VASCULAR ACCESS FOR HAEMODIALYSIS

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ABSTRACT

Objective: The aim of this study was to report our results of vascular access surgery and the factors affecting the outcome.

Study Design: Descriptive study with prospective data.

Place and Duration of Study: This study was carried out at the Combined Military Hospital Rawalpindi, the Military Hospital Rawalpindi and the Armed Forces Institute of Urology form January 1997 to July 2000.

Patients and Methods: Patients with end stage renal disease needing chronic haemodialysis were included in the study. The operative technique used was relatively standard. The fistula initially sited was distal in the arm for as long as possible and in an easily accessible position. Patients who received renal transplant, discontinued dialysis with a functioning shunt and patients who died were excluded form the study.

Results: The primary cumulative at one year patency Cimino AV fistula, elbow AV fistula and graft AV fistula is 66%, 70% and 37% respectively. Diabetic patients had much lower patency than non- diabetics.

Conclusion: A distal autogenous radio-cephalic fistula should be the first choice in patients requiring chronic haemodialysis. The elbow arterio-venous fistula should he the second choice before planning a prosthetic graft.

Keywords: End stage renal disease, chronic haemodialysis, arteriovenous fistula.

INTRODUCTION

Improvements in dialysis techniques and associated medical care have resulted in the expansion of dialysis programmes in response to the increased number and greater longevity of patients suffering from (ESRD) End Stage Renal Disease. Patient acceptability and pressures on surgical resources demand a reliable means of vascular access. Maintaining patent vascular access is a major problem especially. In an ageing haemodialysis population with limited vascular access sites [1,2]. Despite the increasing number of patients with diabetes, peripheral vascular disease and of older age, creation of a native AV fistula is possible in the vast majority of cases [3].

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The objective of our study was to describe the results of vascular access surgery and the factors affecting the outcome.

PATIENTS AND METHODS

This descriptive study was carried out in surgical unit III of Combined Military Hospital Rawalpindi who had been enrolled in the programme for chronic haemodialysis in the dialysis department at Military Hospital Rawalpindi and Armed Forces Institute of Urology form January 1997 to July 2000. The above are 650 bedded teaching hospitals to Army Medical College and Armed Forces Postgraduate Medical Institute. They not only receive patients from Rawalpindi and surroundings but are also the tertiary referral centers of the Armed Forces of Pakistan. Hence they also receive patients referred from the military hospitals and civil hospitals from all over the country. Majority

of the patients are either serving soldiers or retired personnel, their parents, spouses and children. The use of a particular technique or graft material was independent of patient age or presence of diabetes mellitus. All vascular access procedures were performed by one surgeon either primarily or assisting a surgical resident. The operative techniques used and the strategy of placement (distal in the upper limb for as long as possible and in an easily accessible position for the patients) were relatively standard. Generally Radio--cephalic fistula at the wrist and the elbow arteriovenous fistula were created under local anaesthesia. General anaesthesia was used for more complex procedures at more proximal locations. The non -dominant upper extremity was used preferentially. The lower extremities were not used because of the effects of peripheral vascular disease, increased chances of infection and patient in convenience. Patency was defined as confirmed blood flow with sufficient function of the vascular access. Cumulative primary patency is the percentage of shunts that were functioning (without salvage intervention) of the total number of shunts at risk at anyone time. Cumulative secondary patency is the percentage of shunts that were functioning (with all salvage interventions included) of the total number of shunts at risk at anyone time. Primary survival is the time between construction of a vascular access and its first failure. Secondary survival is the time between construction of a vascular access and its ultimate failure, all interim interventions included. A wrist radio-cephalic fistula was the access of first choice. All those accesses constructed when the first choice access was impossible were called the second choice accesses. These included the proximal autogenous AV fistulae and the graft AV fistulae.

Renal transplantation, death and discontinuing dialysis with a functioning shunt implied that the patients were censored that is, they were regarded as no longer at risk and so they were excluded from the study from that date.

RESULTS

Three hundred seven arterio-venous fistulae were performed on 224 patients. There were 139 men and 85 women aged 16 to 68 years (mean=47 years). The aetiology of ESRD in the population studied (table-1). Over a period of two and a half years 170 first AV fistulas and grafts and 137 subsequent ones were created in 224 patients. A total of 203 autogenous Cimino-Brescia AV fistulas at the wrist were constructed, 172 end to side and 31 side-to-side. There were 94, elbow arteriovenous fistulas, among thcm 82 were anastomoses between Brachial artery and the Cephalic vein or the elbow perforating vein and 12 were anastomoses between Brachial artery and superfieialized Basilic vein. There were 11 graft Av fistulae; among them 2 were saphenous vein AV fistulae, 7 were PTFE AV fistulae, and 2 was diastat (expanded PTE base graft) AV fistulae.

The cumulative patency rates 203 autogenous Cimino-Brescia AV fistulae and for all other grafts and fistulae are presented (table-2) and (fig. 1-3). The primary rates in diabetic patients were much lowers than in non-diabetics. Complications that required interventions are listed (table-3).

DISCUSSION

The number of patients with ESRD maintained on chronic haemodialysis is on the increase. The quality of dialytic care has improved and more persons at high risk are being included. The initial assessment of the ESRD patient is the most appropriate time to formulate a tentative plan for immediate and long-term vascular access. Initial appropriate decisions concerning the technique for dialysis will invariably prevent time-consuming emergency access revisions. Vascular access for chronic renal failure should be done in anticipation of future long-term haemodialysis requirements.

Ideal management is the placement of the forearm Radio-cephalic AV fistula under local infiltration anesthesia. The advantages of the Radio-cephalic fistula include the

convenience of site for catheter insertion, and its relatively long and straight course over the straight forearm.

Relative disadvantages include a small sized vein, a diseased artery and inability to see the vein in obese. The experience with the Cimino fistula is similar to that reported by others in that it shows a high early failure rate. Once established and functional the late failure is uncommon and mostly results from thrombosis. Prischl and colleagues demonstrated highly variable outcomes for Radio-cephalic fistulae created by different surgeons [4]. Our preference is the end to side Radio-cephalic fistula because of the complication of venous hypertension associated with the side-to-side anastomosis.

In our experience the technical reasons for failure include:

- Difficult approximation of the artery and vein resulting in acute angulation and/or rotation.
- Atherosclerosis/calcification of the artery causing elevation of an' intimal flap resulting in difficulty in constructing the anastomosis.
- A thrombosed vein segment proximally which is unrecognized pre-operatively.
- Poor arterial flow due to lack of distensibility of arterial wall because or occlusive · arterial disease.
- Early use of fistula before the vein is arterialized.

The elbow AV fistula was constructed in the patient in whom the forearm veins were not suitable or after the failure of a distal AV fistula. The patency rates at one and two years were satisfactory. The results were better when other configurations rather than superficialized Basilic vein were used. End-to-side anastomotic configuration was used in all cases. The complication of cardiac failure is very low. Moreover the cardiac failure, venous hypertension and steal syndrome is mainly seen with side-to-side anastomosis. A diagnosis of congestive cardiac failure is often difficult to attribute solely to the high flow through the fistula as these patients frequently have various combinations of diabetes hypertension and ischaemic heart disease. The flow rate measurement is also not reliable as when associated with co-morbid conditions, a low flow rate may be detrimental. We recommend that elbow A V fistula should be performed before attempting to place a prosthetic graft in patients in which it is not possible to construct a Radio-Cephalic fistula. These AV fistulae may serve to avert the complications of graft procedures.

Table-1: Details of 224 patients entered in this study.

Causes of end-stage renal disease	No. of patients (%)
Diabetes mellitus	63 (28.12)
Chronic glomerulonephritis	33 (14.73)
Chronic pyelonephritis	29 (12.95)
Hypertension	25 (11.16)
Chronic interstitial nephritis	20 (8.93)
Obstructive nephropathy	16 (7.14)
Unknown/others	38 (16.96)

Table-2: Cumulative primary patency of Cimino AV fistulae, elbow AV fistulae and graft AV fistulae (%) after one and two years.

Vascular Access	Cumulative patancy (%)	
	1 year	2 years
Cimino AV fistula	66	52
Elbow AV fistula	70	59
Graft AV fistula	37	21
All AV fistula	45	29

Table-3: Complications of vascular access surgery.

Complications	Incidence (%)
Vein/anastomotic stenosis	34.2
Thrombosis	30.8
Venous hypertension	4.6
Bleeding	1.7
Infection	1.2
Steal syndrome	0.8
Aneurysm	0.5

Table-4: Comparison of survival in different studies.

First author	Time (years)		
	1	2	3
Palder (n=99)	60	--	42
Golledge (n=107)	69	56	--
Present study (n=203)	66	52	--

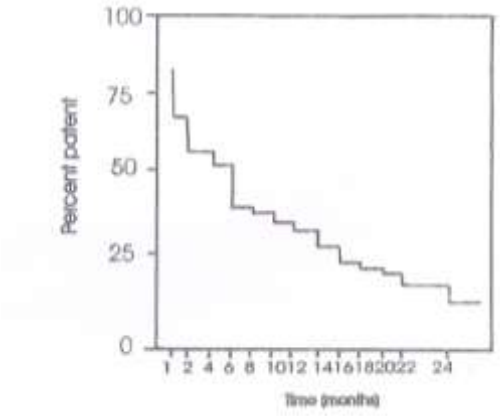
Palder et al [1] colledge [5]

Polytetrafluroethylene (PTFE) appears to be the best tolerated, the most durable and easiest to revise of any synthetic grafts. The patency rate of PTFE was not better than of A V fistulae. This finding is probably influenced by patient selection especially as younger patients and those with less co-morbid conditions were initially considered for Cimino fistula and graft fistula was mostly constricted in the high-complication group. Failure of prosthetic access devised was mostly as a result or thrombosis. Infection of the prosthetic graft was not a common event especially when one considers the frequency of there being punctured. Three of the grafts in our study were infected in one year.

This study also shows that the patency rates of Cimino AV fistulae arc significantly lower in diabetic patients. The diabetic access syndrome begins long before ESRD develops. The arterial inflow is usually inadequate because of atherosclerosis and outflow veins are often scarred by phlebotomies or indwelling catheters. The risk of infection and thrombosis is also increased. The use of an elbow AV fistula or even a graft AV fistula as a primary access in diabetics and prolonged maturation time of 4 or more months may be helpful. Reported results are not easy to compare, but they do give some indication of the figures involved. Even the first choice access, the Radio-cephalic fistula regarded as the best one by every author is not easy to compare. A survey of survival data is offered (table-4). The differences in the patency rates reported in various studies may be related to the patient group, the surgeons or the user of the fistula.

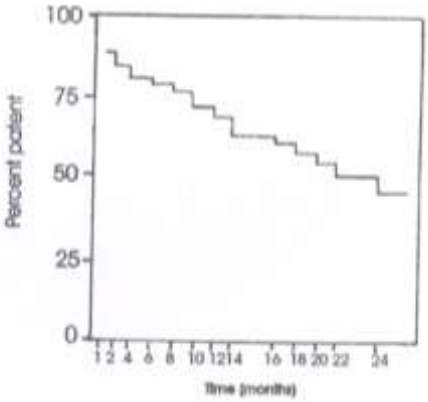
CONCLUSION

The scope and potential of vascular access in chronic renal failure becomes grossly self-evident when one considers the increasing number of patients being treated by long-term maintenance haemodialysis. Thus durability, ease for approach by paramedical assistants, resistance to infection, and potential for revision are basic vascular access goals. We prefer the Radio-cephalic fistula because of its simplicity, lower



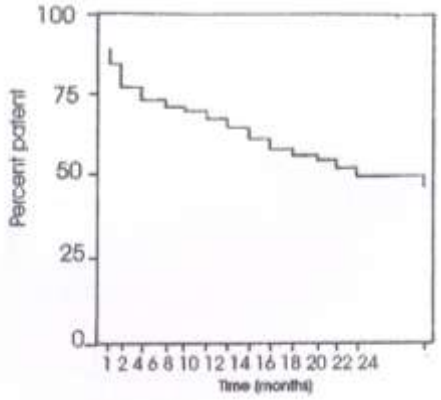
No. at risk	161	147	132	120	115	106	101	93	81	74	68	61	55
Time (months)	1	2	4	6	8	10	12	14	16	18	20	22	24

Fig. 1: Cumulative primary patency of Cimino AV fistulae.



No. at risk	87	80	70	68	62	52	50	47	41	35	33	25	21
Time (months)	1	2	4	6	8	10	12	14	16	18	20	22	24

Fig. 2: Cumulative primary patency of elbow AV fistulae.



No. at risk	10	10	9	9	8	7	7	6	6	5	5	5	4
Time (months)	1	2	4	6	8	10	12	14	16	18	20	22	24

Fig. 3: Cumulative primary patency of graft AV fistulae.

complication rate, and options for revisions. When a wrist fistula is impossible to construct due to poor quality of forearm vessels, constructing a fistula at the wrist is a better option before one places a prosthetic graft. Prosthetic grafts are expensive and have a greater incidence of late complications.

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