

Two Stage Brachio-Basilic Transposition Fistula Provides Superior Patency for Chronic Haemodialysis: Our Experience in SIMS/ SHL

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ABSTRACT

Background: Adequate vascular access is of utmost importance for hemodialysis treatment. Upper arm fistulae, obesity and deep or tortuous veins may impair cannulation and can cause significant complications and inconvenience for the technicians and patients. **Objective:** We intended to present the technique of superficialization (transposition) of the brachio-basilic fistula (BBF) and its clinical outcome regarding patency & complications. **Materials & Methods:** Twenty two brachio-basilic fistulas were fashioned in 20 patients between October 2010 to November 2011. The second stage superficialization (transposition) was carried out at a median of 59.1 days (range: 40-90 days) after fistula formation

and involved mobilizing the arterialized basilic vein through a curved longitudinal incision on the antero-medial aspect of the arm and transposing it beneath skin. **Results:** During the study period 20 brachio-basilic fistulas (BBF) were fashioned in 20 patients. There were 8 (40%) males and 12 (60%) females. The mean age was 53.45 years \pm 12.34 years (range: 21-70 years). The patency rates were 90% at 6 months. Surgical complications of transposition were infection in 2 (10%) patients and lymphocele in 4 (20%) patients. **Conclusion:** Transposition of brachio-basilic fistulas is technically feasible and relatively safe procedure. Patency rates at 6 months are excellent. **Key words:** Arteriovenous Fistula, Brachio-basilic fistula, Haemodialysis, Transposition

INTRODUCTION

The brachio-basilic fistula is the third preferred kidney disease outcome quality initiative (KDOQI) option.¹ Unfortunately not all haemodialysis patients are able to have a distal forearm fistula (Brescia-Cimino Fistula) because of small diameter, diseased or absent peripheral arteries and veins. Consequently, a secondary or tertiary access site is commonly required. Many of these individuals no longer have adequate superficial veins for direct arteriovenous fistula (AVF) construction and require transposition of an otherwise inaccessible basilic vein.

AV fistula is preferred over an arteriovenous graft (AVG) for chronic haemodialysis access because it has advantage of a higher patency rates than that of prosthetic grafts and a lower infection rate.^{2,3} Basilic vein is long, lies deep and free of puncture with a relatively large diameter and higher venous flow with high patency and maturation rates. It also leaves a chance to use the ipsilateral axillary vein for implantation of a synthetic graft after failure of basilic vein transposition.⁴ However basilic vein transposition (BVT) is a time consuming and technically challenging procedure with significant perioperative morbidity due to long incisions and extensive surgical dissection.⁵

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MATERIALS AND METHODS

We performed 20 BBF with superficialization (transposition) for 20 patients from October 2010 to November 2011. Inclusion criteria for brachio-basilic fistula creation include, primary

forearm AVF dysfunction, diabetic and obese patients. Surgery was performed in two stages. Brachio-basilic fistula was made as first stage and later vein transposition was carried out on antero-medial aspect of the arm by curved longitudinal incision bringing the vein beneath the skin. All patients had pre- and post-operative Doppler Ultrasonogram of the operated vessels.

Follow-up information was obtained for 6 months from patient's dialysis technician. Death with a functioning fistula was considered loss to follow up when course of death was not related to fistula.

Table 1: Patients demographics and clinical characteristics

Gender:	No. (%)
Male	8 (40%)
Female	12 (60%)
Age (Years)	53.45±12.34. Range: 21-70
Weight (Kg)	88.95±15.40. Range: 70-135
Etiology of Chronic Kidney Disease.	No. (%)
Diabetes	9 (45%)
Hypertension	6 (30%)
Chronic Glomerulonephritis	4 (20%)
Polycystic kidney disease	1 (05%)

SURGICAL TECHNIQUE

Anatomy

The basilic vein starts as a superficial vein of the forearm and communicates with cephalic vein at the level of cubital fossa. It continues superiorly and medially into a relative superficial location for a short distance; however it soon dives below the brachial fossa where it continues as axillary vein. The basilic vein, brachial artery and median nerve lie in the groove medially between biceps and triceps. The deep location and close proximity of the aforementioned nerves make it unsuitable for repeated access in its native location.

First step:

The basilic vein and brachial artery were isolated through a curvilinear incision in the antecubital fossa. The communicating branch to cephalic vein was ligated.

A side to side anastomosis between brachial artery and basilic vein was created using 6.0 monofilament, non absorbable sutures and skin was closed with interrupted sutures. Surgery was performed under local anesthesia. Maturation of fistula was followed clinically by a palpable thrill or audible bruit. After 4-6 weeks a Doppler USG was done to assure patency and caliber of the fistula.

Second step:

The patients were asked to return to the operating room after 6-8 weeks. The operating site now includes the whole arm from the axilla down. The procedure was performed using general or regional anesthesia. The arterialized basilic vein was palpated and a longitudinal incision was made 2 cm above the arteriovenous anastomosis along the course of the basilic vein. Branches were ligated or sutured and care was taken to avoid traction or injury to the nerves. Mobilization was carried out almost into the axilla. Subcutaneous tract was created over the anterior upper arm from the cubital fossa to axilla by cutting the fat and bringing it below the mobilized basilic vein. Care was taken to avoid any tension and kinking. The wound was closed in layers. Although this superficialized fistula could be used immediately, we preferred to wait for 02 weeks before first cannulation thus allowing fibrous tract to develop around the superficialized vein.

RESULTS

During 13 months (from October 2010 to November 2011), 20 BBF were fashioned in 20 patients. There were 8 (40%) males and 12 (60%) females. The mean age was 53.45 ± 12.34 years (range: 21-70 years). The mean weight was 88.95 ± 15.40 kg (range: 70-135 kg). The cause of end stage renal disease was: Diabetes in 9 (45%) patients, HTN in 6 (30%), chronic glomerulonephritis in 4 (20%) and polycystic disease in 1 (5%) patient. Prior to the creation of AVF 18 patients (90%) were being dialyzed through Internal Jugular Catheter. All patients had brachio-basilic fistulas. The indication for the procedure was failure to develop (mature) in 14 (70%) and failure to prick in the rest of the patient. Post-operative complications observed were infection in 2 (10%) patients and lymphocele in 4

(20%). The time interval between first and second stage was 59.1 days (range: 40-90 days). The mean interval between superficialization and first cannulation was 18.15 days (range: 14-22 days). No death was related to the operative procedure. The patency rate was 90% (n: 18) at 6 months. 2(10%) patients were lost to follow up.



Fig:1. Mobilized basilic vein and median nerve



Fig: 2 wound closure after transposition

DISCUSSION

As long term survival of patients on hemodialysis improved due to better improved medical care and haemodialysis efficiency, more patients require secondary and tertiary vascular access. A significant number of these individuals have difficult access extremities due to complex medical illness and previous vascular access procedures. They often have a history of multiple intravenous catheter, diabetes, peripheral vascular

disease and female gender.^{6,7} The kidney disease outcome quality initiative clinical practice guidelines in vascular access recommends placement of autologous arteriovenous access in the following decreasing order of preference: radiocephalic arteriovenous fistula at the non-dominant wrist, brachiocephalic AVF at elbow, transposed brachial-basilic vein fistula and arteriovenous graft in the upper arm in suitable patients. Dagher described the utility of elevated brachial – basilic AVF in 1976.⁸ Since then there have been numerous studies commenting upon the utilization of this technique of superficializing a deep lying AVF thus making it easier to prick.^{9,10} Our study was designed to evaluate the success rates of transposition procedure in patients having brachio-basilic fistulas which either were difficult to cannulate or remained poorly developed after 6 weeks of formation in spite of having good function on Doppler Ultrasound examination. Our experience with this procedure suggests that this procedure may ensure excellent patency rates if undertaken in appropriate fashion.

Our patient cohort was elderly males and females with an average weight of around 90 kg. These patients were overweight (mean BMI: 29 Kg/m²) and 45% were diabetic. It is our experience that these patients have inadequate vessels especially cephalic veins and since they are overweight there is difficulty in pricking the fistula. These characteristics of our cohort were similar to those described by other authors.^{11,12}

Our cohort included 4 patients (20%) with failed radiocephalic AVF. These patients were operated for brachio-basilic AVF and transposition was carried out as a second stage procedure. Rest of the patients (n:16) had brachio-basilic fistulas made as first AVF. These patients reported difficult pricks and were planned for basilic vein transposition that was carried out at a mean of 59.1 days. All of these patients had adequate flow as evidenced by Doppler USG of the AVF prior to second stage procedure. Two stage brachio-basilic transposition procedures assures proper dilatation and thickening of the vein that makes dissection easy during transposition and resists damage during extensive dissections confirmed by a few studies.^{13,14} Koontz concluded that the fistulae created in two stage procedures have longer

patency rate compared to the ones performed in a single intervention[d10]. El-Mallah observed 90% patency in two stage procedure against 60% in single stage procedure.¹⁵ All of our patients were followed up and dialysis technicians were satisfied with good flow and easy pricking of fistula which was started at a mean of 18.15 days after second stage.

The complication rate as seen by us in our study was quite low (infection 10% and lymphocele 20%) that is comparable to internationally published data.^{16,17,18} It must be remembered that these are easily managed complications and usually do not have long lasting effects as seen in our patients where all of the patients were able to gain function of the AVF soon after transposition procedure. Furthermore failure of a brachiobasilic fistula does not prohibit subsequent use of prosthetic graft at the same site. Matsuura successfully placed a prosthetic graft in 89% of their patients with failed brachiobasilic fistula.¹⁹

The main limitation of our study was the lack of a comparison population. We would have liked to compare transposed AVF with AVG however the cost restraints and consideration that we deal with patients coming from the lowermost socioeconomic strata barred this attempt. We were also unable to eliminate surgeon bias as all of the transposed AVF were created after failure of the primary access or inability to prick a working fistula.

CONCLUSION

Our experience with transposed BBAVF suggests that procedure is a high yield and safe if done by experienced surgeons. However we would like to suggest comparison of transposed AVF with AVG as further research protocol.

REFERENCES

1. National kidney Foundation: KDOQI Clinical Practice guidelines and clinical practice recommendations for vascular access. *Am J Kidney Dis* 2006, 48:176-322.
2. Coburn MC, Carney WI. Comparison of basilica vein and polytetrafluoroethylene for brachial arteriovenous fistula. *J Vasc Surg* 1994; 20:896-904.
3. Polkinghorne KR, Chin GK, Mac Ginley RJ, Owen AR, Russell C, Talaulikar GS et al. KHA. CARI guideline: Vascular access-central venous catheters, arteriovenous fistulae and arteriovenous grafts. *Nephrology* 2013; 18:701-5.
4. Lee CH, Ko PJ, Liu YH, Hsieh Hc, Liu HC. Brachiobasilic fistula as a secondary access procedure. An alternative to a dialysis prosthetic graft. *Chang Gung Med J* 4004; 27:816-23.
5. Oliver MJ, McCann RL, Indridason OS, Butterly DW, Schwab SJ. Comparison of transposed brachiobasilic fistula to upper arm graft and brachiocephalic fistula. *Kidney Int* 2001;60:1532-9.
6. Miller PE, Tolwani A, Luscy CP, Deierhoi MH, Bailey R, Redden DT, et al. predictors of adequacy of arteriovenous fistula in hemodialysis patients. *Kidney Int* 1999; 56:275-89.
7. Roberts JK, Sideman MJ, Jennings WC. The difficult hemodialysis access extremity: proximal radial arteriovenous fistula and the role of angiography and valvulotomes. *Am J Surg* 2005; 190:869-73.
8. Dagher F, Gelber R, Ramos E, Sadler JR. The use of basilica vein and brachial artery as an AV fistula for long-term hemodialysis. *J Surg Res* 1976; 20:373-6.
9. Shemesh D, Olsha O. Transposition of the brachial vein: A new source for autologous arteriovenous. *J Vasc Surg* 2005; 41:1080-1.
10. Dorobantu LF, Stiru O, Iliescu VA, Novelli E. The brachio-brachial arteriovenous fistula: a new method in patients without a superficial venous system in the upper limb. *J Vasc Access* 2006;7:87-9.
11. Allon M, Robbin ML. Increasing arteriovenous fistulas in hemodialysis patients: problems and solutions. *Kidney Int* 2002;62:1109-24.
12. Hakaim AG, Nalbandian M, Schott T. Superior maturation and patency of primary brachiocephalic and transposed basilic vein arteriovenous fistulae in patients with diabetes. *J Vasc Surg* 1998; 27:154-7.
13. Angle N, Chandra A. The two-stage brachial artery-brachial vein autogenous fistula for

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- hemodialysis: an alternative autogenous option for hemodialysis access. *J Vasc Surg* 2005;42:806-10.
14. Dix FP, Khan Y, Al-Khaffaf H. The brachial artery-basilic vein arteriovenous fistula in vascular access for haemodialysis- a review paper. *Eur J Vasc Endovasc Surg* 2006; 31:70-9.
 15. El-Mallah S. Staged basilica vein transposition for dialysis angioaccess. *Int Angiol* 1998; 17:65-8.
 16. Taghizadeh A, Dasgupta P, Khan MS, Taylor J, Koffman G. Long term outcomes of brachio-basilic transposition fistula for haemodialysis. *Eur J Vasc Endovasc Surg* 2003; 26:670-2.
 17. Agarwal A, Mantell. M, Cohen. R, Yan. Y, Trerotola, Clark TW. Outcomes of single-stage compared to two-stage basilica vein transposition fistulae. *JVIR* April 2013;24:579
 18. Kim CA, McLean S, Swearingen MA, Graziano DK, Hirschl B R Two-stage basilica vein transposition- a new approach for pediatric dialysis access. *January* 2010;45:177-184.

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