

The importance of Emergency Approach to Early Failure of Arteriovenous Fistula in Patients with Chronic Renal Failure

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Abstract

Introduction: Arteriovenous fistula (AVF), first described by Brescia and Cimino (BC), remains the first choice as vascular access, for patients with chronic renal failure (CRF) who are candidates for hemodialysis. It is known as the best access for longevity and morbidity; however, primary nonfunction and early thrombosis are the most important reasons for failure.

Patients and Method: Of the 58 native AVF hemodialysis access surgery performed in our clinic between January 2014 and May 2019, the charts of five patients with early AVF failure were evaluated retrospectively. All operations were done under local anaesthesia and a standard BC shunt was created at the wrist region of nondominant arm. Primary nonfunction and early thrombosis rates were recorded, and the outcome after emergency salvage surgery was evaluated.

Results: Primary nonfunction and early postoperative thrombosis were seen to be the causes of early AVF failure in our series (n = 5, 8.6%). Four patients had primary nonfunction at the wrist region (no thrill sound heard) and a new AVF was created at more proximal region in the same surgical session (n = 4, 6.8%). In 3 of them, the new procedure was successful; however, in one patient, the second procedure was also failed due to narrow vein lumens (below 3 mm). One patient had early thrombosis at postoperative hour 6, and he underwent a second antecubital AVF surgery after failure of emergent thrombectomy procedure (n = 1, 1.7%).

Conclusion: Emergency salvage surgery in case of early AVF failure is mandatory to have a good result in patients with CRF.

Keywords: Arteriovenous Fistula (AVF); Early Failure; Primary Nonfunction; Thrombosis; Salvage Surgery; Emergency

Introduction

AVF should be planned at least two months before starting hemodialysis for proper maturation of vascular access. According to the guidelines of the National Kidney Foundation (NKF-K/DOQI), the site order for the surgical intervention of AVF is: wrist (radiocephalic or distal AVF), elbow (brachiocephalic or proximal AVF), arm (brachio basilic AVF with transposition) [1]. AVF created on the wrist is the gold standard as it is relatively simple to create and there is a low incidence of complications. The patency rate for distal access at 1 year varies from 50% to 90% [2].

The most frequent complications related to AVFs are primary nonfunction, early thrombosis, bleeding or hematoma, edema or ecchymosis, insufficient maturation of AVF, stenosis, late thrombosis, early or late infections, aneurysm, steal syndrome and high-rate flow AVF [3]. However, the main factor limiting fistula use is the primary nonfunction and early thrombosis. Therefore, the present study was designed to assess the frequency and characteristics of these complications of AVF in patients with chronic renal failure (CRF), and the outcome of emergent salvage surgery.

Patients and Method

A total of 58 native AVF surgical procedure was done between January 2014 and May 2019, by one staff general surgeon who is experienced in kidney transplantation and vascular access surgery. Demographics, AVF localizations, early failure rates and causes and overall results were recorded from the patient charts.

Physical exams of the vessels (peripheral pulse, follow-up of vein;s shadow on the skin and Allen test) were done in all patients, and only patients with inconclusive physical exam findings were requested preoperative color Doppler ultrasound for arm-mapping. All operations were done under local anaesthesia and a standard BC shunt was created at the wrist region of nondominant arm. Primary nonfunction and early thrombosis rates were recorded, and the outcome after emergency salvage surgery was evaluated. A standard S-shape 4 cm long incision at wrist and curvilinear shape 4 - 6 cm long incision at antecubital region were used. A proper vein with a diameter above 3 mm was chosen and prepared. Then, the fascia was opened and artery was found and prepared. All anastomoses were done with 6/0 or 7/0 polipropylene (prolene, Ethicon, USA). Venous distention, bruit on palpation of the anastomosis and thrill sound were our criterias of a successful AVF creation, and then the incision was closed with separated mattress sutures. In case of primary nonfunction, AVF was created at antecubital fossa at the same session.

Results

The patients had no previous vascular access surgery and all were in predialysis process (31 were women, 53.4% and 27 were men, 46.5). The mean age was 62 years (range, 46 - 81).

Primary nonfunction (n = 4, 6.8%) and early postoperative thrombosis (n = 1, 1.7%) were seen to be the causes of early AVF failure in our series (n = 5, 8.6%). Four patients had primary nonfunction at the wrist region (no thrill sound heard) and a new AVF was created at a more proximal region in the same surgical session. In 3 of them, the new procedure was successful; however, in one patient, the second procedure was also failed due to narrow vein lumens (all below 3 mm). One patient had early thrombosis at postoperative hour 6, and he underwent a second antecubital AVF surgery after failure of the emergent thrombectomy procedure.

The other early complications seen in our series were oozing type bleeding/hematoma (n = 3, 5.1%), arm edema/ecchymosis (n = 4, 6.8%) and infection (n = 3, 5.1%). All of these complications were responded well to the medical treatment. Late complications were seen to be aneurysm (n = 1, 1.7%) and steal syndrome (n = 1, 1.7%). Aneurysm was treated surgically with wall-plication procedure and AVF continued to work, but in other patient with steal syndrome, AVF was ligated.

During the mean follow-up period of 32 months (range 2 - 64), the patency rate of AVF in our series was 94%.

Discussion

While an AVF is the best available form of hemodialysis access, a significant number of fistula never mature to support dialysis (early failure) or fail after successful use (late failure). Salvage of early and late AVF failure is critical to minimize catheter use and is supported by the NKF-K/DOQI. Additionally, it is a powerful strategy to maximize AVF use in hemodialysis patients. Primary nonfunction, early or late vascular thrombosis, infection, venous hypertension, aneurysm, steal syndrome and cardiac failure are among the main complications related to AVF creation [3,4]. Recent studies report 70 to 90% of early patency rates for native AVFs, but there are other studies declaring disappointing ratios, such as 50 to 70% [5,6]. The patency rate of AVF in our series was 94% during a mean follow-up period of 32 months. In our opinion, the high success rate in our series is due to our adherence strictly to the guidelines of NKF-K/DOQI and our emergent surgical salvage procedures in patients with early AVF failures.

AVF patency depends on many factors such as the underlying disease (diabetes, hypertension etc.), age and anatomy of the patient and the surgical technique applied. However, the diameter of vein and/or artery is the most popular topic to be discussed in the current English-written literature [3,7]. In our opinion, the most important predictive criteria for a successful AVF function is the diameter of vein. To our experience, the diameter of vein is more important than that of artery, in contrast to the observation made by Schinstock, et al where the authors suggested that the major predictor of primary and secondary patency in their cohort study was artery size [7]. Depending on the results of our previous studies, we think that a vein with sufficient width (usually at or above 3 mm), venous distention

seen after declamping of the vessels, bruit felt on the operation table, and a very high-pitched thrill sound advancing along the vein have a direct relation with success of AVF operation [3]. Primary nonfunction and early thrombosis were only seen in our patients with narrow vein lumens (below 3 mm).

Similarly, in the present study, we found that primary nonfunction and early postoperative thrombosis were the most common causes of early AVF failure (8.6%). Four patients had primary nonfunction at the wrist region and a new AVF was created at a more proximal region in the same surgical session. In 3 of them, the new procedure was successful; however, in one patient, the second procedure was also failed due to narrow vein lumens (below 3 mm). One patient had early thrombosis at postoperative hour 6, and he underwent a second antecubital AVF surgery after failure of the emergent thrombectomy procedure.

Conclusion

In conclusion, emergency salvage surgery in case of early AVF failure is mandatory to have a good result in patients with CRF.

Conflict of Interest

No conflict of interest.

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