

# Initial Five years of Arterio-Venous Fistula creation for Haemodialysis vascular access in Maiduguri, Nigeria

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## Abstract

**Background:** Arterio-Venous Fistula (AVF) is the preferred method of vascular access for long-term maintenance haemodialysis in patients with kidney failure. The aim of this study was to assess our experience and outcome of native AVF that were constructed in our center in the initial 5 years of commencing the operation in the Kidney Center, University of Maiduguri Teaching Hospital, Nigeria.

**Method:** We maintained a record of all the arteriovenous fistulae operations for the period January 2002 to December 2006. From the medical and operation records of the consecutive patients who had AVF placements in the initial 5 years, we analyzed the demographic characteristics, fistula types, complications and duration of use.

**Results:** Thirty-six AVF operations were carried out on 32 patients who were made up of 22 males and 10 females. The ages of the patients ranged between 16 and 74 years with a mean 39.8 years for the study group. All the patients had their operations on the left upper limb with a total of 32 operations situated at the wrist (radiocephalic) while 4 were at the elbow (brachiocephalic). Three patients had primary fistula failure while 2 had reactionary haemorrhage that required reversal of the fistula.

**Conclusions:** From our experience, the construction of native AVF for haemodialysis is both safe and cost effective. Arteriovenous fistulas last for long periods with a few manageable complications and as such we strongly recommend their placements for maintenance haemodialysis instead of the more frequently used catheters in many developing countries.

## INTRODUCTION

Arterio-Venous Fistula (AVF) is the preferred method of vascular access for maintenance haemodialysis of chronic kidney failure patients as has been recommended by the United States based National Kidney Foundation guidelines (1). Maturation of the native AVF for use as vascular access requires a minimum of three weeks after creation. The demand for an AVF creation is on the increase because of increasing number of patients with ESRD in this environment (2). It is perhaps surprising that despite advances made in the development of graft materials and indwelling silastic catheters, the Cimino- Brescia radio cephalic fistula first described in 1966 continues to be regarded as the ideal form of access. When compared with arteriovenous grafts, AVFs have superior patency rates, low incidence and ease of managing infectious complications, and decreased incidence of other complications such as

thrombosis (3). Native AVF creation requires careful planning, timing, selection of operative site, and meticulous surgical technique and as a result late referral and dearth of adequately trained and skilled manpower militate against its widespread use. Increasing fistula prevalence in the dialysis population requires not only increasing fistula placements but also improving the maturation of new ones maintaining long-term patency of the functional fistulas (4). This study is designed to assess our experience and outcome of native AVF creation for ESRD patients in the first five years of haemodialysis at our Kidney Center.

## METHOD

### SETTING

The study was done in the University of Maiduguri Teaching Hospital Maiduguri which at the time of the study was the sole provider of dialysis treatment in the Northeast zone of

Nigeria. Our center commenced treating patients with haemodialysis in 1999 and prior to that date kidney failure implied certain death except for a few who could afford to undertake expensive referrals to other parts of Nigeria, Europe or the Middle East. The construction of the arteriovenous fistula was carried out by 2 surgeons who picked up the skills at various clinical attachments locally and in Europe.

## DESIGN

We undertook the retrospective analysis of the medical records of all the chronic kidney failure patients who had native AVF creation in our Kidney center for the period January 2002 to December 2006. The aim of the study was to assess our experience in in-center placement of AVF for haemodialysis in Maiduguri. With the use of descriptive statistics we analyzed the demographic variables, types of fistula, complications, duration of function and the outcome of the placement.

## PATIENT SELECTION FOR ARTERIOVENOUS FISTULA CONSTRUCTION

Only a small fraction of the patients that were treated with haemodialysis in our center could get AVF placement before or after the commencement of haemodialysis. Late presentation for renal care clearly militates against starting haemodialysis with a functional AVF. The inability of an individual patient to mobilize resources for the construction of the AVF is probably a dominant factor in determining who gets AVF placement. We excluded an additional four patients whose fistulas were placed elsewhere before their presentation to our unit.

## STATISTICAL ANALYSIS

The study findings were presented as means and percentages. We compared groups with the use of Chi-square test and reported as significant p-values <0.05

## RESULTS

### DEMOGRAPHIC CHARACTERISTICS

This study described the 36 AV placements which were done on 32 consecutive End Stage Renal Disease patients who had native AVF at the University of Maiduguri Teaching Hospital Kidney Center between January, 2002 and December 2006. There were 22 males and 10 females in the group with a male to female ratio of approximately 2:1. The ages of the patients ranged between 16 and 74 years with a mean age of  $39.8 \pm 14.1$  years. Eighty nine percent of

the study population was below 60 years (Table 1).

**Figure 1**

Table 1: Age distribution of 32 patients with AVF

Age groups (years)	Frequency
10 – 19	3
20 – 29	5
30 – 39	7
40 – 49	6
50 – 59	7
60 – 69	3
> 70	1

## OUTCOMES OF AVF PLACEMENTS

All of the 32 patients started haemodialysis with venous catheters as their vascular access before the creation of the native AVF. Approximately 90% had Brescia- cimino fistula in the left forearm while 10% had it in the antecubital fossa (Table 2). Three (9%) of the patients had primary failure of the AVFs situated at the wrist. While one had a revision of the radiocephalic AVF, all of those that had primary failure at the wrist had a second AVF placement at the elbow. Twelve patients (33.3%) used their fistulas for less than one year. Mortality among the dialysis population accounted for the majority (9 out of 12) of the drop out in the first year while transfer of patients to kidney transplant programs accounted for the remainder.

**Figure 2**

Table 2: Types of AVF created in 36 placements

Types of AVF creation	No. of patients (%)
Distal radio cephalic AVF (Cimino-Brescia)	32 (88.9)
Antecubital fossa AVF	4 (11.1)

Fourteen patients (39%) had functional AVF for between one and three years, while 10 (26%) patients had functional AVFs for more than three years. Two patients had reactionary haemorrhage that required reversal of the fistula

while pseudo-aneurysms developed in three patients (Table 3).

**Figure 3**

Table 3: Duration and outcome of 36 placements

Duration of AVF	Number of placements	Failure of AVF	Complications
< 1month	2	3	2
> 1 month to 1year	10	1	-
>1 year to 3 years	14	-	-
> 3 years	10	-	3

## CO-MORBIDITIES AND UNDERLYING CAUSES OF KIDNEY FAILURE

On the basis of clinical assessment, hypertension was the cause of the kidney failure in eight patients while 12 patients had glomerulonephritis. Familial nephritis was the underlying aetiology in two siblings but the cause of the kidney failure was uncertain in 10 patients (Table 4).

**Figure 4**

Table 4: Underlying cause of kidney failure in the AVF patients

Cause	Number
Hypertension	8
Glomerulonephritis	12
Familial nephritis	2
Unknown	10

## DISCUSSION

Arteriovenous fistula is the recommended form of permanent vascular access for long-term maintenance haemodialysis in patients with end stage renal disease (ESRD). Moreover the use of AVFs has played a central role in maintaining the health and quality of life of these patients especially when they have a functional fistula at the initiation of chronic haemodialysis (3). Within the initial five year period of commencement of the creation of AVF in our center, a total of 336 patients with ESRD were started on haemodialysis of whom 32 (9.5%) had AVF placements. The K/DOQI guidelines recommend that AVF should be

constructed in at least 50% of all new kidney failure starting renal replacement therapy with haemodialysis and a prevalence rate of AVF use of 40% (6).

International and regional differences exist in the rate of placement of AVFs. In the US the prevalence rate of AVF placement in new patients was reported to be as low as 15% in the Southeast US and as high as 77% in New England (7). The fact that only about 10% of the patient population presenting to center had AVF placement can be explained by few number of skilled and committed surgeons and the inability of the patients to mobilize the necessary resources for the operations. Late referral for treatment is probably the most important reason for the low rate of AVF placements (2).

In our center the majority of these patients usually come late to the nephrologists and requiring dialysis within days and a few weeks for which they are often started on venous catheters. Late referral for renal care does not allow for the several weeks that are necessary for the maturation of the newly created AVFs and as a result an unacceptably high rate of inadequately prepared patients commencing dialysis (1, 2, 8). Center preferences do influence the relative frequencies of use of the different types of vascular access. In the US based Dialysis Outcome and Practice Patterns Study (DOPPS) the placement of arteriovenous grafts (AVG) was the main alternative to use of AVFs (9). Our study showed a marked tendency towards the use of catheters by the majority of the patients though this trend appears to shift in favour of AVFs in recent times as the fistula culture gathers momentum in our center and the fact that there is a higher morbidity associated with catheter vascular access (10).

Although the DOQI guideline was silent on the primary access failure of AVFs our study showed a high success rate of AVF placement which may be due to the relatively young dialysis population in our center. Whereas the mean age of haemodialysis patients in Europe and the US is about 60 years that of our patients was less than 40 years (4). Moreover there is still a low prevalence of diabetes in our study population with hypertension and glomerulonephritis are the underlying morbidity when compared to the US (11). There are various types of arteriovenous fistulae but the distal radio-cephalic (Cimino Brescia) fistula is considered the gold standard vascular access for haemodialysis treatment (12). Early referral to the nephrologists will enable the patients to have correct placement and adequate

maturation of an AVF before the initiation of haemodialysis. All of our patients were initiated on femoral catheter haemodialysis before the creation of the fistula and was observed by Cheesser et al. (13) that late presentation or referral is associated by increased need for temporary access for first dialysis.

Inadequate management of patients with chronic renal failure before developing ESRD could be one of the causes of high rate of morbidity and mortality seen in patients on renal replacement therapy (13). There are evidences that late referral of patients with chronic renal failure to a nephrologists not only increases the morbidity and mortality rates but also consumes considerable healthcare resources(14,15,16,17,18). In Europe and the United states late referral was estimated to be 20% and 57% respectively and that has a serious detrimental effect on health of the patients with ESRD and in addition total direct and indirect cost is unacceptably high compared to early referral with adequate predialysis renal support (19,20). There are indications that the practice of starting haemodialysis treatment with fistula results in a better fistula outcome when compared to patients who initiate dialysis using catheters (19).

The cost of native arteriovenous fistula creation in our center is 15 thousand naira (\$107) is equivalent to the cost of replacing 15 femoral catheters which even with re-use will be consumed in a few months time. Consequently AVF placement is far more cost effective than catheter use even in our center where poverty is often cited as the reason for not having an AVF. Similar conclusions on the cost effectiveness of AVF placements have been reported elsewhere were obtained in other studies (15, 16). In this study there was a good long term functional AVF rate despite late referral and its attendant complications as a result of the fact that our patients were young and had good quality vessels. Arteriovenous grafts for haemodialysis was not in use in our center during the study period. However successful long-term management of ESRD patients frequently means that the patient may outlive several arteriovenous fistulas and at that late stage, the placement of vascular grafts will be the second best alternative (9, 21).

## CONCLUSION

The placement of native AVF for haemodialysis in patients with ESRD is both feasible and cost effective even in resource poor countries like Nigeria. Arteriovenous fistula has the advantage of longevity and it is associated with

fewer complications when compared to venous catheters. The DOQI recommendations for vascular access can be attained even in developing countries if concerted efforts are made by all the stakeholders in renal care.

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