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# VASCULAR ACCESS FOR HEMODIALYSIS PERSONAL EXPERIENCE AND REVIEW

**Safaaldeen Ahmed**

D.M, CABM, Lecturer, Department of Medicine, University of Basrah College of Medicine, Basrah; IRAQ.

## Summary

In Basrah dialysis unit, in the period from January 1993 to Jun 1997, 35 patients (27 males, 8 females) aged 17-60 years, had 40 arterio-venous fistula(AV) creation. Sixty-nine patients (44 males, 25 females), aged 16-70 years, had 82 AV shunt operations. All these operations done as vascular access for hemodialysis in acute or chronic renal failure patients. AV shunt was found non-durable access with high rate of complications like thrombosis and infection. AV fistula was found an ideal long lasting access for maintenance hemodialysis with few non-disabling complications.

## Introduction

Long-term hemodialysis remains the most important support for patients with end-stage renal disease, and a reliable vascular access is an essential component of this management plan[1]. When the first really practical artificial kidney developed by W.J. Kolff in 1943 hemodialysis was at first limited to treatment of acute renal failure and some acute intoxications, because each treatment on an artificial kidney initially required a separate arterial and venous canulation for each dialysis. Repeated hemodialysis was therefore not possible because of the limited number of sites available for arterial and venous canulation[2].

**Correspondence to:**
Dr. Safaaldeen Ahmed, Department of Medicine, University of Basrah College of Medicine, Basrah; IRAQ.

Treatment of chronic renal failure patients by dialysis was made possible by the introduction of arterio-venous (AV) shunt by Quinton, Dillard and Scribner in 1960. Since then interesting number of maintenance hemodialysis centers have been formed. A more conventional technical advances has been made by the introduction of Cimino-Brescia fistula described by Berscia et al. in 1966[2]. Several alternative vascular access modalities have been introduced including permanent catheter and interposition graft fistula[3,4,5,12], but radial arteriovenous fistula continue to present the optimal access modality[6], and native cephalic vein remains the superior dialysis conduit even thirty years after it was first described[7]. Vascular access complication remain a leading cause of morbidity and hospitalization in patients on chronic hemodialysis[8]. Black race, older age,

female sex and diabetes mellitus as a cause of kidney failure, were all independent risk factors for access-related morbidity[9]. Despite all the progress made in the last thirty years circulatory remain the most troublesome part of the hemodialysis system. Not only is malformation of the access a major cause of problem during dialysis, but also failure of an access and its repair or replacement is a major cause of morbidity for these patients. In addition, since many of the patients may have a normal life expectancy, the problem of maintaining life long circulatory access now looms very large. Finally, problems with access may result in re-circulation during dialysis that, if ignored, can cause serious underdialysis[10].

## Patients and Methods

In the dialysis unit in Basrah General Hospital, which is the only dialysis unit in Basrah, in the period between January 1993 and June 1997, 82 AV shunt to 69 patients (44 males and 25 females), aged 15-70 years (mean 39.7 years) were done. Thirteen patients of them needed two operations.

At the same, 40 AV fistula to 35 patients (27 males, 8 females) aged (7-60) years, (mean 39.6 years) were done. Five patients needed two operations.

AV shunt was indicated in patients with acute renal failure and in chronic renal failure patients when fistula is not yet available. The patient age was not a limiting factor and even patients with malignancy or systemic medical illnesses were accepted if surgery or curative therapy were planned.

| | AV Shunts | AV Fistulae |
|---|---|---|
| Operations no. | 82 | 40 |
| Patients no. | 69 | 35 |
| Males | 44 | 27 |
| females | 25 | 8 |

Table I. Patients and Operations

AV fistula done for patients with end-stage renal disease, less than 60 years old, who had no malignancy or active chronic infection or severe cardio-pulmonary disease.

For AV shunt we used the ankle vessels and local anaesthesia in all patients. Prosterior tibial artery and the great saphenous vein were exposed and in each vessel a silastic rubber tube with a Teflon tip was inserted. These tubes then connected by a rubber connector when the shunt is not in use[11,12,13].

AV fistula creation was done in the upper limbs in all patients, under local anaesthesia using (1-2% lidocaine). Radial artery anastomosis to the cephalic vein in the wrist was done in 12 operations (30%), and in the snuff-box in 3 operations (7.5%). Brachial artery anastomosis to a nearby vein in the anticubital fossa was done in twenty-five operations (62.5%). The anastomosis was usually done side-side in 36 operations (90%), and rarely end-side in four operations (10%). AV fistula needed 15-35 days to ripen and become ready for hemodialysis[11,12,13].

## Results

Sixty-nine patients had 82 Scribner shunts, 5 patients had acute renal failure and 64 patients had chronic renal failure. Thirteen patients needed a second shunt, two of them due to immediate failure or within few days. The other eleven shunts repeated after 2 weeks – 3 months due to primary shunt dysfunction. The average utilization period was about 30 days.

Complications of AV shunt (Table II) included wound infection (28 shunt, 34%); thrombosis (16 shunt, 19.5%); bleeding (6 shunts, 7.3%); sloughing and slipped cannula (3 shunts, 3.65%) and distal limb ischemia (one shunt, 1.2%).

Thirty-five patients had 40 fistulas, five of them (12.5%) failed because of small or sclerosed vessels or due to thrombosis at the time of operation or shortly after it

(3 fistulas, 7.5%). Fistula utilization period could not be determined because of the short observation time.

| Complications | No. | % |
|---|---|---|
| Infection | 28 | 34.14 |
| Thrombosis | 16 | 19.51 |
| Bleeding | 6 | 7.31 |
| Slipped cannula | 3 | 3.65 |
| Limb ischemia | 1 | 1.21 |

Table 2. Complications of Scribner shunt

Complications of Av fistula (Table III) included, aneurysm (5 fistula, 12.5%); forearm swelling (3 fistula, 7.5%); thrombosis (3 fistula, 7.5%); infection of fistula wound (one fistula, 2.5%); rupture and haemorrahge (one fistula, 2.5%); steal syndrome and hand ischemia (one fistula, 2.5%) that developed in a patient with heart failure; followed by baccternia and death and failure (one patient, 2.5%).

| Complication | No. | % |
|---|---|---|
| 1- Anerurysm | 5 | 12.5 |
| 2- Arm swelling | 3 | 7.5 |
| 3- Thrombosis | 3 | 7.5 |
| 4- Infection | 1 | 2.5 |
| 5- Rupture and hemorrhage | 1 | 2.5 |
| 6- Steal syndrome | 1 | 2.5 |
| 7- Heart failure | 1 | 2.5 |

Table III. Complication of AV fistulae

## Discussion

Permanent vascular access is a vital prerequisite for the management of patients with chronic renal failure (CRF) and it is important to arrange for it early in the disease.

Kaufinant JL (1997) had indicated that in Massachusetts, autogenous fistulas now account for fewer than 10% of newly created access sites because, unfortunately, the majority of patients now entering hemodialysis are not candidates for autogenous access, largely because cannulation for previous medical treatments has led to irreversible scarring of either the vein or artery. In addition many of the elderly or diabetic patients entering dialysis have significant calcifications of the forearm arteries that does not allow dilatation to accommodate the increased flow volumes that an effective fistula must deliver[16].

Although we have better results, but for the same reasons 12.5% of our fistulas were unsuccessful and 62.5% were created in the anticubital fossa rather than in the more preferred distal site.

Scantone et al (1992) had thrombosis in 11 from 79 fistulas (13.9%)[14]. Fan PY (1992) also found that thrombosis and infection are the most common complications of AV fistula[15].

We found aneurysmal dilatation as the most common complication of fistula (12.5%), and disfiguring vascular cords may reach up to the shoulder, but this, so as arm swelling, had not affected dialysis efficiency. Thrombosis has happened in 3 fistulas (7.5%). Infection was not common in our fistulas (2.5%), probably because we do not use prosthetic grafts.

This study has also shown Scribner shunt as inappropriate, destructive and non-durable vascular access, with a high rate of complication.

Infection and thrombosis were the most common complications of AV shunt, 34.14% and 19.51% respectively. By reviewing the literature we found no mention of Scribner shunt in the 1990s while there is increasing use of single lumen catheter in the femoral or jugular arteries.

Legendre C et al (1994) found that 60% of medical tams favour femoral access with single lumen catheter for acute renal failure and 45% favour internal jugular access for emergency treatment of chronic renal failure[5].

Kaufman JL (1997) had made it more clear and said that the external Scribner shunt has been largely abandoned because its use is destructive to the

native circulation, it has a high thrombosis and infection rate, and it is inconvenent[16].

## Recommendation

Vascular access strategy should be planned as early as possible in the management of patients with CRF, and these patients should be referred early to nephrologists for better management.

Central venous catheters should be used increasingly instead of Scribner shunt for dialysing patients with acute renal failure and patients with CRF when AV fistula is not yet available.

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