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ORIGINAL ARTICLE

Great saphenous vein transposition to the forearm for dialysis vascular access; an under used autologous option?

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ABSTRACT

Purpose: **The recommended site for the next autologous vascular access in patients without suitable cephalic vein for fistula formation is basilic vein transposition. This study aims to compare outcomes from great saphenous vein transpositions to the forearm with that of basilic vein transposition. Comparison is reported in terms of primary and secondary patency, intervention, and complication rates in our unit.**

Method: **A retrospective search of a prospectively maintained vascular database identified 24 consecutive patients undergoing great saphenous vein transposition (GSVT) and 34 consecutive patients having basilic vein transposition (BVT) were included for comparison. Primary and secondary patency details were obtained from hospital case notes and dialysis unit review records. Patency was studied using a Kaplan Meier analysis and compared using log rank testing.**

Results: **No significant difference was identified in primary or secondary patency between the procedures (*P*=0.745). Primary patency at 6, 12 and 24 months: for GSVT this was 62%, 41%, and 20%; for BVT this was 44%, 32%, and 15% respectively. Secondary patency at 6, 12, and 24 months; for GSVT this was 75%, 50%, and 41%; for BVT this was 65% respectively. Requirements for intervention were similar between groups. Complications were more common in the BVT group.**

Conclusion: **Acceptable patency rates can be achieved using GSVT, thus adding another autologous option for upper limb dialysis access. Our results would suggest GSVT could be performed prior to BVT as the basilic vein may benefit from prior partial arterialization and can subsequently be used if GSVT fails.**

Key words: Basilic vein transposition, Long saphenous vein transposition, Vascular access

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INTRODUCTION

Hemodialysis requires a long-term method of vascular access, the quality and longevity of which is a key determinant of morbidity and mortality in this life prolonging therapy. Autologous arteriovenous fistulae (AVF) have been shown to be the preferred method of vascular access in terms of thrombosis, infection rates, and total cost of maintenance compared to prosthetic grafts or central venous catheters (1). The most common first choice site for AVF is the Brescia-Cimino radio-cephalic AVF (2) followed by the brachio-cephalic AVF. However, some dialysis candidates have a poor native cephalic vein usually because of multiple previous venepuncture or intravenous cannulation which will therefore preclude both radio-cephalic and brachio-cephalic AVF formation. Other patients will have had previous failed access procedures resulting in loss of the cephalic vein fistula sites. Most current guidelines recommend upper arm basilic vein transposition (BVT) as either a single or two stage procedure as the next autologous option (1, 3). This study aims to compare outcomes following great saphenous vein transposition (GSVT) to the forearm with results from BVT in patients lacking suitable cephalic vein AVF sites. Outcomes are recorded in terms of primary and secondary patency, intervention, and complication rates.

MATERIALS AND METHODS

We prospectively maintain a vascular surgical procedure database within our unit for audit and research purposes. A retrospective search was performed and identified a series of 24 patients who had undergone GSVT since August 1997. Thirty-four consecutive patients undergoing BVT were identified from the same period to act as a comparison group. Patient medical case notes and dialysis unit records were gathered for review. Patient details including demographics, previous access procedures, renal pathology, and past medical history were collected.

Data regarding the procedure of interest, complications, interventions and the date and cause of fistula loss were then recorded. Primary and secondary patency was calculated in months from procedure for analysis. Data was entered into a Microsoft excel spreadsheet and statistical analysis performed using SPSS (SPSS 16.0.2 for Windows, April 2008. Chicago: SPSS Inc). Patency was studied using a Kaplan-Meier analysis and compared using log rank testing. Chi-squared testing was used for comparisons between groups.

Surgical procedures

Autogenous radial-anticubital forearm great saphenous vein transposition (GSVT); was performed using a great saphenous vein graft to form the needled part of a fistula between the radial artery at the wrist and the cubital or basilic vein at the anticubital fossa. Under general anesthetic, the radial artery was identified through a longitudinal incision overlying the palpable pulse at the wrist and the anticubital or basilic vein through a transverse incision in the anticubital fossa. A suitable length of harvested great saphenous vein was placed in a superficial and slightly lateral tunnel between the incisions and anastomosed to the vessels. Variations include using the great saphenous vein as a conduit between the brachial artery and either the basilic or proximal cephalic vein as an upper arm fistula.

Single stage autogenous brachial-basilic vein upper arm transposition (BVT) was performed using a technique similar to that in the original description by Dagher et al (4) between the basilic vein and the brachial artery at the level of the anticubital fossa. Under general anesthetic, a longitudinal incision from the anticubital fossa extending up the medial aspect of the arm was made, through which a length of basilic vein was completely mobilized. The brachial artery was then located through the distal end of the incision if possible or a second incision made if necessary. The basilic vein was then tunneled superficially through a curved, antero-lateral path and the anastomosis performed as distally as possible.

RESULTS

The number of patients in each group along with the mean age, proportion of men and the presence of diabetes or arteriosclerotic disease are shown in Table I. Patients with medical histories including documented transient ischemic attacks, cerebrovascular events, angina, myocardial infarction or claudication were considered to have pre-existing atherosclerotic disease. Cases of diabetes and arteriosclerosis did not significantly differ between the groups on Chi-squared testing.

Previous access attempts were not made in 17 patients in the study because of poor superficial veins in the upper limbs (5 GSVT, 12 BVT). Seven patients had commenced continuous ambulatory or automatic peritoneal dialysis in preference to hemodialysis due to perceived difficulty in creating vascular access. The numbers of previous access procedures performed within each group are summarized in Table I.

Patency

Primary and secondary patency rates for the fistulas/grafts are shown as Kaplan-Meier analysis curves (Figs. 1 and 2 respectively). *Primary patency at 6, 12 and 24 months:* for GSVT this was 62%, 41%, and 20%; for BVT this was 44%, 32%, and 15%. *Secondary patency at 6, 12, and 24 months;* for GSVT this was 75%, 50%, and 41% and for BVT this was 65%, 47%, and 21% respectively.

No significant difference in primary (P=0.843) or secondary (P=0.745) patency was identified between the groups on log rank testing.

TABLE I - INCIDENCE OF CO-MORBIDITIES AND PREVIOUS ACCESS AS WELL AS INCIDENCE OF COMPLICATIONS OR INTERVENTIONS REQUIRED TO MAINTAIN PATENCY. (ARTERIOSCLEROTIC DISEASE RECORDED IF DOCUMENTED TIA, CVA, MI, ANGINA, OR PVD)

Comparison of patient groups in study		
	GSVT	BVT
Number	24	34
Mean Age (range)	53 (29-82)	57 (24-84)
Men	14 (58%)	17 (50%)
Diabetic	4 (16%)	9 (26%)
Arteriosclerotic disease	7 (29%)	12 (35%)
No previous access	5 (21%)	12 (35%)
1 previous access procedure	8 (33%)	11 (32%)
2 previous access procedures	4 (17%)	6 (17%)
3 or more previous procedures	4 (17%)	1 (3%)
Previous CAPD only	3 (13%)	4 (11%)
Failure to mature/Early failure	2	3
Wound collection/breakdown	1	8
Steal	0	1
Distal Neuralgia	0	1
Limb swelling	0	2
Angioplasty	6	10 (2 Stents)
Thrombectomy/Thrombolysis	3	1
Revision surgery	0	1

BVT, basilic vein transposition; CVA, cerebral vascular accident; GSVT, great saphenous vein transposition; MI, myocardial infarction; PVD, peripheral vascular disease; TIA, transient ischemic attack

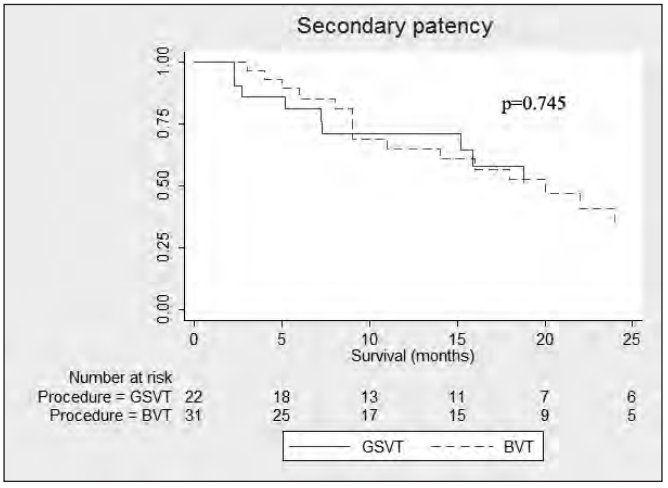

Fig. 1 - *Cumulative survival curve for secondary patency in the two procedures. No significant differences between groups (P=0.745).*

Complications

In the GSVT group there was a single recorded complication of surgery (4%) in the form of a great saphenous vein harvest site non-infected seroma.

In the BVT group 12 cases (35%) had a documented complication following surgery. Six patients had excessive bleeding or wound hematoma in the early post-operative period (2 of whom returned to theater) and 2 patients suffered wound breakdown. One patient complained of distal neuralgia post-procedure. During the lifespan of the fistulas, 2 patients complained of limb swelling, and there was 1 case of steal syndrome. One patient suffered a short episode of cellulitis secondary to needling which was successfully treated with oral antibiotics.

Interventions and mode of failure

Two of the GSVT grafts failed to mature into a useable fistula (8%). There were 6 angioplasties, 2 thrombolysis interventions and a thrombectomy performed to maintain patency in this group. When the study was performed, 10 grafts had failed because of thrombosis, 9 had remained patent until the time of transplant or patient death and 3 remained in use as the primary route of vascular access.

Three BVT patients suffered an early failure (9%). To maintain patency in the BVT group there were 10 angioplasties, 2 with stent insertion. One patient required a thrombectomy and 1 underwent a revision of the anastomosis due to stenosis. At the time of the study, 10 BVT fistulas were still in use as the primary dialysis access route, 7 remained patent until the time of transplant or patient death, 1 patient converted to CAPD with a patent fistula and 16 had failed due to thrombosis.

Fig. 2 - *Intraoperative image showing configuration of graft 1&2 radial artery and distal end of saphenous graft respectively in end-to-side anastomosis; 3&4 proximal end of saphenous graft and basilic vein respectively in end-to-end anastomosis.*

DISCUSSION

Approximately 110 new patients per million commenced dialysis in the UK in 2007 and the numbers are steadily rising over time (5). The UK has an increasingly elderly population and the incidence of obesity and diabetes is also climbing (6). Due to improving management of co-morbidities and kidney replacement therapy patients are also surviving longer on dialysis and it is likely that the combination of all these factors may lead to greater numbers of dialysis patients requiring more complex vascular access procedures in the future.

This study has not demonstrated any significant difference between two autologous complex access procedures in terms of primary and secondary patency. Our secondary patency results for BVT were slightly lower than those of previously published case series (7-9) although it is possible that publication bias may have contributed to our results comparing poorly to those in the literature.

Given that the indication for these procedures is the lack of suitable superficial vessels, it would seem logical that other vessels may be of similar poor quality and that this may affect outcomes. Indeed, 34% of patients included in this study had GSVT or BVT as their primary access procedure, suggesting that lack of or poor quality native superficial veins at first presentation was a significant indication in our series.

Present published guidelines recommend autologous options in preference to prosthetic grafts due to reduced morbidity (1, 3, 10). The rate of complications in our GSVT group was only 4% compared to 35% in BVT and patency rates were not significantly different. Our data would therefore appear to support GSVT as a practical option when the cephalic vein is poor or absent. This strategy enables autologous access formation without altering upper arm vasculature, thus preserving upper arm sites for subsequent access procedures,

including BVT, should the GSVT fail. It is also conceivable that GSVT to the anticubital fossa may partially arterialize the basilic vein and affect success rates in subsequent BVT. It should be borne in mind that great saphenous vein transposition in creating a dialysis vascular access does sacrifice the vein, which excludes it's use as a conduit should the patient need subsequent coronary artery bypass surgery.

As a retrospective study, information on pre-operative evaluation of included patients and anatomic suitability is incomplete. Surgeon preference may also have introduced bias. Ideally a prospective randomized trial would be of value in determining the ideal management for this challenging group of patients; however, the limited patient numbers and multiple confounding factors in this patient group would make such a study difficult to perform.

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