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Outcomes of arteriovenous fistula surgery at KIMS: A tertiary level hospital

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Abstract

Aim: Arteriovenous fistula (AVF) is the preferred access for haemodialysis in patients with chronic renal disease. This study aimed to report the outcomes and common complications of AVF.

Methodology: A prospective, study was conducted on 60 patients on haemodialysis in Department of Surgery KIMS Hubballi, from January-December 2016. The failure rates, complications and outcome were assessed in this study.

Results: Total of 60 AVF fistulae were created. It was radiocephalic in 50 cases and brachial fistula in 10 cases all of which were constructed in an end-side fashion. AVF maturation was seen in n=49 (81.67%) with majority occurring in the first 6 weeks with a failure rate of 18.33% (n=11) who were excluded from the further follow up. Complications developed in 42.86% (n=21) of patients which were managed appropriately.

Conclusion: It is necessary to consider the complications when planning AVF placement and to have a multidisciplinary approach for a better outcome.

Keywords: Arteriovenous fistula (AVF), haemodialysis, brescia-cimino fistula

Introduction

Native arterio-venous fistula (AVF) is considered as the gold standard of vascular access (VA) for HD as it is associated with less infection and offers good dialysis adequacy. Therefore, the creation of an AVF in patients with ESRD remains one of the good practice measures, as recommended by the National Kidney Foundation, New York, NY, in Dialysis Outcomes Quality Initiative DOQI guidelines [1].

A large group of patients who suffer from both acute and chronic renal failure require HD.

In patients with ESRD, haemoaccess by means of an AVF is the most appropriate, because frequent access to the vascular system with a high-flow and the ability to withstand needle puncture are required. The most frequently used fistula and the standard one, by which all other fistulas are compared, is the Brescia-Cimino fistula [2, 3].

Both physicians and patients encounter frequent problems with AVF. The Brescia-Cimino fistula is usually considered as the standard HD access of choice because of its high patency and low complication rate with preservation of alternate access sites in future. Even though this is a simple procedure, it requires well-experienced surgeons and ensuring an adequate collateral flow from the ulnar artery by performing Allen's test before surgery in order to minimize the problem of hand ischemia. In addition, evaluating superficial veins and distal arteries must be done for selecting the best site for fistula. Even then, the two most common reasons for failure of AVF are the surgeon's inexperience and improperly selected vessel for creating AVF [4].

In this study, we review our experience of creating AVF and to analyze the patency rate and the various complications associated with the procedure.

Patients and Methods

In this prospective, randomized, hospital-based study, we analyzed 60 patients who attended KIMS Hospital for Renal Diseases since January to December 2016. All were patients of ESRD or chronic kidney disease (CKD).

All were candidates for HD, and those who consented to take part in the study were recruited. Individual data such as age, sex, residence, occupation, cardiovascular risk factors (arteriosclerosis, diabetes and hypertension), type of dialysis before creation of vascular access, total duration on dialysis, arm used, different sites of AVF creation, state of function after creation of AVF, their respective date of maturation and surgical complications were recorded for all patients.

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Pre-operative clinical assessment was done in all patients and appropriate pre-operative investigations was done such as complete blood count, blood urea, serum creatinine, electrolytes (Na⁺, K⁺), coagulation profile (PT, PTT and INR), human immuno-deficiency virus, serology for hepatitis B surface antigen and hepatitis C, antibody and blood grouping. Allen's test was also performed and the best site for fistula creation was chosen.

Any patient with sepsis, acquired immunodeficiency syndrome, hepatitis C virus or hepatitis B virus, small or deformed limb, uremic-associated bleeding tendency and negative Allen's test were excluded from the study.

Radio-cephalic fistula was performed whenever the cephalic vein was in good condition; otherwise, a fistula at the elbow was created. All procedures were performed by a single surgeon successfully. Post-operatively, all patients were evaluated on the day 1, at the end of first week and after the fourth week for ensuring the fistula patency and performance of HD. After ensuring the patency of fistula and obtaining the thrill, the patient was discharged. During the follow-up, the patency of the fistula was assessed either by palpation for a thrill or auscultation for a bruit.

Complications such as hematoma and subcutaneous thrombosis associated with fistula and blood pressure during HD were assessed by using color Doppler ultrasonography and were recorded.

Parameters were expressed in percentage or mean \pm SD. Comparison between qualitative variables were made using the chi-square test. A p-value <0.05 was considered significant.

Results

Sixty fistulae were created in our study subjects, which included 42 men (70%) and 18 (30%) women. The mean age of patients in the present study was 42.6 years (range from 16 to 65 years) as shown in the table and chart below.

Table 1: Sex wise age distribution of study patients.

Age(years)	Male	Female	Total
10-19	2	0	2
20-29	8	3	11
30-39	4	3	7
40-49	10	5	15
50-59	10	4	14
>60	8	2	10

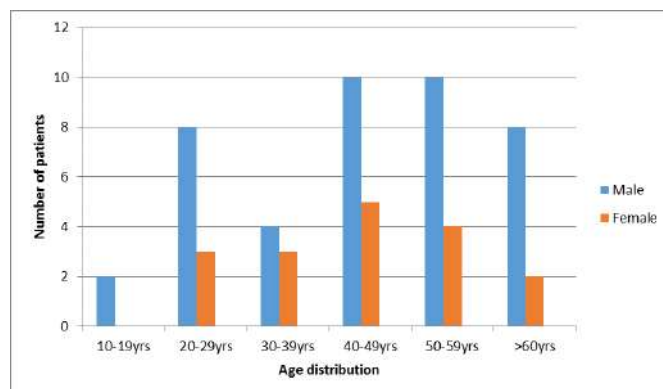


Fig 1: Bar graph showing age distribution of patients

All subjects had been dialyzed with jugular catheter before creation of AVF. A native AVF was created in all our patients as the first permanent access. It was radiocephalic (Cimino-Brescia fistula) in 83.3% (n=50) and at cubital fossa (brachial fistula) in 16.6% (n=10). All AVFs were end-to side, and the condition of its function after operation varied, with 80% (n=48) functioning immediately, 1.67% (n=1) had delayed functioning and 18.3% (n=11) did not function at all and were not considered for the further follow up as shown in the table 2.

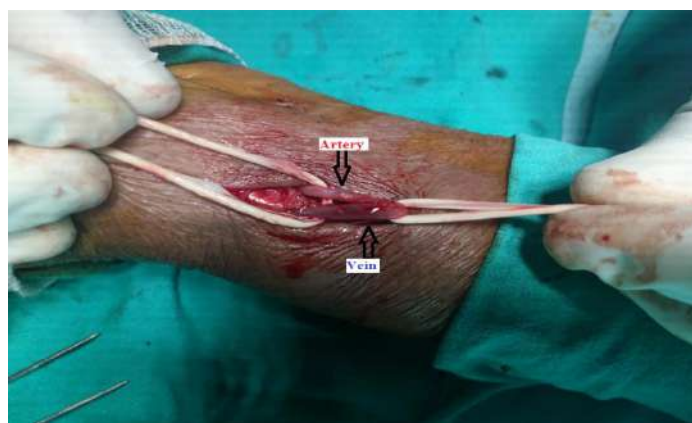


Fig 2: Intra-operative photograph demonstrating artery and vein at forearm.

AVF maturation was seen in 81.63% (n=40) of the cases within the first six weeks, 15% (n=9) in more than six weeks. Failure rate was 18.3% (n=11) who were not considered for further follow up.

Table 2: Maturation and State of AVF in the study

State of AVF	Total	Time needed for maturation		None
		<6weeks	>6weeks	
Immediate functioning	48(80%)	40	8	0
Delayed functioning	1(1.6%)	0	1	0
Non functioning	11(18.3%)	0	0	11

In this study, 42.86% (n=21) developed complications. The most common early complication encountered with the primary AVF was infection seen in 18.33% (n=5) of the cases, while the most common late complication was neuropathy in 18.33% of the cases and is depicted in the following table and pie chart.

Treatment of these complications consisted of surgical intervention for aneurysm, conservative management in the form of antibiotics for infections and compression in case of bleeding.

Table 3: List of Complications

Early complications	No of cases
Infection	5(18.33%)
Thrombosis	3(6.12%)
Bleeding/Haematoma	4(8.16%)
Seroma	2(4.08%)
Late complication	
Neuropathy	5(18.33%)
Pseudoaneurysm	2(4.08%)
Total	21



Fig 3: Photograph of pseudoaneurysm

Discussion

With increasing number of patients undergoing HD due to increase in both the number of patients as well as HD centers, establishing and maintaining a proper vascular access is necessary for successfully performing HD and a well-functioning AVF is essential for the maintenance of HD in patients with ESRD.

The aim of the present study was to review our experience of creating AVF and to assess its success rate and for common complications associated with same.

The native AVF is the optimal VA in HD [5, 6]. It was created in all advanced CKD and ESRD patients, with radio-cephalic (Cimino-Brescia) fistula being the most common in 50 cases (83.3%). This was in accordance with the international recommendations (K-DOQI guide-lines) [1].

Time to first use for AVFs is one of the most important variable for clinical outcome. If the time to maturation was known, nephrologists can plan the ideal time for referring patients for HD access surgery. If a patient undergoes AVF creation before starting HD, the AVF may mature before its first use for HD.

In our study, all patients were referred for vascular access (CVC) after starting HD. This percentage is high compared with the percentage reported in Australian and USA patients (28% and 79%, respectively) [7, 8] and this is due to the late referral of our patients to the nephrologists.

Upper limb AVFs are commonly performed for dialysis in ESRD cases and, especially, distal (radial) fistulas are more preferred because this provides more superficial veins to cannulate and has less complications in comparison with proximal fistula, where greater and comparatively bigger vessels are used [9]. In our study, most of the AVF creations were distal forearm (Brescia-Cimino) in 83.3% (n=50). Our result is quite similar to that reported in Nigeria earlier, i.e. approximately 90% of the patients of HD have Brescia-Cimino fistula [1].

In our study, the condition of the AVF after operation varies, but most of them functioned immediately, 80% (n=48), and the immediate failure rate in our group was 20% (n=12) correlate with the literature data, which varies from 10 to 30% [10, 11]. Maturation is defined as successful cannulation for at least one complete HD session [12]. The National Kidney Foundation Dialysis Outcomes Quality Initiative (DOQI) recommends that fistula should mature for at least one month before cannulation [1].

The overall maturation rate was found to be 81.67% (n=49) compared favorably with published results for all types of native AVFs, both in the upper and in the lower arm.

Complications are well-known with any type of HD procedure. In the present study, 42.86% (n=21) had a complication interfering with the function of their upper arm AVF. Such complications are usually not directly life-threatening, and can often be overcome with appropriate management. Most re-interventions took place before first use, indicating that once matured, upper arm AVFs tended to remain functional.

Results of this study indicate that the practice of AVF in KIMS was found to be sound and comparable to the learning curve as reported in the literature. Early diagnosis of CKD allows creation of native AVF before ESRD sets in and, consequently, use of a temporary catheter can be avoided. Regular monitoring of the VA and a close working relationship between the nephrologists, surgeon, interventional radiologists and nurses can ensure prolonged survival of primary AVF and better treatment of its complications.

Conclusion

It is necessary to have a multidisciplinary approach for a better outcome of AVF and also important to consider the complications when planning AVF placement.

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