

FACTORS RESPONSIBLE FOR FISTULA FAILURE IN HEMODIALYSIS PATIENTS

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ABSTRACT

Introduction: There are multiple factors in failure of Arterio Venous Fistula (AVF) in patients with Chronic Renal Failure (CRF) that require periodic hemodialysis. Out of technical errors, hypotension, site of insertion, size of vessels, diabetes & atherosclerosis are the common causes of failure in AVFs. In this study failure of 100 AVFs in 70 patients was evaluated during four years.

Methods: Seventy five cases of CRF patients who were referred for AVF during January 1996 to December 2000 (1375-1379) were selected and operated upon AVF by a given surgeon with the same technique (end-to-side) and followed for two years regularly. In addition to underlying disease such as diabetes mellitus, atherosclerosis and inappropriate vessels another factors such as hypotension and bleeding of aneurismal vessels were recorded when AVF failed.

Results: Five out of 75 patients were excluded from this study because of impossible insertion of AVF due to severe damage and thrombosis of peripheral vessels. One hundred AVFs were inserted in 70 patients, 53 in snuff box of left hand, 26 in distal of left forearm, 17 cases in left arm and 4 ones in snuff box of right hand. Thirty percent failed primarily (before dialysis) commonly due to drop in blood pressure and among the remaining 70%, 47 patients had functional AVF for at least 20 months and 23 of them 7.5 months functioned for then failed monthly due to hypotension during hemodialysis. (p=0.006)

Conclusion: Hypotension was the cardinal cause of failure of AVFs in CRF patients. We can reduce failure rate of AVFs by monitoring and controlling the blood pressure during hemodialysis and prevent hypotension by salted regimen intake.

KEY WORDS: Arteriovenous fistula, Hemodialysis, Vascular access.

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INTRODUCTION

A large group of patients who suffer from both acute and chronic renal failure may require hemodialysis for filtration of blood from harmful agents such as creatinine. Hemo-access by means of an arteriovenous fistula is appropriate when frequent access to the vascular system, a high-flow system 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.^{1,2} Both physicians and patients encounter frequent problems in AVF implantation. This single procedure requires well experienced surgeons' and ensuring of adequate collateral flow from the ulnar artery by performing Allen test before surgery, in order to minimize the problem of hand ischemia. In addition, evaluating superficial veins and distal arteries must be achieved for selecting the best site for fistula.³ Although, two main reasons for failure of AVF are the surgeons inexperience and improper selected vessels¹⁻³ besides other factors that lead in fistula failure are falling blood pressure, post-operation hemorrhage and vascular injury during operation (due to severe atherosclerosis especially in diabetic

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patients).⁴ As regards importance of AVF implantation in patients with ESRD (end-stage renal disease), in this study we analyze the patency rate of fistula and etiology of failure.

METHODS

In this prospective randomized study, we analyzed 75 patients who attended the Surgery Clinic of Imam-Khomeini General Hospital since January, 1996 to December, 2000. Initially, individual data, age, sex and history of Diabetes Mellitus (DM), vascular disease such as atherosclerosis, vasculitis and hypertension (HTN) were obtained. After recording blood pressure and performing Allen test, the best site for fistula creation was chosen. During operation, vascular diameter, intra-vascular thrombosis, arterial wall atherosclerosis and opening of arterial inflow and venous out flow access were evaluated. If there was no contra indication, an end to side (E-S) arteriovenous fistula was created. If any patient did not meet the mentioned criteria, he would be excluded from the study. All procedures were performed by our team successfully. After ensuring the patency of fistula and obtaining the thrill the patient was discharged. The patient was evaluated on the first day, the first week and after the third week for ensuring the fistula patency and performance of hemodialysis. The fistula complications such as hematoma and subcutaneous thrombosis & blood pressure during hemodialysis were recorded.

RESULTS

Seventy five (75) patients were enrolled for the study. Five patients were excluded because of impossible insertion of AVF due to severe damage and thrombosis of peripheral vessels. One hundred fistula were created in remaining patients, which included of 42 men (60%) and 28 women (40%) their age ranged from 18 to 79 years. In 43 patients (62%) one fistula creation was appropriate, while the second operation was required in 24 patients (34%) and the third fistula was created in the remaining three patients (4%). The reason of repeated fistula creation was the failure of the former fistula. In fifty three cases (53%) the fistula

was created in left snuff box, 26 cases in distal of left forearm in 17 cases the antecubital vein to brachial artery fistula of left arm and (the ulnar artery to the basilic vein) and in remaining 4 cases in right wrist. The minimum patency duration was 20 months in 47 cases. While in 23 cases mean 7.5 months were reported and in 30 cases, an early failure occurred during the first two-three weeks after insertion before hemodialysis. In 22 patients (73%) of the latest group a sharp fall in blood pressure (<100/80) was reported especially during dialysis through a subclavian catheter. Nine patients (30%) underwent thrombectomy and venous dilation of the superficial veins because of fragility and inappropriate veins selected for fistula creation. Four out of nine patients suffered from intermittent blood pressure changes. Twenty three patients were diabetic who suffered from arteriosclerosis. Hypotension was the most common etiology of the AVF failure, as we had a report of 93% of hypotension at the time of AVF failure. In early failure group 20 cases (66%) were in left wrist, 7 cases (23%) in left forearm, two cases (7%) were in left arm and one case was in (4%) right forearm. There was no significant difference between the mentioned groups in early failure rate when compared with the total number of AVFs on specific site, except significantly lower rate in the arm fistulas. In 70 cases the fistula was patent and functional for hemodialysis. Forty seven (47) out of 70 patients had active fistula by the end of study while in 23 patients it was active for a period of 7.5 months. In this group 14 cases were in left wrist, seven cases in left forearm and 2 cases in left arm. In sixteen out of 23 cases hypotension was the reason of AVF failure three of which were diabetic. In remaining 7 patients hemorrhage & hematoma after frequent punctures and ensuing venous thrombosis was the etiology of AVF fistula.

DISCUSSION

Upper limbs are the gold standard for frequent dialysis in CRF cases especially distal fistula are more common because this creates more superficial venous & less complication in comparison with proximal fistula when

greater & major arteries are used.⁵ Additionally, in cases of impairment disabling aneurysmation and bleeding in distal types it is not required to repair the fistula and ischemia risks of distal limb decreased.⁶ Consequently despite the risk of failure distal type fistulas implantation of distal fistulas in upper limbs is our first choice except in cases where distal thrombosed vessels it cannot be performed.¹² Although some studies here claimed that brachial fistula is a good choice if radiocephalic venous is not accessible.⁷ In present work we performed brachial fistula just in 7%. In our study 30% of all operations led to primary failure. However with the microscopic vascular surgery & new technologies less complications and higher success rate or even higher probability of fistula repair is possible.⁸ In AVF failure cases falling blood pressure and diabetes & arterial atherosclerosis were reported in 73% and 23% respectively. Previous studies reported 55% success rate.⁹ Main reasons for failure were positive history of CVA and IHD in addition to higher age and dependency to dialysis during surgery.¹¹ High dose administration of heparin using bigger venous, mean blood pressure of 8mmHg or higher alongside with appropriate technique and ideal operating systems were major etiologies for success rate of up to 84%. Although duplex ultrasonographic study is suggested for advanced evaluations of diabetic elderly and patients with peripheral vascular disease.¹⁰ In ideal situation success rate increased up to 74% in children who require dialysis. The fistulas implanted in arm (7% of all cases in our study had the lowest rate of primary failure in comparison with radio cephalic and snuff box fistulas ($p < 0.05$). In our study major reason for AVF failure (primary and secondary) was fall in blood pressure (70%, 73% respectively). Besides any factor that led to blood pressure changes increased this probability ($p = 0.006$). As a consequence the most important factor along with good vascular selection is stable blood pressure (100/80mmHg). Raised blood pressure, in addition to other complications of hypertension, increases the risk of bleeding in

the fistula site and AVF failure. On the other hand hypotension would lead to AVF failure because of thrombosis.¹³ Finally, it is suggested that in patients who require AVF implantation for dialysis, Blood pressure control should be performed by administration of antihypertensive therapy and low salt diet. In addition during dialysis, monitoring of blood pressure and preventing hypotension by eating salty nuts is suggested).

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