SPECIAL CONSIDERATIONS IN THE CARE OF THE INFANT CAPD/CCPD PATIENT

Alicia M. Neu, M.D., Division of Pediatric Nephrology, The Johns Hopkins University School of Medicine, Baltimore, Maryland
Bradley A. Warady, M.D., Division of Pediatric Nephrology, The Children’s Mercy Hospital, Kansas City, Missouri

INTRODUCTION

Although peritoneal dialysis (PD) has been used extensively in pediatric patients with end-stage renal disease (ESRD) for more than 15 years, this technology was not routinely offered to infants who presented with irreversible renal failure before the late 1980’s. This practice was the result of a combination of poor patient outcome, characterized by profound neurologic impairment and poor growth, as well as limitations in the equipment available at that time. Fortunately, technical advances and increased clinical experience have improved the availability and the outcome of PD in these patients such that it is now the expectation to offer renal replacement therapy to the even the smallest infant with isolated renal failure. Despite these advances, this population of patients continues to present unique clinical challenges that distinguishes them from older children and adults on PD. This chapter addresses a number of the special issues that arise when caring for infants with ESRD, with therapeutic approaches practiced in our pediatric centers and others.

PERITONEAL DIALYSIS: THE TREATMENT OF CHOICE FOR INFANTS WITH ESRD?

It is commonly believed that renal transplantation is the renal replacement therapy (RRT) of choice for pediatric patients with ESRD because of the improvement in growth and neurologic development regularly associated with a successful transplant. However, early single center reports suggested that patients younger than 2 years of age at the time of transplantation experienced poor graft survival. (1-3) The 1989 report of the North American Pediatric Renal Transplant Cooperative Study (NAPRTCS) later confirmed the poor results with patients 0-1 years of age at the time of transplantation experiencing the poorest pediatric (i.e. < 18 years of age) 1 year graft survival of 73% and 51% for living related donor and cadaver donor recipients, respectively. (4) Whereas subsequent single center
reports have demonstrated improved graft survival in infants with the use of quadruple immunosuppression (prednisone, azathioprine, cyclosporine and Minnesota antilymphoblast globulin), the most recent NAPRTCS data continues to reflect the high risk nature of renal transplantation during infancy. Although the relative risk of graft failure associated with recipient age < 24 months in patients receiving living donor grafts has decreased from 1.7 in 1993 to 1.4 in 1995, the relative risk of graft failure in cadaveric donor recipients aged less than 24 months remains very high at 2.03. (5,6,10) Until transplantation can be more uniformly successful in this high-risk patient population, some pediatric centers have adopted the practice of postponing transplantation, especially when associated with a cadaveric donor, until after the 2nd year of life. This practice is reflected in the NAPRTCS data that reveals the youngest patients to be over-represented in the dialysis population, with 11% of all patients < 2 years of age at initiation of dialysis compared to 6% of patients being < 2 years of age at transplantation. (7) Thus, many infants who develop ESRD will likely receive a course of dialysis as RRT.

For infants who do require chronic dialysis, PD is the dialysis modality of choice. Although controlled studies assessing the influence of dialysis modality on patient outcome in children have not been performed, PD may offer many advantages for pediatric patients when compared to hemodialysis (HD) including improved growth, metabolic control, and a more liberal diet. (7-10) In addition, the performance of HD in small infants may be associated with substantial technical barriers including difficulty in establishing and maintaining a vascular access, as well as the limitations of a tolerable extracorporeal volume and ultrafiltration rates. (11,12) Given these limitations, the use of HD in the care of infants with ESRD is often restricted to those with medical contraindications to PD (i.e. abdominal wall defects), those who do not have a caretaker willing to or capable of performing home dialysis and those who require transfer from PD because of recurrent peritonitis or ultrafiltration failure. (11-13) The preferential use of PD for infants with ESRD had been confirmed by the NAPRTCS, which reported that 89% of children aged 0-1 years and 70% aged 2-5 years were placed on peritoneal dialysis at initiation of dialysis. (14) In addition, data from the 1995 United States Renal Data System (USRDS) report reveals that 9% of pediatric patients less than age 4 years are treated with HD while 75% receive PD. The modality choice of 16% of dialysis patients in this age range was categorized as “unknown dialysis”. (15)

DIALYSIS EQUIPMENT CONSIDERATIONS

One of the most prominent barriers to the early use of peritoneal dialysis in infants was the lack of appropriate equipment. Although adult catheters, dialysis solution bags and tubing and automated cyclers could be adapted to the larger pediatric patient, the inability to modify this equipment for a small infant often proved prohibitive. It was not until 1980 that dialysate bags with a volume smaller than 2 liters were commercially available and not until 1989 that an automated cycler could deliver an exchange volume less than 250 ml. (16) Today, dialysate bags with volumes as small as 250 ml are readily available and the Pac Xtra automated cycler (Baxter Healthcare Corp, Deerfield IL) can deliver an exchange volume as low as 50 ml with incremental adjustments of 10 ml. Despite the