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Impact of surgeon factor on radiocephalic fistula patency rates

Ilker Murat Arer*, Hakan Yabanoglu

Baskent University Adana Teaching and Research Center, Department of General Surgery, Adana, Turkey

HIGHLIGHTS

- Overall secondary patency rate was found in 144 (77.4%) patients.
- No statistical difference was observed according to secondary patency rates.
- Postoperative complication rate was 9.6%.
- Operating surgeon is not a major factor on radiocephalic fistula patency rates.

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ABSTRACT

Introduction: Hemodialysis with arteriovenous fistula (AVF) has been widely accepted treatment modality for patients with chronic renal failure (CRF). Radiocephalic fistulas are considered to be the most desirable for the initial vascular access. The aim of this study is to investigate the surgeon factor on radiocephalic fistula patency rates.

Methods: A total of 186 patients with diagnosis of CRF underwent Radiocephalic fistula for hemodialysis access were included. Patients were divided into 2 groups according to operating surgeon. Patients were evaluated according to demographic characteristics, secondary patency rates, second AVF creation and complications.

Results: Mean age was 57.7 ± 14.8 years. The most common etiology of CRF was idiopathic (66.6%). 40 (75.5%) patients in group 1 and 122 (91.7%) patients in group 2 were pre-dialysis patients ($p < 0.05$). Overall secondary patency rate was 77.4%. Patients in group 1 and group 2 have secondary patency rates of 83% and 75.2%, respectively ($p = 0.458$). Second AVF creation was done in 2 (3.8%) patients in group 1 and 23 (17.3%) patients in group 2 ($p < 0.05$). Postoperative complication rate was 9.6%.

Conclusion: Operating surgeon is not a major factor of secondary patency in radiocephalic arteriovenous fistulas.

1. Introduction

Renal replacement therapy (RRT) is the only treatment modality except renal transplantation for chronic renal failure (CRF) that can be achieved with either hemodialysis or peritoneal dialysis. AVFs are preferred due to longer patency, decreased thrombosis, infection, and mortality rates compared to arteriovenous grafts (AVG) and central venous catheters [1]. Proximal or distal AVFs have different patency rates however distal AVFs on non-dominant site are commonly recommended and initially preferred site. The radiocephalic fistula, described in 1966, is the distal AVF considered to be the most desirable for the initial vascular access [2]. This fistula is accepted as to be the gold standard for vascular access in CRF patients [3]. Primary failure rates has been reported to be 15–30% [4,5]. As the diameter of artery and vein increases from distal to proximal arm, patency rates also increase. Patency rates can also be influenced by operating surgeon factor especially for distal AVFs that need high technical skill and experience. The aim of the current study is to investigate the surgeon factor on distal AVF, radiocephalic fistula, patency rates.

2. Methods

A total of 408 consecutive patients with diagnosis of CRF

* Corresponding author. Baskent University Adana Teaching and Research Center, Department of General Surgery, Dadaloglu District 2591, Street No:4/A, 01250, Yuregir, Adana, Turkey.
E-mail addresses: igy1981@yahoo.com (I.M. Arer), drhyabanoglu@gmail.com (H. Yabanoglu).

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underwent arteriovenous fistula for hemodialysis access between October 2011 and February 2015 in Baskent University Adana Teaching and Research Center. Of these patients 186 underwent radiocephalic fistula creation were included in our study. Snuff-box and proximal radiocephalic fistulas were excluded. Data were collected retrospectively and randomization was not done. Patients were divided into 2 groups according to performing surgeon; group 1 consists of one general surgeon experienced on vascular access surgery (approximately performing 160–200 vascular access operations per year) and group 2 consists of other eight surgeons which are residents performing all general surgery operations (averagely performing 30–50 vascular access operations per year). All patients were operated under local anesthesia. All patients were evaluated for age, sex, comorbidity, etiology, duration of CRF, number of previous AVFs, arterial, venous, and anastomosis diameter, AVF site, anastomosis technique, preoperative mapping with venography, postoperative intravenous heparin infusion, postoperative secondary intervention (for bleeding, thrombus etc.), presence of early-term complications such as hematoma, bleeding, infection and thrombosis affecting patency, presence of angiographic or surgical intervention for complications, catheterization during operation, operation time, secondary patency rates, functionality of vascular excess (presence of thrill or murmur), preoperative presence of central catheter and second AVF creation. Preoperative venous mapping with venography was carried out when there is a history of multiple AVF operations or there was a problem related to venous structures on physical examination. Patients with insufficient thrill after anastomosis were administered IV heparin infusion at 100 U/kg for 12 h. Enteric-coated aspirin 100 mg was prescribed on discharge next day after surgery to all patients. The patients were checked at the end of the first and third weeks. Patients with functioning AVFs underwent hemodialysis at the end of 4th week.

The distal part of the non-dominant extremity was selected as the vessel and anatomical site whenever possible. Physical examination was done for all patients. The criteria of operability without ancillary tests were i) confirming adequate circulation according to Allen test; ii) the power of arterial pulsation being of 2 out of 4 in semi quantitative assessment; iii) vein diameter being at least 1 mm in tourniquet-free evaluation and 2 mm in tourniquet evaluation, and returning to its original diameter when tourniquet is removed; and iv) the suitable vein being observed for at least 5 cm and easily compressible. Secondary patency was defined as four consecutive hemodialysis procedure without problem together with the presence of thrill and/or murmur 1 month after the operation.

3. Statistical analysis

Statistical analysis was performed using the statistical package SPSS (Version 17.0, SPSS Inc., Chicago, IL, USA). For each continuous variable, normality was checked by Kolmogorov Smirnov and Shapiro–Wilk tests and by histograms. Comparisons between groups were applied using Mann Whitney U test were used for the data not normally distributed. The categorical variables between the groups was analyzed by using the Chi square test or Fisher Exact test. A multiple logistic regression analysis was used to know associations between group and other measurements, with group as dependent variable. Values of $p < 0.05$ were considered statistically.

4. Results

Among 186 patients 53 (29%) were in group 1 whereas 133 (71%) were in group 2. Characteristics of patients were given in Table 1. 117 (62.9%) patients were male and 69 (37.1%) female. Mean age of patients in group 1 and 2 was 61 ± 16 and 56.4 ± 14.2 years, respectively that is statistically different ($p = 0.027$). The most common etiology of CRF was idiopathic (66.6%), followed by diabetes (19.4%), hypertension (4.8%), glomerulonephritis (3.8%), stone disease (2.7%), polycystic kidney disease (2.2%) and Alport syndrome (0.5%). Hypertension (31.7%) was the most common comorbidity followed by coronary artery disease together with hypertension and diabetes (20.4%), hypertension and diabetes together (17.2%), diabetes (8.6%), congestive heart failure (2.7%). The mean CRF duration was 19 ± 36.9 months for group 1 and 16 ± 27.8 months for group 2 ($p = 0.927$). Average body mass index (BMI) for group 1 was 24.4 ± 4.1 for group 1 and 24.5 ± 2.8 kg/cm^2 ($p = 0.507$). Most of the patients were predialysis therefore 40 (75.5%) patients in group 1 and 122 (91.7%) patients in group 2 did not have prior AVF surgery. 12 (6.5%) patients have 2 prior AVF operations, 9 (4.8%) patients have 1 AVF operation and 3 (1.6%) patients have 3 AVF operations. The most common site of AVF was left (79.6%) being the non-dominant site whereas right site was preferred in 38 (20.4%) patients. There was no statistical difference between groups according to site ($p > 0.05$). Preoperative vascular mapping with digital subtraction venography was performed in only 33 (17.7%) patients. Surgeon of group 1 performed only end to side anastomosis whereas surgeons in group 2 performed side-to-side anastomosis in 84 (63.2%) and end-to-side anastomosis in 49 (36.8%) patients. Mean operation time of patients for group 1 and 2 was 30.6 ± 12.4 and 58.2 ± 23 min respectively ($p = 0.000$). Average artery, vein and anastomosis diameters for group 1 were 2.45 ± 0.59 and 2.35 ± 0.64 and 3.04 ± 0.79 mm respectively whereas group 2 measurements were 3.32 ± 0.56 and 3.21 ± 0.61 and 5 ± 1.86 mm respectively (Table 2). Significant statistical difference between groups was observed according to artery, vein and anastomosis diameters ($p = 0.000$). Intraoperative catheter administration was done in 1 (1.9%) patient of group 1 and 21 (15.8%) patients of group 2 that is statistically significant ($p = 0.005$). 15 (28.3%) patients in group 1 and 44 (33.1%) patients in group 2 received postoperative heparin infusion for 24 h ($p > 0.05$). Of 123 patients have central venous catheter, 37 (69.8%) were in group 1 and 86 (64.7%) were in group 2 ($p = 0.607$). Overall secondary patency rate was 77.4%. Patients in group 1 and group 2 have primary patency rates of 83% and 75.2%, respectively ($p = 0.458$). Early postoperative complications such as venous thrombosis, bleeding and seroma were observed in 6 (11.3%) patients of group 1 and 12 (9%) patients of group 2 ($p = 0.252$). Second AVF creation was done in 2 (3.8%) patients in group 1 and 23 (17.3%) patients in group 2 that is statistically significant ($p = 0.016$). No postoperative mortality was observed but overall mortality was seen in 15 patients (8.1%).

Table 1
Characteristics of the patients in both groups.

	EVAS (n = 53)	OS (n = 133)	P value
Male/Female	42/11	75/58	**0.004**
Age (years)[a]	61 ± 16	56.4 ± 14.2	**0.027**
CRF duration (Months)[a]	19 ± 36.9	16 ± 27.8	0.927
BMI (kg/cm^2)[a]	24.4 ± 4.1	24.5 ± 2.8	0.507
Preemptive renal disease (%)	75.5	91.7	**0.005**
AVF site (%)			1.000
Right	20.8	20.3	
Left	79.2	79.7	
Anastomosis type (%)			**0.000**
Side-to-side	0	63.2	
End-to-side	100	36.8	
Operation time (Minutes)[a]	30.6 ± 12.4	58.2 ± 23	**0.000**

Abbreviations: AVF: Arteriovenous fistula, BMI: Body mass index, CRF: Chronic renal failure, EVAS: Experienced vascular access surgeon, OS: Other surgeons.
[a] Values are means ± standard deviation.