Survey of Factors that Affect the Arteriovenous Fistulas Survival in Semnan and Mahdishahr, Iran

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Abstract

Background: First step in chronic dialysis is establishing a suitable dialysis access. Arteriovenous fistula (AVF) has been known as the gold standard for hemodialysis; and due to complex interaction of factors that affect the survival time of fistula, we decided to evaluate survival time and affective factors among the dialysis patients.

Methods: In a historical cohort study, we analyzed 52 patients of the Semnan and Mahdishahr Dialysis Centers. The data recorded by history taking and physical examination.

Results: The survival of fistula was 83%, 80%, 67%, and 40% after 1, 3, 5, and 10 years respectively. Our results showed that the survival time of fistula was higher among patients with left-side AVFs. Factors such as age, gender, underlying disease, dialysis session per week, the time that patients started dialysis after installing fistula and fistula infection did not statistical significant affect the survival time.

Conclusions: The survival time of AVF among dialysis patients of Semnan and Mahdishahr is satisfying, and installing the fistula in left hand lead to higher survival.

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Introduction

The first step in chronic dialysis is establishing a suitable dialysis access, which can deliver adequate blood flow through the dialysis machine that is 300 ml it per minute. On the other hand, reaching the long-term patency of fistula and minimizing the long-term and short-term complications of fistula is very important (1). Due to complications of primary catheters such as infection, stricture or thrombosis; it is better to use arteriovenous fistula (AVF) or arteriovenous graft for upper extremity as a dialysis access (2).

According to increase in life expectancy and number of patients with chronic renal failure (CRF) and recognition of AVF as a gold standard of dialysis access, performing researches on installing AVF and assessment of patency and complications of these fistulas has an important role (3). Vascular access procedures and complications are major causes for hospitalization in dialysis patients; and it has been estimated that these factors account for over 20% of hospitalization of dialysis patients and cost over one billion dollars annually in United States (4).

Factors that may affect the survival of fistula are underlying diseases, surgical procedures and skilled staff (5). About 90% of AVFs are patent within 12 months, but it decrease to 75% after 4 years. In many patients fistulas have had good performance for longer, even 10 years; which is due to the good condition of vessels, patients care and obsessive care of hemodialysis technicians (6). According to older patients that were referred to dialysis centers in Semnan we decided to survey the factors that affect the AVF survival to raise survival rate by preventing factors that cause failure of fistulas.

Materials and Methods

In a historical cohort study, all the patients with end

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stage renal disease whose AVF was used for hemodialysis in the Semnan dialysis centers (Fatemiye hospital in Semnan and 15th Khordad Hospital in Mahdishahr), included total of 52 patients, were analyzed. Data analyzed were age, gender, number of fistulization, fistula location (right/left and brachial/radial), the time patients started dialysis after installing fistula, dialysis sessions per week, underlying disease, failed and active fistula survival and fistula infection, which recorded by history taking and physical examination. Also, we completed our data by investigating the patient's file and by performing an interview with patient's family and dialysis centers supervisors.

The fistula failure definition was: A fistula that cannot deliver the optimal dialysis blood-flow, which is 300 ml it per minute with two needles. Moreover, the diagnostic criteria for fistula infection based on clinical findings included: Erythema, cellulitis, tenderness, induration, masses, drainage, and sinus tract.

The data were analyzed by SPSS for windows (version 21; IBM Corp., Armonk, NY, USA) by using Kaplan–Meyer survival test and cox regression analysis. All information about the patients remains confidential and secure.

Results

In this study, 52 patients were analyzed. The mean age of patients was 59.9 ± 14 years, which ranges from 31 to 83 years. 28 patients (53.8%) were female and 24 patients (46.2%) were male. 13 patients (25%) had failed fistula, which the mean survival time of fistula based on the patency time of first fistula was 36.4 ± 32.3 months.

In this study, the first survival of fistula was 83% and 67% of patients had functioning fistula after 5 years. (Figure 1) Survey of underlying diseases showed that 33 patients (63.5%) were diabetic (Table 1). Hypertension was found in 29 patients (55.8%) and 4 patients (7.7%) had collagen vascular disease. Other causes of renal failure such as polycystic kidney disease were seen in 10 patients (19.2%). 16 patients (30.8%) had right side AVF and 36 patients (69.2%) had left side AVF. Forty-three patients (82.7%) had a brachial fistula, and 9 patients (17.3%) had a radial fistula.

The mean time of starting dialysis after installing the fistula was 68.7 ± 65.3 days that ranges from 10 to 365 days. The fistula infection rate was 1.9%. 43 cases (82.7%) were dialyzed three times, 7 cases (13.5%) were dialyzed two times, and 2 patients (3.8%) were dialyzed 4 times per week.

Out of 36 patients with left side fistula only 16.7% of patients had fistula failure, while out of 16 patients that had right side AVF, 7 patients (43.8%) had fistula failure (Table 2).

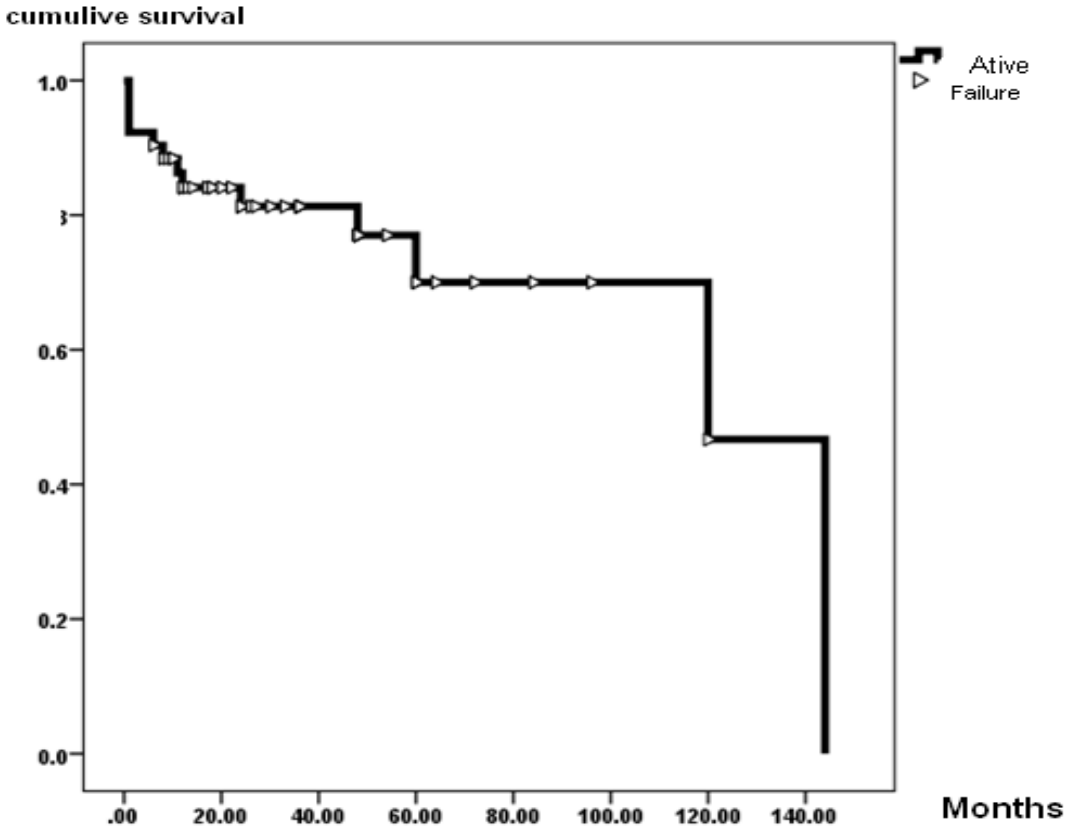

Figure 1. Cumulative survival of **arteriovenous** fistula in studied patients

Table 1. First, second and third year survival of AVF in hemodialysis patients

Variables	First year	Second year	Third year
Gender			
Male	0.82	0.82	0.82
Female	0.85	0.79	0.79
Diabetes			
Yes	0.84	0.77	0.77
No	0.84	0.84	0.84
Blood pressure			
Yes	0.81	0.75	0.75
No	0.86	0.86	0.86
Hand			
Left	0.88	0.88	0.88
Right	0.73	0.62	0.62
Fistula's location			
Brachial	0.82	0.78	0.78
Radial	0.89	0.89	0.89
Collagen vascular disease			
Yes	0.24		
No	0.87	0.84	0.84

AVF: Arteriovenous fistula

Table 2. Variables affect the AVF failure in studied patients

Variables	P-value	OR	CI_{95}
Age	0.090	1.02	0.7-2.1
Gender (female/male)	0.070	1.23	0.8-4.3
Diabetes	0.090	2.01	0.6-8.2
Dialysis sessions per week	0.200	0.8	0.4-1.45
Number of previous arteriovenous fistula	0.070	2.15	0.7-9.1
Fistula's site (right hand/left hand)	0.001#	4.7	4.1-16.2
Collagen vascular disease	0.100	0.6	0.3-1.4
Dialysis center	0.200	1.01	0.9-2

#Significant, AVF: Arteriovenous fistula; OR: Odds ratio; CI: Confidence interval

Discussion

The mean age of our patients was 59.9 ± 14 years. In Erkut et al. study the mean age of patients was 45 years (7).

In this study, age and gender did not have a significant relationship with survival time. This data is identical to the results of studies that showed age and gender does not affect the survival time of AVF (6,8-11).

In this study, the survival time was 83%, 75% and 67% after 1, 4 and 5 years respectively. In Salahi study, first year survival was 94% and in Xue study was 90%, which is almost identical to our results (12,13).

In Croatia study, the 1st year and the 5th year survival was 73% and 36% respectively, which the survival time in our study was higher (9).

In Yazd study, the 1st and 4th year survival was 90.9% and 43.6% respectively, which the 4th year survival was higher in our study (6).

These data shows that the 1st year survival of AVF in Semnan is almost as same as the centers above; but long term survival of our fistulas are higher compared to the centers above.

In this study, three underlying diseases were studied that 33 patients had diabetes, 29 patients had HTN and 4 patients had CVD. In this study, underlying disease did not affect the survival time.

This data confirm the Salahi study that showed diabetes and HTN did not affect the survival, consistent with Yazd study (6,12); and opposite to Smith and Erkut et al. that indicated, diabetes reduced AVF survival (7,10).

Opposite to the results of Puskar study that diabetes was in fourth place of causes of CRF (9). In our study, diabetes and hypertension were two major causes of CRF in dialysis patients.

In this study, patients with left side AVFs were more than patients with right side AVFs. In addition our result showed fistula survival was higher among the patients with left side AVF. In the same study, survival was lower in right hand (12).

Our results confirm that location of fistula (brachial/radial) didn't affect the survival, which is similar to Erkut et al. study (7). Puskar showed that proximal forearm fistula survived longer than the distal one in opposite to Ates opinion, that recommend distal part of forearm for fistulization because of prolonged survival in this part (9,14).

In this study, mean time for starting dialysis after fistulization was 68.7 ± 65.3 days that this finding had not significant impact on survival. Moreover, Rayner

showed that starting dialysis after 14 days do not affect the survival time, which this finding is almost similar to our study (15).

Saran showed that earlier cannulation of a newly placed vascular access was not associated with increased risk of vascular access failure and kybartiene indicated that AVFs of the patients who started planned hemodialysis functioned longer as compared to AVFs of the patients who started hemodialysis urgently (8,16).

In this study, dialysis sessions per week had not a statistically significant impact on survival, opposite to some studies showed AVF survival was directly dependent on either the number of hours or the number of hemodialysis sessions per week (7,9). The limitation of this study is the few number of patients in Semnan, which makes the compression difficult.

Conclusion

The follow-up study of AVFs has been shown that although the average age of the patients of this study is higher than similar studies; and the patients has had high-risk factors such as diabetes and high blood pressure, the survival rate of fistula is acceptable. Insertion of the fistula on the left arm has had a reduction on repeated surgeries as well as much longer functioning performance.

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