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Arteriovenous Prosthetic Graft: An Alternative in Patients with no Vascular Access for Hemodialysis - Our Experience

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Abstract

Background: A large group of patients with exhausted veins native arteriovenous fistula creation becomes is not possible and one has to consider the alternate methods of vascular access the prosthetic graft is an alternative with acceptable results.

Objective: To study the patency rates and complications associated with vascular access the arteriovenous prosthetic graft for hemodialysis. As native arteriovenous fistulas have been shown to be the superior means of repeated vascular access for hemodialysis.

Methods: The prosthetic graft was interposed between the deep vein (venous end) and to brachial or radial artery (arterial end) and was seated subcutaneously in the forearm after tunneling it through by means of a mid-forearm incision. Each patient was given a handmade diagram depicting, an inflow arterial and outflow venous limbs for the knowledge and exact cannulation by the hemodialysis staff.

Results: All the 30 patients were already on hemodialysis either on a neck line or a peripheral long line. (T) The mean operative time was 56 min (± 10 min).

All the 30 procedures were carried out without any bothersome intraoperative complication(s). Four (13%) patients required temporary gauze packing to tackle puncture bleeds in the graft material. Remaining 26 (86%) patients did not have any needle puncture bleeding. None (0%) of the patients had any major anastomotic bleeding or leaks on table.

On the next day of assessment, 2 (6.6%) patients had a small perianastomotic hematoma which required no surgical intervention. Six (20%) of the patients had cellulitis of the forearm which resolved within a week without any complications. Three (10%) patients developed infection of the wound with 1 (3.3%) necessitating graft removal and angioplasty under regional anesthesia. Four (13%) patients required single thrombectomy of the graft while as 1 (3.3%) patient required second thrombectomy and low dose anticoagulation.

Conclusion: Some of the patients with exhausted veins native AV fistula creation become impossible and one has to consider the alternate methods of vascular access. We studied 30 such patients who were not ideal for native AV fistula creation. Instead we resorted to synthetic loop graft fistulas and evaluated them for surgical outcomes and clinical utility.

Keywords: End stage renal disease; Hemodialysis; Vascular access; Arteriovenous

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Introduction

Patients of chronic renal disease with end stage nephropathy require periodic hemodialysis as a temporary or palliative therapeutics unless a renal transplant is considered and is done. Not all these patients maintain good venous architecture throughout their course of hemodialysis either due to repeated intravenous accesses or as a part of their primary renal disease and general debilitation and poor health. Arteriovenous (AV) grafts are required for hemodialysis access when options for native fistulas have been fully exhausted, where they continue to play an important role in hemodialysis patients, offering a better alternative to central vein catheters [1].

Native arteriovenous fistulas have been created in number of patients with very good patency rates and less complications. As of now native AV fistulas have been shown to be the superior means of repeated vascular access for hemodialysis. However in certain strata of patients with exhausted veins native AV fistula creation becomes impossible and one has to consider the alternate methods of vascular access. We studied 30 such patients who were not ideal for native AV fistula creation.

Instead we resorted to synthetic loop graft fistulas and evaluated them for surgical outcomes and clinical utility.

Material and Methods

We selected out 30 patients of CKD, ESRD who were referred to us for a vascular access. These patients were not amenable for conventional native AV fistula creation due to very small veins. The patients were evaluated both clinically as well as by USG Doppler for venous calibre and were only considered for loop AV graft after these patients were deemed not to have appropriate veins for AVF creation. The non dominant arm was selected for the loop fistula creation. A 20 cm PTFE venaflo graft was used to create a loop between the distal brachial artery and concomitant deep vein. All patients were administered a standard dose of unfractionated heparin 5,000 units before the artery was looped or clamped. The anastomosis was carried by 7-0 prolene with a 9 mm round body needle.

The loop graft was seated subcutaneously in the forearm after tunneling it through by means of a mid-forearm incision. Each patient was given a handmade diagram depicting an inflow arterial and an outflow venous limb for the knowledge and exact cannulation by the hemodialysis staff. The procedures were conducted on day care basis under local anesthetic infiltration and patients were discharged the same day after a short hospital stay.

The patients were assessed the next day and weekly thereafter for 8 weeks.

Inclusion criteria

1. Patients with clinically exhausted veins.

2. Patients with USG Doppler documented very small superficial veins.

3. Failed native AV fistulas with unfavorable veinous anatomy.

Exclusion criteria

1. All patients with favorable superficial veins, visible clinically.

2. All patients with USG Doppler documented good calibre veins.

Results

The mean age of our patients was 59 years with a range of 27 to 68 years. Among them, 8 were male and 22 were female patients. All the 30 patients were already on hemodialysis either on a neck line or a peripheral long line. (T)

The mean operative time was 56 min (± 10 min).

All the 30 procedures were carried out without any bothersome intraoperative complication(s). Four (13%) patients required temporary gauze packing to tackle puncture bleeds in the graft material. Remaining 26 (86%) patients did not have any needle puncture bleeding. None (0%) of the patients had any major anastomotic bleeding or leaks on table.

On the next day of assessment, 2 (6.6%) patients had a small perianastomotic hematoma which required no surgical intervention. Six (20%) of the patients had cellulitis of the forearm which resolved within a week without any complications. Three (10%) patients developed infection of the wound with 1 (3.3%) necessitating graft removal and angioplasty under regional anesthesia. Four (13%) patients required single thrombectomy of the graft while as 1 (3.3%) patient required second thrombectomy and low dose anticoagulation.

The mean patency rate at 6 months and one year was 68% and 54% respectively. Compared to it, primary patency at 1 year for forearm arteriovenous grafts ranges from 22% to 50% and secondary patency at 1 year ranges from 78% to 89% [2]. Lei W, Ji J, et al. [3] reported patency rates of 73 and 64% respectively at 1 and 2 years.

Discussion

The Arteriovenous Fistula (AVF) is recommended as the preferred hemodialysis access [2-4]. This access has been regarded as a lifeline for the patients with the end-stage renal diseases, and Arteriovenous Fistula (AVF) is the golden standard access for hemodialysis [1-3,5]. However, placing an AVF in all patients may result in poor access outcomes and increased Central Venous Catheter (CVC) use because of increased co-morbid conditions, age, and sub optimal vessels [2]. Although Arteriovenous Grafts (AVGs) for dialysis access have been applied to patients who were poor candidates for an arteriovenous fistula, durability after AVGs has been clinically suboptimal [6]. The optimal location (forearm or upper arm) and configuration (loop or straight) of AVGs are not known [5].

Ample pre-operative planning is essential to improved clinical success and the decision to place a graft at one location *vs.* the other should be based solely on previous access history, physical exam and appropriate venous imaging [7].

Prosthetic loop forearm arteriovenous grafts serve an alternate and a useful means of vascular access in patients with failed native AV fistulas and poor superficial venous anatomy. For patients who require a chronic hemodialysis vascular access, an AV graft may be an appropriate choice as initial hemodialysis access or as a secondary access if an AV fistula has failed to develop [8].

AV prosthetic loop is an unusual but effective and safe procedure that may be a good alternative for the patients who do not allow the conventional hemodialysis access [3,9].

The potential complications of cellulitis, thrombosis and graft infection need to be anticipated and dealt with timely interventions. Although additional salvage interventions may need to be considered in the patients with prosthetic graft implants, we may conclude that patients with poor forearm vessels do benefit from implantation of a prosthetic graft for vascular access [10].

Conclusion

Some of the patients with exhausted veins native AV fistula creation become impossible and one has to consider the alternate methods of vascular access. We studied 30 such patients who were not ideal for native AV fistula creation. Instead we resorted to synthetic loop graft fistulas and evaluated them for surgical outcomes and clinical utility.

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