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Opinion Article

An Overview on Pediatric Hemodialysis

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DESCRIPTION

Every year, the incidence and prevalence of pediatric End-Stage Renal Disease (ESRD) cases rises. For these children, transplantation is the best treatment choice since it preserves vascular access sites, allows for more normal growth and development, and improves quality of life. It's difficult to get and keep access to hemodialysis for children. A multidisciplinary team of nephrologists, surgeons, interventional radiologists, anesthesiologists, and nurses dedicated to the treatment of these children is required for successful vascular access. Pediatric vascular access has a wide range of procedural diversity and complexity. Because of the differences in patient size, surgeons must be knowledgeable with a wide range of procedures, instruments, and medical devices. The small number of pediatric-specific vascular access products available often dictates or greatly influences the access procedure used.

Patients with ESRD in children should be recognized early, and counseling should begin 9-12 months before starting Renal Replacement Therapy (RRT). This goal, however, is rarely realized, with 44% of patients meeting a nephrologist for the first time at the start of dialysis. Identifying people at risk for Chronic Kidney Disease (CKD) is a key roadblock to early counseling. There are currently few screening programs available, and there is no consensus on when dialysis should be started. When the estimated Glomerular Filtration Rate (eGFR) falls below 10-15 ml/min/1.73 m^2, dialysis should be started in children, but these figures are questionable in children under the age of two. Furthermore, dialysis is not started in infants and children solely on the basis of test results. The full clinical picture, including dietary, hydration, and electrolyte status, must be evaluated. Prenatal ultrasonography has proven to be effective in identifying patients who are at risk for CKD and providing early counseling. When a child develops ESRD and requires Renal Replacement Therapy (RRT), peritoneal dialysis and hemodialysis are alternatives while waiting for a kidney donation.

Hemodialysis began in 1924, when George has attempted unsuccessfully to circulate blood outside the body with an artificial kidney. His success came from an alternative method in which the patient's blood was removed, heparinized, and circulated through a dialyzer before being reinfused; a time-consuming procedure that required 9 repeats to be effective. Dr. Willem Johan Kolff constructed the first revolving drum artifcial kidney in the 1940s, bringing innovation to a halt. This apparatus requires a minimum of two square meters of membrane and 1.5 units of blood priming. Kolff travelled to the United States to fine-tune his concept after the first 15 patients expired. By the early 1950s, he had developed a machine that treated acute renal failure but ruined the patient's vasculature due to the access trocars. The "Scribner shunt," created by Dr. Belding Scribner, is an ex *vivo*, plastic, "U" shaped shunt connecting artery and vein that provides Kolff's prosthetic kidney with reliable, reusable, long-term dialysis access. Other grafts, such as modified bovine carotid artery and Polytetrafluoroethylene (ePTFE), were utilized by 1972.

Pediatric kidney problems vary with age, according to the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). Congenital anomalies of the kidney and urinary tract, which account for 30-45 percent of pediatric ESRD in infants and young children, as well as hereditary diseases, nephrotic syndrome, and system diseases in children aged 5-14 years, are the most common causes of pediatric ESRD overall and in infants and young children. Glomerulonephritis is more common in older children (38 percent). The past medical history should be comprehensive, with an emphasis on concomitant diseases, previous dialysis, and blood transfusion history. Because cardiovascular events are a leading cause of morbidity and mortality, it's critical to detect risk factors like hypertension, diabetes, and obesity. Depression is a less typically discussed comorbidity. Depression affects about 20% of CKD adults, which is four times more than the general population. Depression is linked to poor outcomes in ESRD patients, and it should be recognized and treated as soon as possible.

The majority of pediatric vascular access decisions are made on the basis of insufficient, low-level adult and pediatric data. Pediatric vascular access recommendations, both national and international, are rarely implemented. Over HD catheters, they prefer Arteriovenous Fistula (AVF) over Arteriovenous Graft

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(AVG). HD catheters, the most frequent type of vascular access, provide patients with fast, safe, atraumatic access with low primary failure rates but increased rates of thrombosis, infection, and venous stenosis. The second and third most prevalent pediatric hemodialysis access procedures, respectively, are AVFs and AVGs. They necessitate medical competence, multiple skin punctures, and more time to mature. They're linked to a higher likelihood of first failure but a higher rate of secondary patency. AVFs have higher primary failure rates, lower primary patency rates, and higher secondary patency rates when compared to AVGs.