

## BASILIC VEIN TRANSPOSITION FOR MULTIPLE FAILED ARTERIOVENOUS FISTULAS - OUR EXPERIENCE

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### ABSTRACT

#### BACKGROUND

The National Kidney Foundation- Dialysis Outcomes Quality Initiative Guidelines recommend primary use of autogenous arteriovenous access in patients of chronic renal failure waitlisted for haemodialysis. In spite of troublesome comorbidities associated with BVT, it is still the most preferred technique when autologous veins are not available to construct radiocephalic or brachiocephalic fistula. The present study highlights our experience with BVT with small incision technique over a period of three years with excellent outcome.

#### MATERIALS AND METHODS

This retrospective study included all the patients who underwent BVT at our tertiary care center between August 2013 and August 2016. It was performed in patients with failed previous RCF or BCF or who had small caliber or thrombosed cephalic veins. The patients with minimum 3 mm basilic vein diameter on Doppler were only included in the study. A 3-cm horizontal incision was made in antecubital fossa to expose brachial artery and basilic vein. Multiple longitudinal separate second skin incisions (2-3 cm) were made to explore proximal part of basilic vein. Side branches of the vein were isolated and ligated. The divided basilic vein in antecubital fossa was brought over fascia through newly-created subcutaneous tunnel followed by end-to-side anastomosis.

#### RESULTS

A total of 30 (20 males and 10 females) underwent BVT in the three years period. The mean fistula maturation time was 40 ± 10 days. Maturation rate was 100% and the postoperative flow rate was 280 ± 22 (mL/min.). No bleeding, thrombosis, failure, pseudoaneurysm or rupture occurred in our patients. Arm oedema occurred in 6 (20%) patients, infection in 4 (13%) and lymphorrhoea in 5 (17%). The mean follow-up was six months.

#### CONCLUSION

BVT is an alternative method with excellent initial maturation and functional patency rates requiring less extensive skin incision and surgical dissection. It is the most durable haemodialysis access procedure for those patients having multiple forearm AVF surgeries.

#### KEYWORDS

Basilic Vein, Transposition, Radiocephalic, Brachiocephalic, Fistula.

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#### BACKGROUND

With increasing prevalence of End-Stage Renal Disease (ESRD), the number of patients requiring Haemodialysis (HD) has been increasing worldwide. The most frequently used method for HD in these patients is Arteriovenous Fistula (AVF). Brescia et al<sup>1</sup> first introduced autologous vascular access for haemodialysis in 1966. Ideal haemodialysis accesses are radial to cephalic Arteriovenous Fistula (AVF) or brachial to cephalic AVF. Transposed basilic vein to brachial artery arteriovenous fistula was introduced in 1976 by Dagher et al<sup>2</sup> and reported again in 1996<sup>3</sup> by him.

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The Kidney Disease Outcome Quality Initiative (KDOQI) recommends autologous radiocephalic or brachiocephalic AVF as a primary method of choice in HD patients, but for the patients with failed radiocephalic/brachiocephalic fistula or with smaller caliber superficial veins, vascular access becomes difficult. Therefore, the Basilic Vein Transposition (BVT) as a secondary option is recommended in those patients.<sup>4,5</sup> The BVT is a time consuming and technically-challenging procedure with significant perioperative morbidity due to long incisions and extensive surgical dissection.<sup>6</sup> The conventional BVT requires long incision over the medial aspect of the arm to dissect the basilic vein up to axillary vein. It is then cut in the cubital fossa and transposed into the subcutaneous tissue by multiple small incisions to perform the end-to-side basilic vein and brachial artery anastomosis. In our institute, we used two to three small incisions to dissect the basilic vein and then it is tunneled into the subcutaneous tissue over the fascia. This retrospective study aims to evaluate the patency and

complication rates of BVT performed with this small incision technique.

## MATERIALS AND METHODS

This is a retrospective study including all the patients who underwent BVT at King George's Medical University, Lucknow, between August 2013 to August 2015. The BVT was done in those patients who had either failed previous RCF or BCF or who had small caliber or thrombosed cephalic veins. We did colour Doppler of the upper limb before surgery of all the patients before the surgery. The minimum vein diameter of 3 mm was taken up as a cut-off value to undergo this procedure. All the patients underwent one-stage BVT where a 3 cm horizontal incision was made two fingers above the antecubital fossa to expose the brachial artery and basilic vein. Multiple longitudinal separate second skin incisions (2-3 cm) were made to explore proximal part of basilic vein. We used portable Doppler to identify artery and vein, so as to limit the incision size. The side branches of the vein were isolated and ligated. The basilic vein was divided near the antecubital fossa and brought over fascia through the newly-created subcutaneous tunnel. The subcutaneous tunnel was created with the help of sharp metallic guide of Romo Vac suction drain and then tract dilated with straight long artery forceps. The end-to-side anastomosis of basilic vein was done with brachial artery with 7-0 Prolene (Figure 1). All the patients were evaluated for the patency rates and complications for six months.

## RESULTS

A total of 30 (20 males, mean age (46.2 ± 16) and 10 females, mean age (43.6 ± 10)) patients underwent BVT in 3 years at our institute from August 2013 to August 2016. Out of all the patients, 13 (43%) were previously operated on at our institute and 17 (57%) patients with failed AVF surgery were referred at our tertiary care. The characteristics of the patients including mean age, duration of ESRF, number of AVFs, patency duration, comorbidities and diameter of the basilic vein and brachial artery are shown (Table 1). The mean operative time for BVT was (180 ± 10 min.). The patients were followed for six months.

The fistula maturation rate was 100% and the mean postoperative flow rate was (285 ± 20 mL/min.). The patency was observed at discharge at six weeks and six months. There was no primary failure in these patients. The mean maturation time was 42 ± 10 days. Six (20%) patients had arm oedema and four had infections (13%), which were treated with arm elevation and antibiotics. There were 5 (17%) patients who had lymphorrhoea, which completely stopped in a month with conservative management, including aspiration and dilute Betadine instillation. No bleeding, thrombosis, failure, pseudoaneurysm or rupture occurred in our patients.

| Variables                          | BVT (n=30)            |
|------------------------------------|-----------------------|
| Gender (M/F)                       | 20:10                 |
| Mean age (years, male:female)      | 46.2 (±16):43.6 (±10) |
| ESRF duration                      | 21.2 (±4) months      |
| Previous failed AVF (outside)      | 17 (57%)              |
| Hypertension                       | 24 (80%)              |
| Diabetes mellitus                  | 22 (74%)              |
| Heart disease                      | 8 (27%)               |
| Peripheral vascular disease        | 5 (17%)               |
| Smoking                            | 10 (33%)              |
| Mean basilic vein diameter (mm)    | 3.42 ± 1.4            |
| Mean brachial artery diameter (mm) | 3.62 ± 1.2            |

**Table 1. Demographics of the Patients**

BVT- Basilic vein transposition, ESRF- end-stage renal failure, AVF- Arteriovenous fistula.

## DISCUSSION

The establishment and maintenance of haemodialysis vascular access for the ESRD patient is a costly modality with significant associated morbidity.<sup>7</sup> AVF surgery to supply extracorporeal blood flow during HD has been performed for many years.<sup>8</sup> According to the National Kidney Foundation's KDOQI, "Radiocephalic (RC) and Brachiocephalic (BC)" fistulae should be the first and second choices for vascular access, respectively, and in the absence of adequate veins or after failed RC/BC access, a brachio basilic fistula or arteriovenous graft should be considered. BVT was first described in 1976 and has been increasingly accepted as a viable option for secondary or tertiary vascular access.<sup>9</sup> BVT has advantages, because it does not use prosthetic graft, only one vessel anastomosis is needed and can use a prosthetic graft in the same arm, if the AVF fails. Its disadvantages include the possibility of damaging the vein when being isolated, large skin incisions, wound complication, damage to median and musculocutaneous nerves due to heavy dissection and long maturation time.

Although, the perioperative morbidity associated with BVT is higher. It is increasingly the access procedure of choice when a superficial arm vein is unavailable. The conventional BVT required longer incisions, but with modified technique of 2 to 3 small incisions for dissecting the basilic vein and then tunnelling it in the subcutaneous plane, the morbidity is minimal in our series. To improve the result of BVT, we have incorporated various technical modifications such as- making the anastomosis under loupes magnification (2.5-4) with the aid of a head light, superficialisation as well as transposition of the basilic vein preventing angulation, while doing anterolateral transposition, hydrodistending the vein to increase its lumen diameter and to identify any leaks and the use of a suction drain to prevent seroma formation.

In a single-stage procedure, basilic vein can easily twist during tunnelling and cause immediate thrombosis or stenosis in the vein near the axillary and basilic junction (swing point), but no such event encountered in our series during tunnelling. Few studies in the literature have compared different techniques for BVT.<sup>10,11,12</sup> Kakkos et al<sup>12</sup> compared one stage and modified two-stage BVT and found

fistula maturation was 85.5% in Group 1 and 81.6% in Group 2. They concluded that there was no significant difference between the groups. In this study, all the patients underwent single stage BVT with better fistula maturation rate.

Reported complication rate for BVT remains high (between 47% and 71%) when long incisions were used to dissect the vein,<sup>13</sup> but this can be reduced with technique of transposition with small incisions. The complications in this study were lymphorrhoea in 28%, infection in 17%, oedema in 33% and haematoma in 6%, which probably were due to the excess dissection, but all were managed conservatively. Early postoperative acute arm swelling is a combination of the larger dissection coupled with the higher venous flow seen after BVT.<sup>14</sup> The oedema may hamper successful needling of the AV fistula. The lymphorrhoea resulting from lymphoedema due to extensive dissection was managed with arm elevation. Few of the patients required intermittent aspiration and dilute Betadine instillation. The postoperative wound infections occurred mostly in diabetic patient, but were successfully treated with daily dressings. Almost, all the patients had resolved oedema and lymphorrhoea by the time of maturation of fistula. Thus, early complications do not seem to have any impact on fistula outcome. There was no thrombosis, failure, rupture or pseudoaneurysms that occurred in our patients.

The main limitations of the study are the retrospective design, short follow-up time and the mean diameter of the basilic vein that underwent BVT was predetermined. It is well known that many factors influence fistula maturation,<sup>15,16,17</sup> but in terms of improving fistula outcome and technical success rates, the preoperative assessment of basilic vein quality and caliber using duplex ultrasound has been increasingly advocated.<sup>18</sup>

## CONCLUSION

In our experience, the BVT is technically feasible, safe, reproducible procedure and having excellent fistula patency. It is the most durable HD access procedure for those patients having multiple forearm AVF surgeries. With small incisions for exteriorisation and followed by subcutaneous tunnelling of the basilic vein, the operative complications are minimal as compared to conventional long incision technique.

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