THE TREATMENT OF CHRONIC RENAL FAILURE IN CHILDREN

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Chronic renal failure in children usually leads to end-stage renal disease (ESRD). When the onset occurs very early in life, that is in children less than 2 years of age, the consequences are more severe. It has been appreciated for some time that children with chronic renal failure grow poorly and can develop crippling bone disease. In addition, there may be severe neurological disabilities (1, 2, 3).

Thus, the early therapeutic goal for such children is to enhance growth and prevent bone disease. This means providing adequate nutrition. Such children frequently have a poor appetite. Interestingly, it may be the anorexia is a protective mechanism to inhibit growth, and in turn not overburden inadequate kidneys. We feel accepting growth failure is wrong, and thus have encouraged adequate nutrition, even if it leads to earlier dialysis. Resorting to tube feeding has

become a common therapeutic tool. In some children, where oral nutrition is barely adequate, the institution of chronic peritoneal dialysis will make the anorexia even worse, and thus the need for extraordinary nutrition strategies such as tube feeding, imperative. The anorexia produced by chronic peritoneal dialysis may be related to hyperglycemia from dextrose absorption from the dialysate, or the feeling of satiety from abdominal distention related to the instilled dialysate volume. We have shown that Gastric (G)-tube feeding for children on chronic peritoneal dialysis can be safe (4). The tube causes few problems during the pre-dialysis, dialysis, or early transplant period. Other strategies to improve nutrition have been tried. Adding amino acid to the dialysate has been performed in adults and children and the results have been encouraging (3, 6). Our first experience with amino acid dialysis was from a one year-old female on CAPD who developed hypoalbuminemia and edema secondary to albumin-loss in the dialysate. Amino acid dialysis was most effective in correcting this problem. Since then we have studied the acute and long-term effects of amino acid dialysis. It is currently given to children on chronic peritoneal dialysis who develop hypoalbuminemia in spite of all attempts with oral nutrition.

Our experience with growth for children on chronic peritoneal dialysis has been rewarding. Such children grow better than those on

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hemodialysis, and nearly as well as those who are transplanted (7) -However, it appears that no matter how well we dialyze or feed a patient, it is not possible to produce accelerated or "catch-up" growth. Recent reports of accelerated growth in children with chronic renal failure or end-stage renal disease who are given recombinant human growth hormone (rhGH) are exciting (8). Even though early reports are encouraging, it is necessary to prove the safety and efficacy of such therapy. How much growth will be achieved over the long-term, and is there a neoplastic risk in using a "growth-factor"? Another new recombinant hormone treatment is erythropoietin. It is possible that the correction of the anemia of chronic renal failure may also enhance growth, possibly by improving appetite and providing better tissue regeneration.

Healthy bones are mandatory for good growth. If not treated, renal osteodystrophy (ROD) is an invariable consequence of chronic renal failure. It is relatively easy to prevent ROD by controlling the plasma calcium and phosphorus levels and using vitamin D early. Rather than wait for radiological changes of renal osteodystrophy. It is our policy to start Calcitriol or Alpha-Calcidol once the glomerular filtration rate is <30 ml/min/1.73m sq. We also tend to control the phosphate level with dietary restriction and calcium carbonate. Aluminum hydroxide is only used on a short-term basis to correct hyperphosphanemia. The experience with vitamin D metabolites in preventing renal osteodystrophy is good (9). Current work is being done on providing Calcitriol by alternate routes, such as intravenously and intraperitoneally (10). In theory, parenteral 1,25 dihydroxy vitamin D₃ should be more effective in controlling hyperparathyroidism.

The ultimate treatment for CRF/ESRD is a successful renal transplant. At our institution

greater than 350 transplants in children have been performed since 1969. The majority have been cadaveric donors, however, more recently, because of reduced availability of kidneys, we have been doing more living-related donors (LRD). Because of poor results in transplantation for very young children, i. e. <4 years of age, we favour LRD's for this group. Immunosuppressive therapy is now more aggressive; that is, the routine use of early quadruple therapy (Prednisone, Azathioprine, antilymphocyte globulin. Cyclosporine A) and OKT3 when required. Using such powerful therapy makes it all the more mandatory to provide close surveillance to monitor for infections, such as Epstein-Barr virus (EBV) and cytomegalovirus (CMV) infections, and malignancy.

Where are we going with ESRD therapy in children? It would appear that automated peritoneal dialysis is a more acceptable therapy for children than adults. In many pediatric centres CCPD is used by 75% of their patients. The future of more efficient dialysis, such as Tidal peritoneal dialysis, must be assessed both for efficacy and cost effectiveness. Peritonitis and catheter exit-site infections continue to be a problem. However, improved techniques, such as a "Y-set" or the "ultra-set", have reduced the infection rate. Nutrition and growth go hand in hand. Naso-gastric or gastric tube feeding is popular in many centres. Unfortunately, tube feeding can cause psychological eating disorders and thus preventative strategies are needed. Erythropoietin is now commonly used for the anemia of chronic renal failure. Its long-term effectiveness needs controlled investigations. Long-term controlled trials of growth hormone are mandatory. Renal osteodystrophy can be prevented for most patients using the currently available drugs. An effective and safe phosphate-

binder is required since calcium carbonate and aluminum hydroxide both have limitations.

Finally, for the transplant patient, we need to improve donor kidney preservation, and immuno-regulation of the recipient. However, our most important goal is the early diagnosis and prevention of renal disease.

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