

Vascular Access and Survival in Hemodialysis Patients in Rasht, Iran

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Introduction. Arteriovenous fistulas and grafts are two common permanent access methods for hemodialysis. Selection of an appropriate access, appropriate surgical techniques, and treatment of complications are basic principles of long-term maintenance of vascular access. We aimed to assess the survival of arteriovenous fistulas and grafts in our dialysis center.

Materials and Methods. A total of 200 cases of vascular access placement in 155 patients were reviewed. Data on the type of access and the duration of a functional access were collected for survival analysis.

Results. The median duration of dialysis was 70.6 months. Among different methods of vascular access, elbows' wrinkle arteriovenous fistulas (57.0%) were the most frequently used vascular access. The longest mean survival period based on the anatomical location was seen in patients with the arteriovenous fistulas of the wrist (100.2 months); however, there were no significant relationships between anatomical location and durability of vascular access. The mean survival of vascular access was 96.4 months in men and 104.9 months in women. The mean vascular access survival in diabetic patients was 78.8 months as compared with 101.6 months in nondiabetics.

Conclusions. Antecubital arteriovenous fistulas were the most common forms of vascular access among our hemodialysis patients; however, arteriovenous fistulas of the wrist provided a better survival. Monitoring of the arteriovenous access and early diagnosis of its insufficiency can guarantee timely intervention and a better survival time.

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INTRODUCTION

The population of patients with end-stage renal disease (ESRD) is increasing by 6% per year, and annually, vascular access and treatment of its complications will exceed more than a billion dollar.¹⁻³ In Iran, the same increasing trend is seen in the ESRD population.⁴ Although the favorable treatment in patients with ESRD is kidney transplantation, due to the high costs and

failure of transplantation, long-term hemodialysis has become the most common therapy used in these patients.⁵

One of the important issues in these patients is creating and maintaining a permanent vascular access.⁶ Two types of permanent access used in hemodialysis patients are arteriovenous fistula (AVF), which is made from patients' vascular structure, and arteriovascular graft (AVG), which

is created by synthetic materials or animals' vein.^{7,8} Reducing morbidity and costs of vascular access maintenance is now a challenge for nephrological care teams. Vascular access problems, occurring in about 16% to 25%, often lead to hospital admission. Therefore, appropriate access selection, appropriate surgical techniques, and treatment of complications are basic principles of long-term success in the delivery of care to hemodialysis patients.⁹ We aimed to assess the survival of arteriovenous fistulas and grafts in our dialysis center.

MATERIALS AND METHODS

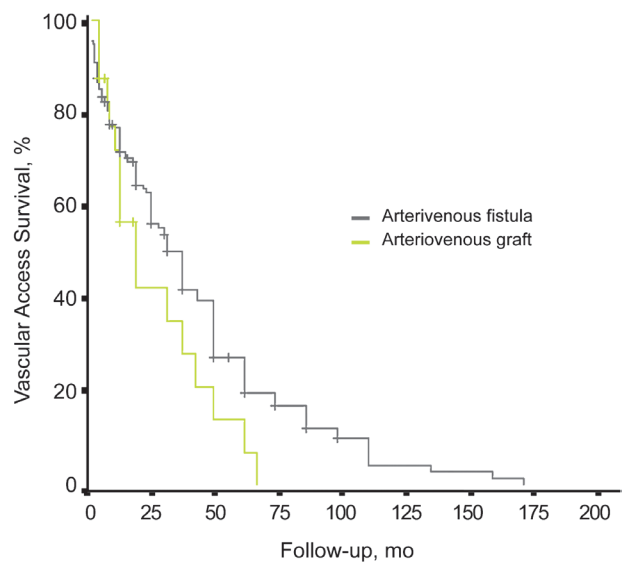
In a retrospective study, we reviewed vascular access surgery in hemodialysis patients referred to Razi Educational-Care Center of Guilan University of Medical Sciences, which is the only center of dialysis in Rasht, Iran. Between April and June 2006, a total of 200 vascular access surgeries were done in 155 patients. We collected data on their clinical characteristics to study the survival of the AVFs and AVGs. Diagnosis of inadequate vascular access was done clinically by a vascular surgeon.

Then collected data were imported into the SPSS software (Statistical Package for the Social Sciences, version 10.0, SPSS Inc, Chicago, Ill, USA), and survival analysis was done on vascular access data using the Kaplan-Meier statistic method.

RESULTS

Of the 155 patents studied, 58.5% were men and 41.5% were women. The mean age of the patients was 54.9 ± 14.6 and the median duration of dialysis was 70.6 months. Of the patients, 78.5% had experienced temporary central venous catheter placement. Among different methods of vascular access, elbows' wrinkle AVFs (57.0%) were the most frequently used vascular access (Table).

The summary of the survival analysis of different AVFs and AVGs are listed in the Table, and the Figure shows survival curves for AVFs and AVGs. The longest mean survival period based



Comparison of survival function of arteriovenous fistulas and arteriovenous grafts.

on the anatomical location was seen in patients with an AVF of the wrist; however, there were no significant relationships between anatomical location and durability of vascular access. The mean survival of vascular access was 96.4 months in men and 104.9 months in women. Despite the higher survival period in female patients, there were no significant relationships between sex and vascular access survival. The mean vascular access survival in diabetic patients was 78.8 months as compared with 101.6 months in nondiabetics.

DISCUSSION

In this study, the survival of vascular access in hemodialysis patients of Razi Hospital in Rasht, Iran, was evaluated. In a review by Nobakht Haghghi and associates, the majority of ESRD patients in Iran were in the age group of 45 to 64 years,⁴ indicating a younger population than the European and American patients. In our study, the mean age of our patients was 54.8 ± 14.0 years. The most frequent vascular access was the antecubital AVF and the highest mean survival

Vascular Access Types and Their Survival*

Access Type	Number (%)	Survival at 12 Months, %	Survival at 24 Months, %	Mean Survival Vascular Access, mo
Elbows' wrinkle arteriovenous fistula	114 (57)	91	81	91.6
Wrists' arteriovenous fistula	62 (31)	87	75	100.2
Hands' arteriovenous graft	14 (7)	73	...	44.2
Legs' arteriovenous graft	10 (5)	65	...	29.6

*Survival at 24 months was not reported for the patients with graft due to the small number of patients (ellipses).

period was related to AVF of the wrists. Although there were no significant relationships between anatomical location and duration of vascular access survival in our cohort and some others', such an association has been confirmed by another report from Iran by Khavaninzadeh and colleagues.¹⁰ It is generally recommended that AVF of the wrists be the first choice, due to the acceptable circulation, low rate of complications, and the maintenance of access location.¹¹

In the studies published to date, the 1-year survival of AVFs of elbows wrinkle and wrist, respectively, were 64% to 93% and 76% to 95%,^{10,12} and our results fall in these ranges (91% and 87%, respectively). In our center, the survival of secondary vascular access within 1 year could not be evaluated by the Kaplan-Meier statistical method, because of small numbers of thrombectomy cases. In our cohort, a higher mean survival of vascular access survival was reported in women, as compared to men. However, there were no statistically significant relationship between survival period of vascular access and sex. In other studies, the mean period of vascular access survival was higher in men.^{13,14} Moreover, there were no relationship between a certain period of access survival and sex.¹⁵

Temporary central venous catheterization in ESRD patients will increase chances of central veins synostosis and hypertension in the upper limb venous flow of the same side, which ultimately reduces vascular access survival and its removal in case of complications. Therefore, it is recommended to minimize the central vein catheterization.¹⁶⁻¹⁸ Monitoring of arteriovenous access helps early diagnosis of insufficiency and timely intervention would lead to longer survival time.

CONCLUSIONS

In our study, survival of vascular access in the AVF is longer than AVG. On the other hand, the costs of AVG are more than AVF.^{19,20} Therefore, it is recommended, except in specific cases, AVF be the preferred access.²¹ Timely recognition of ESRD patients via the appropriate screening and early referral for vascular placement prevent from temporary central venous catheterization, and the monitoring of the vascular access in order to early identification and timely action will lead to increased access survival.

CONFLICT OF INTEREST

None declared.

REFERENCES

1. US Renal Data System. USRDS Annual Data Report. The National Institutes of Health, National Institute of Diabetes, Digestive and Kidney Diseases. Bethesda: The National Institutes of Health; 2001.
2. Hakim R, Himmelfarb J. Hemodialysis access failure: a call to action. *Kidney Int.* 1998;54:1029-40.
3. Henderson LW. Future developments in the treatment of end-stage renal disease: a North American perspective. *Am J Kidney Dis.* 2000;35:S106-16.
4. Haghighi AN, Broumand B, D'Amico M, Locatelli F, Ritz E. The epidemiology of end-stage renal disease in Iran in an international perspective. *Nephrol Dial Transplant.* 2002;17:28-32.
5. Sheth RD, Brandt ML, Brewer ED, Nuchtern JG, Kale AS, Goldstein SL. Permanent hemodialysis vascular access survival in children and adolescents with end-stage renal disease. *Kidney Int.* 2002;62:1864-9.
6. Ezzahiri R, Lemson MS, Kitslaar PJ, Leunissen KM, Tordoir JH. Haemodialysis vascular access and fistula surveillance methods in The Netherlands. *Nephrol Dial Transplant.* 1999;14:2110-5.
7. Pisoni RL, Young EW, Dykstra DM, et al. Vascular access use in Europe and the United States: results from the DOPPS. *Kidney Int.* 2002;61:305-16.
8. Colnon PJ, Nicholson ML, Schwab S. Hemodialysis vascular access practice and problems. 4th ed. Oxford University Press; 2000. p. 52.
9. Kalman PG, Pope M, Bhola C, Richardson R, Sniderman KW. A practical approach to vascular access for hemodialysis and predictors of success. *J Vasc Surg.* 1999;30:727-33.
10. Khavaninzadeh H, Omrani Z, Shirali A, Najmi N. Determination of prevalence and survival of various types of vascular access in patients with end stage renal disease under chronic hemodialysis, in Tehran during 2004. *J Iran Univ Med Sci.* 2009;15:71-5.
11. Fitzgerald JT, Schanzer A, Chin AI, McVicar JP, Perez RV, Troppmann C. Outcomes of upper arm arteriovenous fistulas for maintenance hemodialysis access. *Arch Surg.* 2004;139:201-8.
12. Bender MH, Bruyninckx CM, Gerlag PG. The brachiocephalic elbow fistula: a useful alternative angioaccess for permanent hemodialysis. *J Vasc Surg.* 1994;20:808-13.
13. Rayner HC, Pisoni RL, Gillespie BW, et al. Creation, cannulation and survival of arteriovenous fistulae: data from the Dialysis Outcomes and Practice Patterns Study. *Kidney Int.* 2003;63:323-30.
14. Vernaglione L, Mele G, Cristofano C, et al. Comorbid conditions and gender impact the primary survival of distal radio-cephalic arteriovenous fistula inpatients on long-term hemodialysis. *J Nephrol.* 2005;18:276-81.
15. Marcus RJ, Marcus DA, Sureshkumar KK, Hussain SM, McGill RL. Gender differences in vascular access in

- hemodialysis patients in the United States: developing strategies for improving access outcome. *Gend Med*. 2007;4:193-204.
16. Oguzkurt L, Tercan F, Torun D, Yildirim T, Zumurtdal A, Kizilkilic O. Impact of short-term hemodialysis catheters on the central veins: a catheter venographic study. *Eur J Radiol*. 2004;52:293-9.
 17. Droll KP, Lossing AG. Carotid-jugular arteriovenous fistula: case report of an iatrogenic complication following internal jugular vein catheterization. *J Clin Anesth*. 2004;16:127-9.
 18. Karakaya D, Baris S, Guldogus F, Incesu L, Sarihasan B, Tur A. Brachial plexus injury during subclavian vein catheterization for hemodialysis. *J Clin Anesth*. 2000;12:220-3.
 19. Bruns SD, Jennings WC. Proximal radial artery as inflow site for native arteriovenous fistula. *J Am Coll Surg*. 2003;197:58-63.
 20. Silva MB, Jr., Hobson RW, 2nd, Pappas PJ, et al. A strategy for increasing use of autogenous hemodialysis access procedures: impact of preoperative noninvasive evaluation. *J Vasc Surg*. 1998;27:302-7; discussion 7-8.
 21. Salimi J, Zafarghandi MR. The patency rate and complications of polytetrafluoroethylene vascular access grafts in hemodialysis patients: a prospective study from Iran. *Saudi J Kidney Dis Transpl*. 2008;19:280-5.

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