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Research Article

Vascular Access for Hemodialysis in a Pediatric Population. A Review of Cases in Two Hemodialysis Centers in Yaounde Cameroon

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Abstract

Background: End Stage Kidney Disease (ESKD) patients need a form of renal replacement therapy among which hemodialysis. Vascular access is an essential suscess factor in this repetitive and sometimes life long therapy. In paediatric population construction of a vascular access faces some specific constraint and the objective of this study is to report the experience on a cohort of ESKD in two hemodialysis centers in Yaoundé Cameroon.

Materials and methods: We retrospectively review all the patients who build their fistula or were on hemodialysis under 16 year age in Yaoundé General Hospital (HGY) and University Hospital Center (CHU). The socio-demographic data and all pertinent clinical informations were recorded and analysed.

Results: We study 19 patients ; 8 from CHU and 11 from HGY. The mean age was 13 years at the initiation of dialysis. The main aetiology of renal failure was chronic glomerulonephritis follow far away by obstuctive uropathy in two cases and one case of lupus erythematosis. The success rate of fistula creation was 69.5%. The mean number of central venous catheter use before AV fistula was 1.9.

Conclusion: The Vascular access by AV fistula since his developpment has provide relief to the patients with ESKD. It is both successful in distal and proximal location on the forearm in pediatric population but there is a need to clinical evaluation on an individual base. Use of magnifying glass may be an advantage.

Keywords: Vascular access • Pediatric • Arteriovenous fistula • Hemodialysis

Introduction

Chronic renal failure is an emerging preoccupation in medical practice worldwide. It is estimated that the burden of population having End-Stage Kidney Disease (ESKD) is going to rise from 2.61 million in 2010 to 5.44 million in 2030 [1,2]. This rise in western countries is attributed to the increase in the population, the increase prevalence of diabetes and hypertension but in developing countries communicable diseases as HIV, infectious glomerulonephritis and some other avoidable etiologies are responsible of this condition [3]. Hemodialysis is based on a reliable vascular access that faces specific challenges in the pediatric population with tiny vessels, low distal arterial pressure, and the necessity of a long-term strategy since any vascular access has a mean lifespan usually estimated to 6 years [4]. The transplantation that is the most attractive solution is limited by the donor capacity and the medical expertise available in sub-Sahara Africa. The aim of this study is to review pediatric population in two hemodialysis centers in Yaounde in Cameroon undergoing hemodialysis to analyze the difficulties to initiate the renal replacement therapy, the selection made for vascular access in this particular group and the outcome to share our experience [5].

Materials and Methods

This is a retrospective and descriptive study carry in two dialysis centers in Yaoundé Cameroun from 2020 to 2024. The centers involve in the study were the University Hospital Center (CHU), the Yaoundé General Hospital (HGY). All patient who had a vascular access by a Central Venous Catheter (CVC) or an arteriovenous

fistula aged at the initiation less than 16 years were include. The socio-demographic informations were registered with the informations about the etiology of the kidney disease, the mode of VA at the moment of dialysis initiation, the type of AV fistula according to the society of vascular surgery nomenclature (SVS) [5]. The patency history, the complications that arise during the functioning of the AV fistula. All informations were include in an excel data sheet and analyzed. We require and obtain the authorizations of the ethic committee of the two participating hospitals. Authors declare they have no conflict of interest about the content herein.

Results

We had 19 patients fulfilling the inclusion criteria's. Eight from CHU and 11 from the General hospital of Yaoundé. At the time of initiation of dialysis, the mean age was 13 years (8-15). There were 10 females and 9 males. All but one patients was not pursuing an academic educational program. Concerning the etiology of renal failure, 1/19 was due to Lupus erythematosus, 2/19 were due to malformation of the urinary tract (posterior urethral valve one, ureteral malformation for the other), 16/19 were related to chronic glomerulonephritis. The types of VA realize were distal (radiocephalic) 7 /18 and proximal (proximal radio-cephalic, brachio-cephalic, brachio-basilic) 11/18. In one case, the patient was still doing dialysis with CVC. All the patients initiate the dialysis with CVC before building an AV fistula in 18 cases for the last patient the fistula was still to schedule (Figure 1).

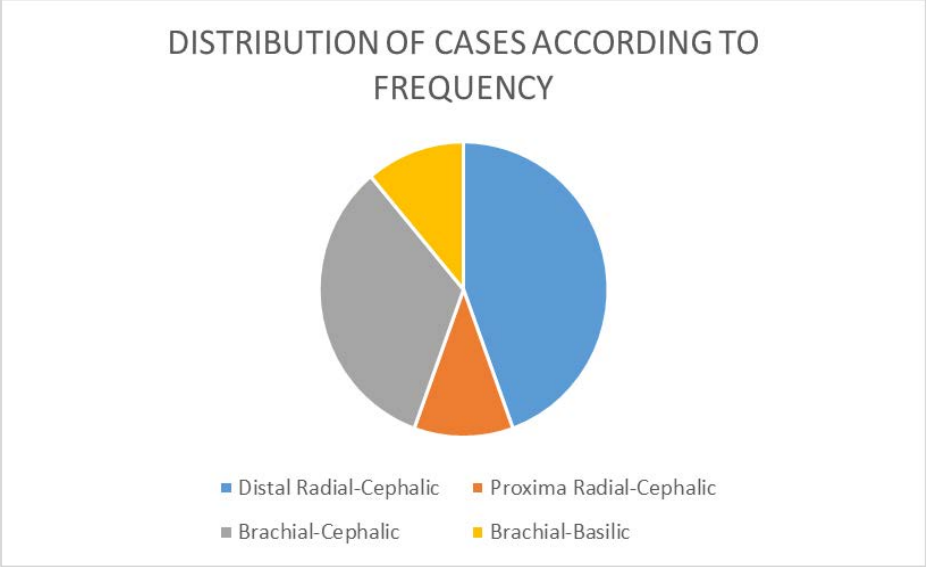

Figure 1. Distribution of cases according to frequency of type of AV fistula.

For the 18 patients already having a vascular access with AV fistula, only 5 (26.5%) had a previous fistula that stops working for 4 (21%) or was not use for 1. There were 26 attempts for the 18 fistula build that reaches maturation corresponding to 69.5% success rate. We couldn't analyzed the duration of the fistula since they were not build at the same time but the average duration was 3.3 years in this case series. The longest duration was 12 years. All the fistulas were autogenous fistulas; no graft was use. In CHU all the fistula were build using magnifying lens the situation in HGY was not mention. The preoperative vein mapping by ultrasound was infrequently use and report. All our patients initiated their dialysis with a catheter and the mean number of catheter use was 1.9 per patient range 1-4.

We register three complications 16%, namely 2 aneurysmal dilatation, 1 infection successfully treated conservatively with antibiotics (Figure 2). One of the two patients with aneurysmal dilatation had another fistula to avoid the rupture or continuing dilation and rupture. One patient of this cohort has a successful transplantation of the kidney during the study time.

Figure 2. A aneurysm on a fistula that last 12 years; B The same patient with functioning fistula of the opposite forearm.

Discussion

The establishment of a VA for hemodialysis in childhood patient is challenging because it should be part of a whole strategy that integrate future alternative in case the fistula stops working and because of the anatomical constraint of vessel size [6,7]. Since 1997, the NKF/DOQI has set some changes into the practice to establish an hierarchy that consider autogenous AV fistula as the priority vascular access for dialysis. In this series, the autogenous VA was the only solution attempt. It is more an adhesion to the patient reality since we are dealing with children with a mean age of 13 and mostly in whom the venous superficial network is not exhausted. The autogenous AV fistulas are more easily handle with less infection and less procedures needed to keep the patency than the graft [8,9].

The sex ratio was 1.22 with no prevalence of one gender. The etiology of the ESKD was mainly chronic glomerulonephritis and some particular situation as a case of poorly treated posterior urethral valves. This remind us how important it is to diligently diagnose and treat urinary tract issues because even in adult population, obstructive uropathy is the cause of cases of renal failure with prostatic adenomas or adenocarcinomas.

There was a slight preference of proximal fistulas (proximal radiocephalic, brachial cephalic, brachial basilic) 55% over distal ones (distal radioephalic) 44%. Considering the anatomy of the vessels, this choice seems more advisable since the vessel are bigger and the pressure also. We did not find pertinent to study the side of fistula since the recommendation generally follow is to use the non-dominant side initially and to change only if an appropriate size superficial vein is not available [10].

The success rate of fistula creation in this pediatric group was 69.5% that seem to us less than the classical 80% rate in the literature in general [11-14]. Success rate for fistula creation in the literature is diverse with some authors reporting 37% of primary failure. It is advise to use microsurgical techniques (magnification) to improve the results and we feel helpful doing so in CHU Yaounde [15].

All the patients initiated their dialysis with a CVC. This is not in line with the recommendation from the fistula first initiative set in 2003 by the National kidney foundation [16-18]. This can be attributed to diagnosis difficulties and the sudden onset of the failure of the kidney function. This may be oppose to the adult population with known diabetes or hypertension that are monitor prior to end stage condition.

There were very few cases in which preoperative ultrasound were used to better select the vessel appropriate for AV fistula construction. In general it is not mandatory to do an ultrasound before fistula creation and some studies has even pointed out that this strategy may promote the construction of fistula that will fail maturation. We mainly use the clinical assessment with tourniquet with principles guidance to select the type of fistula [19].

Peritoneal dialysis is advocate as a solution to building AV fistula and certain studies says that it may be more compatible with other activity as schooling. It is not offer in our centers yet and it has its own drawback as infectious risk, past abdominal surgery in which it can be contraindicated [5,20].

We registered only two complications types but in a larger cohort, many other complications recognize may arise as bleeding, thrombosis, skin ischemia, carpal tunnel syndrome, steal syndrome [5].

Conclusion

The vascular access by AV fistula since his development has provide relief to the patients with ESKD. Their construction in pediatric group has to take in consideration the constraint of small size, the duration of the use and our poor social conditions. The use of microsurgical equipment improve the success rate of the surgery in achieving maturation. In practice, many such patient in our environment faces many social challenges that render any school program with family life conflicting. The development of a transplantation program is on the way like in the general hospital of Yaounde and will broaden the possibilities of successful care in this group.

Limitations

This study was limited by low case load in the two centers but that is due to the pediatric group targeted. This is to us the main justification of this retrospective study that may shed light on the routine management of this restricted number of patients.

Competing Interest

The authors declare no competing interests.

Author's Contribution

Study design: Marc Leroy Guifo ; Data collection and manuscript writing: Martial Dongmo Tiazok, Marc Leroy Guifo ; data collection: Nono Tamto Eric Aristde, Sylvia Santerre Vanessa, Francois Jerome Folefack Kaze, Victorine Nzana, Francois Tchokouaha Nguegoue . All the authors read, correct and approve the final version of the manuscript.

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