunosupperessive therapy also include infection and neoplasm such as lymphoproliforative disorders. **(Black AE. Savitsky EA, Votey SR 2003)**

Sequellae of previous disease may influence any further anaesthetic management such as (renal dysplasia, polycystic kidney, hemolytic uremic syndrome) and in a case of

longstanding renal failure the child may be present with renal-osteodystrophy.

Adequate perioperative hydration and avoidance of possible nephrotoxic agents are mandatory. Sevoflurane can be used safely despite the production of fluoride.

(Mark T.K.and David J.P.2004)

Moreover the psychological aspects of taking care of a child and (the family!) with chronic disease must be taken into account.

(Anver ED, Chavers B 2005)

Aim of the Essay

Aim of this essay is to throw some lights on the following:

- Function of the transplanted kidney graft.
- Sequellae of the immunosuppressive therapy on the recipient child.
- Sequellae of the previous diseases which may still affect the recipient child.
- Anaesthetic management.

KIDNEY TRANSPLANTATION

The earliest kidney transplant in a child was performed by Michon and colleagues in Paris on Christmas Eve in 1952. A 16-year-old boy had just undergone nephrectomy for a right ruptured kidney after a fall. Unfortunately, it was discovered he had no left kidney. An ABO-compatible kidney from his mother was placed in the iliac region. Initially, the kidney excreted urine and had good renal function. However, on posttransplant day 21, abrupt anuria occurred, indicating rejection and the patient died. Two years later, Murray and colleagues performed the first successful kidney transplant between two identical twins. The first successful pediatric transplant was performed by Goodwin, Mims, and Kaufman at the University of Oregon in 1959 between pediatric identical twins, one of whom had glomerulonephritis. Eighteen years posttransplant, the kidney was still functioning with normal morphology by biopsy.

Routine kidney transplantation in pediatric patients, however, awaited the development of effective immunosuppressive agents. Potent corticosteroids, calcineurin inhibitors such as cyclosporine or tacrolimus, monoclonal antibodies, antimetabolites like azathioprine, and the purine synthetase inhibitor MMF have all been used successfully in pediatric patients to prevent rejection. Superior survival and improved long-term growth and development can be obtained with kidney transplantation compared with chronic hemo- or peritoneal dialysis. Newer immunosuppressive regimens relying less on high-dose corticosteroids have further improved the growth and development of children receiving a renal transplant. In addition, pediatric patients who receive a kidney transplant are much more likely to have a normal lifestyle compared with those requiring hemodialysis. (*Papalois and Najarian, 2001*).

Approximately 300 pediatric patients undergo living related kidney transplantation a year in the United States and

150 to 200 receive a cadaveric transplant. Infants and small children (<15 kg) constitute between 10% and 15% of both cadaveric and living related transplants in the pediatric age group.

(McDonald et al., 2000)

Numerous studies have shown that the overall success rate for renal transplantation in children and teenagers is similar to that of adults . The most recent 1- and 5-year patient survival rates in patients receiving living related kidney transplants were 97% and 94%, respectively. The graft survival rates over the same time periods were 91% and 78% . The patient survival rates for recipients of cadaveric organs are slightly lower: 96% at 1 year and 91% at 5 years. However, the graft survival rates at 1 (81%) and 5 years (64%) are much lower in recipients of cadaveric organs. Rejection is the main cause of graft loss.

In contrast, most reports show that the 1-year patient survival following transplantation is lower if the recipient is less than 2 years of age compared with older children following living-related transplantation (89%); graft survival is also less (≈85%). Both the mortality and graft loss are greater in cadaveric transplantation as well . Vascular thrombosis is much more likely to be a cause of graft loss in infants than older children or adults. Although renal transplantation has been successful in very small children (<10 kg), clearly infants and small children constitute a high-risk group for kidney transplantation.

(Elshihabi et al., 2000) .

Unique Characteristics of Pediatric Recipients:

Recipients of renal transplants differ from their adult counterparts in several ways. Obstructive nephropathy or hypoplastic kidneys are common causes for transplantation in

the pediatric age group. Glomerulonephritis is less common, and, in contrast to adults, diabetes as a cause of renal failure in this age group is rare . Consequently, many of the diseases that cause renal failure in children do not recur and successful transplantation could, in theory, be a permanent solution. Also, although most adults have received dialysis before transplantation, up to 35% of children who receive a transplant have never had dialysis before. Of the children who are on dialysis, one half are receiving peritoneal and one half hemodialysis . Finally, kidney transplantation using infants or small children as donors has a lower success rate because of the small size of the donor vasculature. Therefore, children usually receive a transplant from someone who is an adult or large child, often much larger than the recipient. In recipients who are infants or small children, the kidney may be many times larger than they would normally .

Infants less than 2 years of age are an important subset of pediatric patients because they are at higher risk for graft loss. Unlike older children or adults, rejection in infants is not the primary cause of failure of the transplanted kidney. The main reason for graft loss in the younger recipient is vascular thrombosis.

(*Beebe et al., 1991 ; Singh et al., 1997 ; Healy et al., 2000 ; Neipp et al., 2002*).

Infants also have a higher incidence of delayed function of the renal allograft. This is important because infants and children with delayed graft function have an increased incidence of graft loss in the years following transplantation. Kidneys with delayed function are likely to have sustained permanent injury

and are susceptible to failure following rejection or other insult. Providing adequate perfusion of a very large kidney relative to the recipient size to prevent vascular thrombosis and delayed graft function is one of the main challenges for the pediatric anesthesiologist caring for an infant or a small child undergoing renal transplantation

(*Tejani et al., 1999*)

Function of the Transplanted Kidney

Renal transplantation remains the treatment of choice for end-stage renal disease (ESRD) in regards to patient survival many risk factors are known to influence long- term graft function and survival. among these include:

- recipient age
- recipient race
- presence of delayed graft function (DGF)
- presence of HLA mismatching
- presence of acute rejection episodes

Improvement in half-life was seen even after an adjustment for these risk factors, indicating that additional, unidentified factors remain. Renal function within the first year of transplantation also has been reported to an important factor influencing graft survival. *(Hariharan et al,2003).*