

Comparison of Six-Month Patency Rate in Ulnar-Basilic Fistula and Radio-Cephalic Fistula for Hemodialysis Access

Alireza Khazaei¹, Mehdi Ramezani¹, Rooholla Bakhshi¹, Mehdi Mohammadi¹, Abdolvahhab Pourmahmudian^{1*}

¹ Zahedan University of Medical Sciences, Tehran, Iran

Abstract

Background and Objectives: There are different types of vascular access. We compared the patency rate in Ulnar-Basilic fistula and Radio-Cephalic fistula for vascular access in hemodialysis patients for six months.

Methods: The study was performed on 60 patients (aged 50.6±13.5 years) with end-stage renal failure undergoing hemodialysis within 2012-2014 in Imam Ali Hospital in Zahedan, Iran. The patients were divided into two groups. The first group was established anastomosis of wrist radial artery and the cephalic vein and in the second group between ulnar artery and basilic vein in the forearm. Both groups were followed up with respect to patency of the fistula for six-months.

Findings: The mean duration of renal failure requiring transplantation among patients was 1.4±1.0 years. The frequency of patency after six months in Ulnar-Basilic fistulas was less than that in the Radio-Cephalic group; however, the difference was not significant (76% vs. 70%, $P > 0.05$). All fistulas in the two groups showed thrill, except one patient (3.3%) in the Ulnar-Basilic group (primary failure). Hypertension was detected in one patient in the Radio-Cephalic group. Moreover, hematoma was observed in two patients in the Ulnar-Basilic and in two patients in the Radio-Cephalic group, and thrombosis was observed in two patients in the Ulnar-Basilic and in a single patient in the Radio-Cephalic group. Aneurism was observed in three patients (10%) in the Ulnar-Basilic and in four patients in the Radio-Cephalic fistulas. The steal syndrome was observed in two patients in the Radio-Cephalic group, and infection was seen in one patient (3.3%) in the Ulnar-Basilic group and in four patients (13.3%) in the Radio-Cephalic group.

Conclusions: Fistula patency rates were comparable in both groups, and there was no significant evidence of postoperative complication difference between the two groups.

Keywords: Hemodialysis, Ulnar-Basilic fistula, Radio-Cephalic fistula, ESRD

Background and Objectives

The adequacy of hemodialysis (HD) depends on the quality and reliability of vascular access. Current data suggests that once successfully created, a well-functioning native vein fistula is the optimal access for HD because of its good patency, low complication rate and low morbidity [1]. Common fistulas such as forearm radial-cephalic, upper arm brachial-cephalic or upper arm brachial-basilic fistulas have been more studied previously [2]. It is evident that the success

of AVF creation and maturation is dependent on pre-fistula surgery planning regarding site selection for fistula anastomosis and surgical technique [3]. Radiocephalic arteriovenous fistula was introduced in 1960 as an autologous vascular access for hemodialysis, and previous studies have shown good long-term survival and a low complication rate for radiocephalic arteriovenous fistula; however, high incidence of primary failure is the most important complication of this technique [4]. Ulnar-Basilic fistula was first presented in 1967 by Hanson *et al.* [5]. Ulnar-Basilic fistulas may be considered when forearm cephalic vein is not usable or an autogenous forearm radial-cephalic fistula cannot be performed [6,7]. However, compared with other techniques, Ulnar-Basilic fistulas showed higher early failures, lower patency rates and longer time to

*Corresponding author: Abdolvahhab Pourmahmudian, Zahedan University of Medical Sciences, Tehran, Iran, Tel: +98 9128186934, Email: web@sinains.com

maturation in some studies [8]. As mentioned above, the findings about Ulnar-Basilic and Radio-Cephalic fistulas are not consistent; so, to address these concerns, this study aimed to compare patency rate for six months in Ulnar-Basilic and Radio-Cephalic fistulas for hemodialysis access in patients with end stage renal disease under hemodialysis.

Methods

In this randomized clinical trial, 60 patients with chronic kidney disease (CKD) candidate for hemodialysis were recruited within 2011-2013 in Zahedan Imam Ali Hospital. The enrolled participants were counseled, and informed consent was obtained before randomization, as per the institution's protocol. Moreover, the Ethics Committee of Zahedan University of Medical Sciences approved the study protocol. The patients were randomized in Radio-Cephalic and Ulnar-Basilic groups. To randomization, we used sequential numbers; in this case, the first number was given to the first patient and anastomosis of the wrist radial artery and the cephalic vein was established (Radio-Cephalic group $n = 30$) sequentially. The next number was given to the next patient, and anastomosis of ulnar artery and basilic vein in the forearm was performed (Ulnar-Basilic group, $n = 30$).

To rule out any stenosis, the clinical evaluation was complemented for all patients in the two groups. A necessary requirement for this choice of access was patency of vein from the wrist to the arm region. Moreover, before fistula creation, the veins of the upper extremities were evaluated using a tourniquet and Allen's test to assess blood supply to the hand. Interventions were performed by one surgeon under local anesthesia using 1% lidocaine. Then the patients were followed up for six months, and the rate of patency and complications such as hematoma, thrombosis, aneurism, steal syndrome and infection related to the mentioned two techniques were compared in the two groups.

Statistical analyses

Data were analyzed using the SPSS software (version 20). Categorical data were presented as numbers (%), and continuous data as mean \pm SD. We used the Chi 2 or Fisher's exact test to compare the categorical variables and the Mann-Whitney's rank sum U test to compare the continuous variables. $P < 0.05$ was considered significant.

Results

Sixty patients including 31 males (51.7%) and 29 females (48.3%) with the mean age of 50.6 ± 13.5 years were evaluated. The difference between the two groups regarding sex and age was not significant. The mean duration of renal failure requiring transplantation among the patients was 1.4 ± 1.0 years.

The frequency of patency after six months in the Ulnar-Basilic group was less than in the Radio-Cephalic group but the difference was not significant (76% vs. 70%, $P = 0.34$). All fistulas in the two groups showed thrill, except one patient (3.3%) in the Ulnar-Basilic group (primary failure).

Hypertension was detected in one patient in the Radio-Cephalic group. Moreover, hematoma was seen in 2 patients in the Ulnar-Basilic and in 2 patients in the Radio-Cephalic group, and thrombosis was observed in 2 patients in the Ulnar-Basilic and in 1 patient of the Radio-Cephalic group. Aneurism was observed in 3 patients (10%) in the Ulnar-Basilic and in 4 patients in the Radio-Cephalic fistulas. The steal syndrome was found in 2 patients in the Radio-Cephalic group, and infection was seen in 1 patient (3.3%) in the Ulnar-Basilic fistulas and in 4 patients (13.3%) in the Radio-Cephalic group (Table 1).

Discussion

Hemodialysis access is an important challenge for physicians because, in CKD patients under hemodialysis a major cause of morbidity and mortality is hemodialysis access failure [9-10]. Previous studies indicated that early fistula failure rates are high and range from 20 to 61%. It is also evident that the success of AVF placement and maturation is largely dependent on pre-fistula surgery planning regarding site selection for fistula anastomosis and surgical technique [11,12]. Based on the US National Kidney Foundation Kidney Dialysis Outcomes Quality Initiative (NKF-K/DOQI) Vascular Access Work Group guidelines, the preferred types of vascular access are forearm radialcephalic, elbow brachial-cephalic and upper arm brachialbasilic fistulas [1,13]. In this experience, we recruited 60 patients with the mean age of 50.6 ± 13.5 years with ESRD under hemodialysis, and compared the outcomes of Ulnar-Basilic and radio cephalic fistulas. As stated in the introduction, previous studies have provided conflicting information about the advantages and disadvantages of these techniques. The current experience indicated that the frequency of patency after six months in the Radio-Cephalic group slightly was higher than in the Ulnar-Basilic fistulas [$P = 0.34$]. Moreover,

in Radio-Cephalic fistulas, hypertension, steal syndrome, aneurism and infection were slightly more than in the Ulnar-Basilic fistulas. On the other hand, thrombosis was marginally higher in the Ulnar-Basilic fistulas. These results are in general agreement with the results of Salgad who found no remarkable evidence of infection, bleeding, aneurism and steal syndrome in 60 patients with ulnar basilic fistula [6]. However, in 20 patients, the radiocephalic and brachiocephalic fistulas failed and radio basilic fistulas were performed for them [6]. In line with our study, Anton *et al.* reported 78% patency after 12 months and 73.5% and 67% after 3 and 5 years that are slightly higher than our results (the overall patency in our study after six months was 73%)[14]. Considering the rate of patency, the literature registered a great variability regarding equipment, experimental designs and techniques used in the placement of fistulas, and close attention should be paid to these parameters when reviewing and comparing these studies. For example, Allon reported 40-90% patency in 12 months [11]. Bourquelot found less patency than our study (60% of patency after 80 days) and more failure rate was detected (4 cases); in addition, 21 cases did not mature ever [15]. This outcome is inferior compared with our results. In the current survey, all fistulas were matured, and primary failure was seen in only one patient.

In summary, although patency rates in current experience were not as good as in some previous reports, the results of current and previous reports support the use of ulnar basilic fistulas as an alternative for radio cephalic fistulas in situations where the preferred access type cannot be performed, which, once matured, shares the advantages compared with radio cephalic fistulas. Bourquelot *et al.* emphasized that the creation of ulnar basilic fistulas is technically challenging, maturation is slow, and low maturation rates are common [15].

Although our findings extend the results of prior observational analyses but the creation of fistulas in patients with ESRD should be studied in more detail and depth in keeping with the recommendations of the NKF-K/DOQI Vascular Access Work Group guidelines.

The main limitations of our study were the relatively small sample size and short duration of follow-up (6 months). Further investigations are recommended with longer follow-up and larger series to validate the findings reported here. Furthermore, previous reports indicated that hemodialysis training improves quality of life in these patients [16], so training of patients about such risk factors as smoking [17] may be useful.

Table 1 Characteristics of Ulnar-Basilic and Radio-Cephalic groups

Variables	Radio-Cephalic		Ulnar-Basilic	
	N	%	N	%
Sex (n=30)				
Male	17	56.7	14	46.7
Female	13	43.3	16	53.3
Patency after 6 months (n=30)				
Yes	23	76.7	21	70
No	7	23.3	16	26.7
Thrill (n=30)				
Yes	30	100	29	96.7
No	0	0	1	3.3
Hypertension (n=30)				
Yes	1	3.3	0	0
No	29	96.7	30	100
Hematoma (n=30)				
Yes	1	3.3	1	3.3
No	29	96.7	29	96.7
Steal syndrome (n=30)				
Yes	2	6.7	0	0
No	28	93.3	30	100
Thrombosis (n=30)				
Yes	1	3.3	2	6.7
No	29	96.7	28	93.3
Aneurism (n=30)				
Yes	4	13.3	3	10
No	26	86.7	27	90
Infection (n=30)				
Yes	4	13.3	1	3.3
No	26	86.7	29	96.7

Conclusions

The Ulnar-Basilic fistulas showed comparable patency rate and complications related to fistula placement with Radio-Cephalic fistulas in patients with ESRD under hemodialysis.

Acknowledgements

We would like to thank the nursing, administrative and secretarial staff of the nephrology department and clinic at our hospital for their contribution to the maintenance of patient

records. No potential conflicts of interest were disclosed.

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Please cite this article as:

Alireza Khazaei, Mehdi Ramezani, Rooholla Bakhshi, Mehdi Mohammadi, Abdolvahhab Pourmahmudian. Comparison of Six-Month Patency Rate in Ulnar-Basilic Fistula and Radio-Cephalic Fistula for Hemodialysis Access. *International Journal of Hospital Research* 2015, 4(1):33-36.