

Vascular access using the superficial femoral vein

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ABSTRACT

Purpose: The superficial femoral vein (SFV) provides an alternative autologous conduit for fistula formation in patients who might otherwise require a prosthetic graft for hemodialysis (HD) access. The purpose of this study was to assess the results of this technique.

Methods: Patients who underwent formation of a SFV fistula were identified from a prospectively maintained database. Case notes were reviewed for details of the operation, complications, subsequent interventions, and to determine whether the fistula was used for vascular access.

Results: Fifteen patients (seven males, eight females; median age 53, range 28-72 yrs) were identified. Patients had a median of four (range 2-9) previous fistulae. In three patients, the mobilized SFV was transferred to the upper limb while 12 patients had lower limb fistulae. Twelve patients (80%) used their SFV fistula for HD. Eleven patients developed a wound complication (infection, dehiscence, hematoma or bleeding), with four patients returning to theater for formal exploration and three requiring application of a vacuum dressing. Two patients developed post-operative lower limb ischemia. Two patients died during a median follow-up time of 7 (range 1-27) months.

Conclusion: In selected patients who have exhausted conventional routes for vascular access the SFV fistula can be used for the maintenance of HD. There is, however, significant associated morbidity and repeated intervention is often required.

Key words: Femoral vein, Arteriovenous fistula, Kidney failure

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INTRODUCTION

Reliable vascular access is essential for hemodialysis (HD). Its creation and maintenance take time and effort and use considerable resources; access creation and complications account, respectively, for 5.3% and 12.7% of in-patient days in patients in their first year of renal replacement therapy in Scotland (1).

The arteriovenous fistula (AVF) is universally agreed to be the best form of vascular access. Several large observational studies have shown that patients with central venous catheters (CVCs), and to a lesser extent synthetic grafts (arteriovenous grafts, AVGs), are more likely to die than patients dialyzing via AVFs (2-5), although the assertion that access type is an independent risk factor for mortality has been challenged (6). Patients with CVCs are much more likely to be hospitalized than those with AV access (5). Use of a CVC is an independent risk factor for bacteremia (7).

One of the many challenges of vascular access surgery is the subset of patients with repeated access failures

who subsequently have limited usable veins for further AVF formation. In these circumstances there are a variety of potential options. A long saphenous vein thigh loop has been associated with wound problems, multiple stenosis, the need for repeated angiographic interventions and bleeding (8, 9). Prosthetic material can be used for AVG formation, but thrombosis and infection are important considerations.

An alternative and autologous conduit for an interposition fistula is the superficial femoral vein (SFV). The use of this conduit was first described in 2000 (10). These authors suggested that the large diameter and relatively thick walls of this vessel are useful characteristics, but they warned that harvesting the SFV is a time consuming procedure that has the potential for significant morbidity. There remains little published data describing the success of this fistula.

We have used the SFV for fistula formation in patients who have limited access options. The aim of this study was to review our experience and the outcome of these patients.

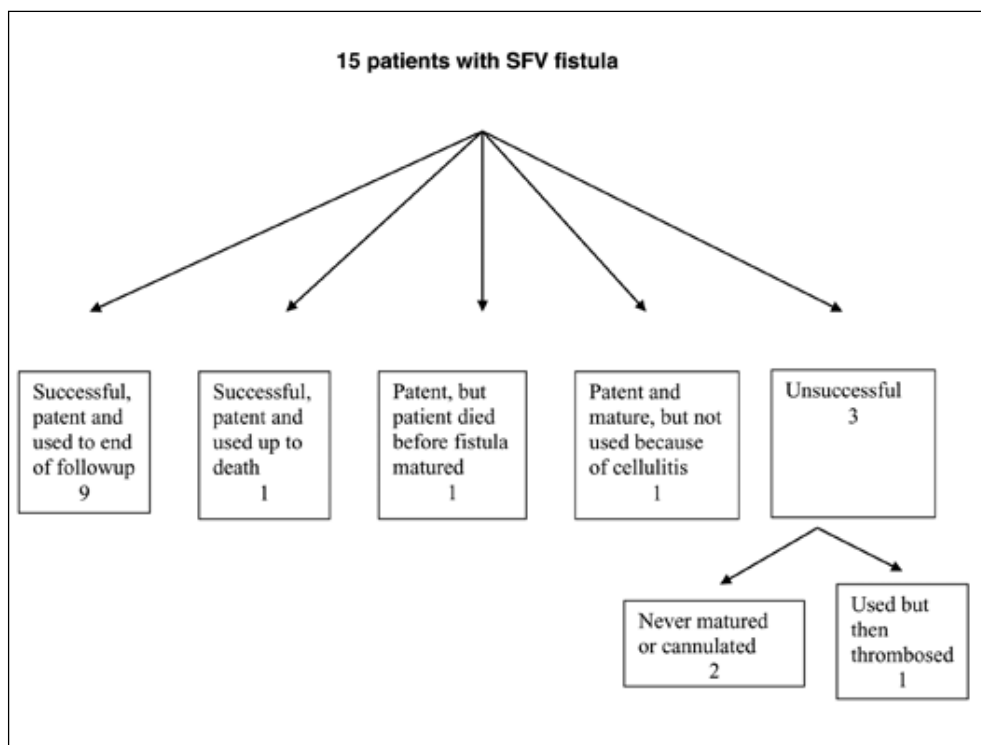


Fig. 1 - Fistula use and mortality at a median 7 (range 1-27) months following formation of the superficial femoral vein fistula.

15 patients with SFV fistula.

METHODS

Prior to the commencement of the study appropriate institutional approval was obtained. Patients who had undergone formation of a SFV fistula were identified from a prospectively maintained database.

Relevant information was obtained from eligible patients' casenotes. Where necessary these data were supplemented by obtaining data from other hospital information systems or by interviewing dialysis unit staff or patients.

Baseline demographic data and details of the operation, post-operative complications and subsequent operative or endovascular interventions were obtained. Fistula success was determined by patency and the ability to use it for dialysis. Details of previous AVF formation along with renal transplant surgery were also recorded.

RESULTS

Fifteen patients (seven males, eight females) with a median age of 53 (range 28-72) yrs were identified. These patients had a median of four (range 2-9) fistulae prior to their SFV operation. These previous procedures included upper and lower limb fistulae using both autogenous and prosthetic material.

In 12 patients the mobilized and transposed SFV was anastomosed to either the superficial femoral or popliteal

artery. In the remaining three patients the SFV was translocated to the upper limb to form a brachial artery to axillary vein fistula.

At the time of data collection patients had been followed for a median 7 (1-27) months. Figure 1 shows the outcome data for the 15. Two patients died in the follow-up period, one of whom successfully used the fistula up to death, while the other died before the fistula matured. Of the 13 surviving patients, nine successfully used their SFV fistula up to the end of the follow-up period. Of the remaining four patients, one used their fistula for HD, but the fistula was subsequently rested because of a wound infection, initial success was followed by subsequent fistula thrombosis in another and the fistula failed without being used in two. Figure 2 shows the secondary patency. Wound complications occurred in 11/15 patients and are detailed in Table I.

Two patients developed major ischemic complications in the early post-operative period. One, with a SFV to popliteal artery fistula, developed a steal syndrome resulting in an acutely ischemic leg. Given the considerable difficulties this patient had experienced with vascular access, it was felt inappropriate to ligate the fistula. The leg deteriorated and required below knee amputation 7 days after the formation of the fistula. The fistula remains in use. In the second patient the SFV fistula thrombosed acutely and was replaced with a prosthetic graft. The patient's leg immediately became ischemic as a result of steal and the prosthetic fistula required disconnection.

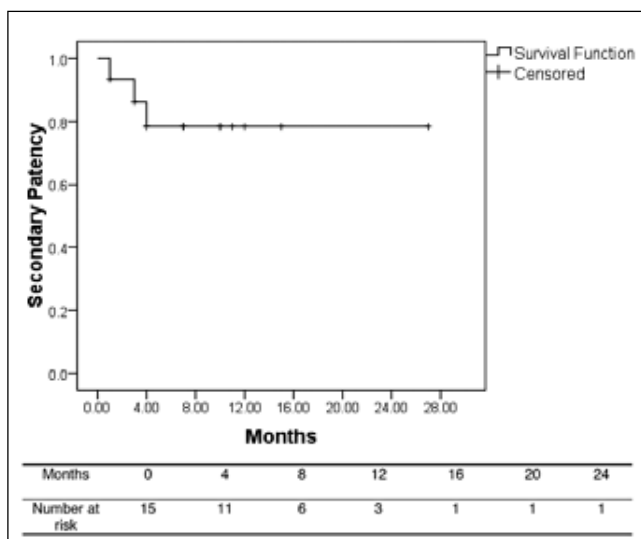


Fig. 2 - Kaplan-Meier survival analysis showing secondary patency of 15 superficial femoral vein fistulae at median follow-up of 7 (1-27) months.

TABLE I - THIGH WOUND COMPLICATIONS IN 11 PATIENTS

Wound Complication	Number of patients
Wound dehiscence requiring application of a vacuum dressing	3
Superficial infection	3
Seroma/collection requiring formal incision and drainage	2
Bleeding requiring re-suturing	1
Infection/dehiscence requiring debridement	1
Deep collection treated conservatively	1

DISCUSSION

The use of the SFV as a vascular access conduit is only considered in those patients who have exhausted conventional access routes and our results support this approach. However, we have found that SFV fistulae offer acceptable patency rates and the potential for medium-term maintenance of HD. Other studies describing the use of this technique (or a composite SFV/prosthetic conduit) have reported similar findings (11-13).

The SFV fistula has some attractive features. It is applicable to those who have superior vena cava or bilateral subclavian vein stenosis/occlusion. The entire surgical procedure can be performed under regional anesthesia (unless a brachio-axillary fistula is fashioned) and insertion of prosthetic material in the thigh is avoided.

It is, however, important to highlight the wound related morbidity encountered following this operation as described in this series and by others (11, 12). Wound problems will result in prolonged hospitalization and have considerable resource implications. More importantly wound complications can result in a delay to cannulation.

Acute limb ischemia is a recognized complication of this technique. Other authors have reported limb loss, steal and compartment syndromes (11, 12). This is clearly a catastrophic complication; however, patients being considered for this procedure have such limited vascular access options that taking this risk can be justified. It has been suggested that improved patient selection and intraoperative measures may reduce post-operative ischemia following SFV fistula formation (14).

One issue that this article is unable to address is at what stage a SVF fistula should be used. The major issue being whether this form of vascular access is preferable to an AVG, and whether it should be used before or after an AVG. A recent systematic review has suggested that SVF fistulae have better primary and secondary patency rates and a lesser rate of infective complications compared with femoral AVG (15). However, AVG usage was associated with a lower rate of ischemic complications. Further clinical trials are needed to further address this issue.

In conclusion, in selected patients who have exhausted conventional routes for vascular access the SFV fistula can be used for the maintenance of HD. The operation is associated with considerable morbidity and should only be performed by surgeons with appropriate vascular experience to manage the various complications, and who are fully supported by an appropriate team of nephrologists and interventional radiologists. Further work is necessary to determine better the indications for SFV fistula formation and its long-term patency.

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Conflict of interest: No author has a proprietary interest or other conflict of interest.

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