International Journal of Surgery 44 (2017) 76–81

Contents lists available at ScienceDirect

International Journal of Surgery

journal homepage: www.journal-surgery.net

Original Research

# Outcomes of relocation of basilic vein in brachiobasilic fistulas in chronic renal failure

Farzad Kakaei [a, b], Ahad Hasankhani [a], Mir-Salim Seyyed-Sadeghi [c], Peyman Virani [a], Tooraj Asvadi [a], Sina Zarrintan [a, *]

[a] Department of General & Vascular Surgery, Tabriz University of Medical Sciences, Tabriz, Iran
[b] Section of Organ Transplantation, Imam Reza Hospital, Tabriz University of Medical Sciences, Tabriz, Iran
[c] Department of Surgery, Ardebil University of Medical Sciences, Ardebil, Iran

## HIGHLIGHTS

- Relocation of basilic vein for brachiobasilic AVF is technically feasible and safe.
- Relocation of basilic vein for brachiobasilic AVF has excellent patency in short-term follow-up.
- Relocation of basilic vein for brachiobasilic AVF has acceptable complication rate.

## ARTICLE INFO

*Article history:*
Received 16 May 2017
Received in revised form
9 June 2017
Accepted 12 June 2017
Available online 15 June 2017

*Keywords:*
Brachiobasilic fistula
Hemodialysis
Patency
Complications

## ABSTRACT

*Background:* In patients without or with injured cephalic vein, using the basilic vein for creating arteriovenous fistula (AVF) is the best way for hemodialysis. In order to create AVF, the basilic vein should be superficialized and lateralized. This study sought to examine outcome of relocation of basilic vein in brachiobasilic fistulas in patients with chronic renal failure (CRF).

*Methods:* We evaluated the outcome of creation of brachiobasilic fistula with transposition of basilic vein in 27 patients (14 males and 13 females with mean age of 60.03 ± 8.04 years) with CRF. The success rate and complications were recorded during the follow-up period. The fistula was regarded efficient if cannulation was feasible conveniently and a minimum flow rate of 250 ml/min for 4 h at least for 3 consecutive hemodialysis sessions through both lines was documented 30 days postoperatively.

*Results:* The mean time gap between previous AVF creation or try and the relocation of basilic vein was 3.55 months. Thirty days postoperatively, 85.2% of the created AVFs were efficiently working. There were postoperative complications in 40.7% of patients including venous hypertension (14.8%), bleeding (7.4%), hematoma (7.4%) and distal paresthesia (11.1%).

*Conclusions:* Brachiobasilic AVF fistula provides a suitable option for vascular access in cases with failed previous AVF. Relocation of basilic vein for brachiobasilic AVF is technically feasible, safe and with excellent patency in short-term and complication rates are acceptable.



## 1. Introduction

In recent years, the number of chronic renal failure (CRF) patients requiring hemodialysis (HD) is rapidly increasing [1,2]. Due to improved HD technique and a better treatment of comorbidities, dialysis patients now have a higher life expectancy. These patients are in need of proper vascular access (VA) which is able to last for long-term use. Autogenous arteriovenous fistulas (AVFs) are considered the most reliable long-term VA in patients undergoing HD [3].

Compared to arteriovenous grafts (AVG) and central venous catheters (CVC), a well-functioning AVF is superior in providing access for HD efficiently and at the same time with the least rate of access related complications such as stenosis and thrombosis. It also requires fewer interventions to maintain patency [4].

According to the Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines, the first and second choices for VA are radial-

* Corresponding author. Department of General Surgery, Golgasht St., Tabriz University of Medical Sciences, Tabriz, 51664, Iran.
*E-mail address:* s.zarrintan@yahoo.com (S. Zarrintan).

http://dx.doi.org/10.1016/j.ijsu.2017.06.037
1743-9191/

cephalic AVF and brachial-cephalic AVF, respectively. Unfortunately, many patients are unable to have or maintain a distal upper limb AVF because of inappropriate veins or arteries. In the absence of adequate veins or after failed radial-cephalic or brachial-cephalic access, a brachial-basilic (BB) fistula or AVG should be considered [5]. The use of basilic vein to create an AVF was first described by Dagher et al. [6]. Since then, the procedure has had several changes and modifications.

The basilic vein in the upper arm has the advantage that as a deep vein, it is rarely damaged by previous venous punctures and it is often of good caliber. However, the basilic vein must be mobilized and superficialized during fistula formation and this increases the complexity of the procedure. It is usually relocated and transposed anterolaterally through a subcutaneous flap [7].

The previous reports have indicated that BB fistulae have an acceptable outcome [8–11]. In the present study, we aimed to evaluate the outcome of relocation and transposition of the basilic vein in brachiobasilic fistulas in CRF patients.

## 2. Materials and methods

In a single center research, from October 2014 to October 2015, all patients in whom previous forearm AVF was failed or creation of a forearm AVF was not suitable were evaluated for entry into the study. Inclusion criteria were minimum vein flow of 400 ml/m and minimum vein diameter of 6 mm in Doppler sonography before surgery, absence of stenosis or thrombosis in the draining vein and at least two months duration from the insertion of previous fistula which was not functional by the most experienced hemodialysis staffs. Exclusion criteria included: planned graft AV access procedures, age younger than 18 years, diameter of the brachial artery at the elbow less than 3 mm, absence of radial or ulnar artery pulses, diameter of the basilic and cephalic veins in any location in the upper arm less than 3 mm, and inability to obtain informed patients' consent to enter to the study. In addition, patients with steal syndrome from previous procedures, venous hypertension from previous procedures, active skin infections or skin lesions at the incision site, fibrosis in the proximal site of the basilic vein or the length of the vein less than 10 cm due to various branches and deformity in the incision site were excluded. The patients who were lost to follow-up before the first hemodialysis session were also excluded. Obesity was not a criterion for exclusion from the study. The study was approved by the institutional review board and informed consents were obtained from all participants.

All patients who were referred to a brachiobasilic AV fistula underwent pre-assessment and underwent duplex scans to assess suitability for the fistula. At the physical evaluation, arterial pulse strength, presence of a recent access, formation of a prominent elastic structure upon application of pressure, and vein diameters were assessed to determine the surgical site. For those patients who had more than one suitable site, the most distal one was generally selected in order to preserve the proximal site. All vascular accesses were performed directly by an experienced surgeons (who conducted placement of >100 vascular accesses previously) or by a surgical chief resident supervised and directed by the attending surgeon.

*Surgical procedure:* An incision was made from axilla to elbow to define possible length of 10 cm for the basilic vein. Once the entire vein was dissected, side branches were ligated, and the basilic vein was detached from its bed. After 4 cm isolation of subcutaneous layer from the fascia, the basilic vein was transposed to the lateral side in the anterior surface of the arm and fixed at the new position. The brachial artery was incised after clamping, and an end-to-side anastomosis between the basilic vein and the brachial artery was completed. Once done, clamps were removed and bleeding was controlled.

A day after surgery, the patients were evaluated for possible thrill on the basilic vein and the presence of vascular reflux and if there was no complications, patients were discharged. Patients were also evaluated for possible complications 7 and 14 days postoperatively. Assessed complications consisted of bleeding and hematoma formation in 7 days of postoperative period and neuropathy, pseudoaneurysm formation and venous hypertension in 14 days of postoperative period. All fistulae were scanned by duplex ultrasound after 30–45 days of AVF creation. Maturation was determined and defined as successful cannulation of the fistula with a minimum vein diameter of 5 mm, a flow rate of greater than 250 ml/min for four hours and at least for 3 sessions a week. The primary outcome of the study was successful cannulation of AVF. Secondary outcomes were flow rate and vein diameters obtained by duplex scanning of AVF defined by vein diameter greater than 6 mm and flow rate of more than 600 mL/min [5]. In addition, complications 7 and 14 days postoperatively were considered as the secondary outcomes.

*Data analysis*: All data were analyzed using the Statistical Package for Social Sciences, version 17.0 (SPSS, Chicago, Illinois). Baseline data are reported as means ± standard deviation (continuous data) or percentages (categorical data), depending on the data level. Paired T-test was used to compare findings before and after brachiobasilic AVF insertion. A $p$ value of 0.05 or less was considered to be statistically significant.

## 3. Results

Twenty-seven patients were included due to the inclusion and exclusion criteria. The study patients underwent relocation of basilic vein in brachiobasilic fistulas. Table 1 demonstrates baseline findings of the study population. Hypertension was the main etiology for renal failure. Table 2 illustrates the associated comorbidities of the study patients.

Mean diameter of the mid forearm before and after surgery was 23.57 ± 1.22 and 24.12 ± 1.13 cm ($p = 0.49$). Mean diameter of the middle of the arm was 31.63 ± 1.77 cm before surgery and 32.20 ± 1.88 cm after surgery ($p = 0.31$). Mean diameter of the basilic vein during surgery was 8.90 ± 1.18 mm and mean length of the released basilic vein was 21.90 ± 2.22 cm. Mean length of the lateralization for basilic vein was 4.63 ± 0.49 cm. Mean duration of the surgery was 99.72 ± 11.22 min.

Successful cannulation and proper hemodialysis after 30 days was observed in 23 cases (85.2%). Twenty-two patients (81.5%) had flow rate of more than 600 mL/min in duplex ultrasound scan on 30–45 postoperative days. In addition, 24 patients (88.9%) had external vein diameter greater than 6 mm in duplex ultrasound scan on 30–45 postoperative days.

Eleven patients (40.7%) had postoperative complications. Four patients (14.8%) had complication with 7 days of postoperative period. Seven patients (25.9%) had complications 14 days postoperatively. Table 3 demonstrates the frequency of complications in 7 and 14 postoperative days. Hematoma was seen in two patients (7.4%) and in one patient surgical irrigation and hemostasis was required. Venous hypertension was also seen in four patients (14.8%) and in one patient ligature of fistula was required. Distal neuropathy was seen in three patients (11.1%). The neuropathy was presented by paresthesia of forearm.

## 4. Discussion

The choice for proper VA is AVF and is mainly radial-cephalic and brachial-cephalic anastomoses. However, some patients require more proximal access due to their inability to maintain a