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Original Article

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Evaluation of the Impact of using Autologous Saphenous Vein as an Alternative to Hemodialysis Access in Hemodialysis-Dependent ESRF Patients

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Abstract

Background: The study investigates the use of autologous saphenous vein (GSV) as an alternative for hemodialysis in patients with End-Stage Renal Failure (ESRF), comparing it with Polytetrafluoroethylene (PTFE) grafts due to its flexibility and increased cost.

Methods: In 2024, a non-randomized clinical trial was performed on patients with chronic renal failure and ESRD. Participants were referred to Zakaria Clinic and Velayat Hospital in Mashhad and divided into two intervention groups: autologous saphenous vein implantation and artificial vein implantation. Clinical data were evaluated immediately after surgery, at six weeks, and three months post-surgery, and compared between the two groups.

Results: This study included 56 patients with chronic renal failure and ESRD, with a mean age of 55.3±13.99 years, and found no infection, seroma leakage, or hematoma. The findings indicated that there was no significant difference between the two groups in terms of access (χ^2=0.076; p=0.783). The artificial vein group reported only one case of vein perforation, pseudoaneurysm, hemorrhage, and ischemia, and two cases of edema, with no significant difference between the two groups. Three months after surgery, a significant difference was observed between the two groups in terms of thrombosis, with a higher rate in the artificial vein group (p=0.049). The artificial vein group experienced a significantly higher frequency of Arteriovenous Fistula (AVF) failure three months after surgery compared to the saphenous vein group (χ^2=0.076; p=0.783).

Conclusion: The study suggests that autologous saphenous vein transplantation is a more suitable option for hemodialysis-dependent ESRF patients due to its lower complications.

Keywords: Arteriovenous fistula, Chronic kidney failure, Hemorrhage, Polytetrafluoroethylene, Renal dialysis, Thrombosis

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Introduction

Chronic Kidney Disease (CKD) adversely affects the outcome of peripheral artery disease treatment (1). Patients with CKD are at increased risk for generalized atherosclerosis compared with those with normal kidney function. These effects are particularly severe in patients with Critical Limb-Threatening Ischemia (CLTI) and End-Stage Renal Disease (ESRD) (2,3). About 20% of these patients who suffer from Peripheral Artery Disease (PAD) have an almost double risk of developing CLTI, which can lead to death or amputation if left untreated (4).

Many patients with CKD are dependent on hemodialysis. Having adequate vascular access and its support is a determining factor in having effective hemodialysis. The best way to access blood vessels using an autologous Arteriovenous Fistula (AVF) is a simple and safe method for treating this patient, ensuring enough blood flow for hemodialysis, which leads to lower death rates, fewer health problems, and reduced costs for the patient (5,6). Vascular access is a lifeline for patients with ESRD who require hemodialysis and, in rare cases, Chronic Intestinal Failure (CIF) who require Parenteral Nutrition (PN). For short-term treatment, surgeons often use Central Venous Catheters (CVCs) for vascular access, but because there is a high chance of infection with CVCs in ESRD patients, AVFs are usually the better choice for long-term or lifelong treatment (1). An AVF is a surgical connection between the arterial and venous systems. The goal is to create an accessible vascular structure with sufficient blood flow that can be cannulated repeatedly to allow adequate hemodialysis or parenteral nutrition therapy.

As published in standard guidelines, the initial choice for AVF is the autogenous Radiocephalic AVF (RCAVF). If the quality of the peripheral vessels isn't good enough, doctors recommend using closer fistulas like the Brachiocephalic AVF (BCAVF) or the Brachiobasilic AVF (BBAVF) in the elbow and upper arm. When these options are not possible or access is unsuccessful, grafting as a vascular conduit can be considered to create an arteriovenous angioaccess. This procedure uses a looped or straight prosthetic material, mainly Polytetrafluoroethylene (PTFE), that acts as a conduit between the artery and vein (7). Many renal patients lack suitable autologous veins in the upper extremities for AVF construction for hemodialysis. Therefore, it is important to evaluate and compare alternative fistula options for patients. The Great Saphenous Vein (GSV) and the PTFE graft are both suggested as other options and have shown good short-term results as long as they stay open (8). Heparin-linked PTFE (He PTFE) grafts have previously proven their durability in femoropopliteal bypass surgery in both above-the-knee and below-the-knee positions. Some authors have also reported encouraging results for He PTFE in the subpopliteal position in the absence of a suitable autologous vein (9). Furthermore, there is a lack of information on the long-term outcomes of subpopliteal He PTFE grafting for patients with CKD.

Surgical revascularization is a treatment option for these patients, who are frequently characterized by diffuse atherosclerotic disease that often involves the subpopliteal vessels, immunodeficiency, susceptibility to infection, and poor wound healing (10). For these patients, previous studies have confirmed the advantages of autologous vein grafts over artificial conduits in terms of patency and limb salvage after lower limb bypass. The study compared limb bypass surgeries using autologous vein grafts with those using expanded PTFE bypass grafts. In this regard, the most commonly used is the GSV approach.

An increasing number of patients appear to require tibial bypass grafts for limb salvage because they do not have an adequate saphenous vein available. Several alternative conduits have been proposed, including the lesser saphenous vein, brachial vein, compound veins, compound vein with PTFE, and PTFE with or without distal AVF. Unfortunately, these alternative conduits have not yielded similar results when using distal bypass grafts to the tibial arteries. This finding has led some to advocate early amputation without attempting to salvage the limb in certain subgroups of patients (11). Given the limited flexibility of PTFE clamps, their high cost, and the high rate of disease progression, GSV may be the best option for patients with deep, inaccessible veins in the upper extremities (12). Due to the increasing number of patients requiring hemodialysis and the necessity for safe and reliable vascular access that ensures optimal long-term performance while minimizing

complications and enhancing the survival of hemodialysis patients, the GSV method has recently gained significant attention. The present study aimed to investigate the use of autologous saphenous vein as an alternative to hemodialysis access in dialysis-dependent ESRF patients alongside a control group with PTFE grafts.

Materials and Methods

Place and date of implementation

The place of implementation of the present study was Zakaria Clinic and Velayat Hospital in Mashhad. Data were collected in 2024.

Materials and equipment used/subjects

This design included a researcher-made checklist to collect and record data from patient records. The subjects included patients with chronic renal failure and ESRD who were candidates for autologous saphenous vein implantation or artificial vein implantation due to lack of vascular access in the form of AVF and who had been referred to Zakaria Clinic and Velayat Hospital in Mashhad for implantation of permanent dialysis access in 2024.

Study design

The present study was a non-randomized clinical trial that was conducted on patients with chronic renal failure and ESRD who were candidates for implantation of permanent dialysis access and who had been referred to Zakaria Clinic and Velayat Hospital in Mashhad in 2024.

Methods and implementation steps

The present study was a non-randomized clinical trial that was conducted on patients with chronic renal failure and end-stage renal failure who were candidates for autologous saphenous vein implantation or an artificial vein due to vascular insufficiency in the form of AVF and who had referred to Zakaria Clinic and Velayat Hospital in Mashhad in 2024.

The samples were collected using convenience sampling. After obtaining the necessary permits from the ethics committee, the patients were assigned to two groups using the permutation block method. The participants were divided into two intervention groups: autologous saphenous vein implantation or an artificial vein.

Study protocol

The entire study group was examined by Color Doppler Ultrasound (CDU) in the preoperative period. The superficial venous system of these patients (<1.5 *mm*) was unsuitable for performing a simple radial/brachial artery-cephalic vein anastomosis. Patients were routinely evaluated by physical examination and CDU in the first month and were followed up every 6 months. The quality of the venous system and the patency of the graft were assessed using the LOGIQ 7 system (General Electric Healthcare, Tokyo, Japan) ultrasound equipment at all CDU examinations. All examinations were performed with the patient in the supine position. Both the arterial and venous systems were assessed. The transverse diameter of the superficial venous system was measured. If the diameter of the vein was less than 1.5 *mm*, proximal vein stenosis (such as the subclavian vein) was observed, or the target vein was occluded, the use of these veins was inadequate. CDU also evaluated the saphenous vein during the preoperative period, applying the aforementioned criteria to it. The graft's patency was mainly assessed by CDU during follow-up. Thrombosis within the common duct or a flow rate of less than 200 *ml/min* was recorded as graft failure.

Surgical technique

All patients underwent surgery under local anesthesia and mild intravenous sedation. The saphenous vein was identified *via* CDU, and local anesthesia was performed before incision. After visualization of the vein, additional local anesthetics were administered through the subcutaneous tissue layers and fascia of the saphenous vein. A 10- to 15-*cm*- long saphenous vein graft was harvested below the knee. The surgeons initially located the brachial artery by making a transverse incision in the antecubital region. The radial artery, if its diameter was greater than 5 *mm*, was used to perform the proximal anastomosis of the fistula. The basilic or long brachial vein was then located through a second 2-3 *cm* incision according to the anatomical features of the vein, such as caliber or side branches near the anastomosis site. A direct tunnel was created in the subcutaneous

tissue between the previously determined arterial and venous anastomosis sites. After intravenous heparin administration, the autologous saphenous vein graft or PTFE was preserved, and both the artery and vein were ligated. The size of the selected graft determined which artery to use. A 5-7 *mm* arteriotomy was performed for the brachial artery or 10-12 *mm* for the radial artery. After completion of the arterial anastomosis, the graft was passed through the tunnel, and the fistula lumen was carefully inspected for any external kinking or compression. The distal (vein) anastomosis was created after an 18-20 *mm* venotomy. Patch plasty of the graft created the venous anastomosis, preventing further fistula stenosis, a common observation at this anastomosis site.

Next, demographic information, including age, sex, education, and occupation of the patients, was collected. Clinical data were evaluated before surgery, immediately after surgery, and at six weeks and three months postoperatively. The data included the performance of the implanted vein, such as infection rate, cannulation, blood vessel ischemia, aneurysm, seroma leak, failure rate, and vein occlusion. All variables were evaluated immediately after surgery, six weeks after surgery, and three months after surgery, and compared between the two groups.

Statistical methods and sample size

In this study, the sample size was calculated as 29 people in each group, considering the study of Uzun *et al*, who reported a failure rate of 2.17% for the saphenous vein method and 0.52% for the artificial vein method, considering an error of 5% and a power of 80%. Data analysis was performed using SPSS version 27 software. Data description was performed using appropriate tables and graphs to express dispersion and central indices. The mean and standard deviation were used to describe quantitative data, and qualitative variables were expressed as frequencies and percentages. The Kolmogorov-Smirnov test was used to assess the normality of the variables. Statistical analysis was performed using the chi-square test. The t-test and its nonparametric equivalent, Mann-Whitney U, were used to compare interval variables. The significance level of the data was considered less than 0.05.

Ethical considerations

In this study, informed consent was obtained from all participants. The study implementation steps were explained to the participants, and they were assured that they could leave the study at any time. All ethical considerations were observed, and all information filled in the questionnaires was kept completely confidential and was not used for any other purpose for this study. To maintain confidentiality, the patients' data were entered in checklists with their names removed and coded.

Code and date of approval by the ethics committee

This study was approved on May 31, 2024, by the Institutional Ethics Committee of the Faculty of Medicine at Mashhad University of Medical Sciences under the title "Evaluation of the effect of using an autologous saphenous vein as an alternative to hemodialysis access in hemodialysis-dependent ESRF patients" with the code IR.MUMS.MDICSAL.REC.1403.107.

Code and date of registration in IRCT

This study was approved by the Research Committee of the University of Medical Sciences, Mashhad University of Medical Sciences, with the code IRCT20240911063008N1.

Results

This study included 56 patients with chronic renal failure and ESRD, whose mean age ranged from 55.3±13.99 years. A comparison of the two groups indicated that there was no difference between them in terms of mean age (t=1.17; p=0.24). Examination of the frequency of gender in these patients showed that 24 of them (42.8%) were male and 32 (57.2%) were female. The findings indicated that the two groups were similar in terms of gender (χ^2=0.29; p 0.58). Table 1 compares the frequency of smoking, blood pressure, and diabetes in the two groups. The findings indicated that there was no significant difference between the two groups in terms of smoking (χ^2=0.091; p=0.763), but the findings indicated a higher incidence of blood pressure in the artificial vein group compared to the saphenous vein (χ^2=5.35; p=0.021). No difference was observed between the

Table 1. Comparison of the rate of smoking, infection, and diabetes between the two groups

Variable		Saphenous vein group (28=n) No. (%)	Artificial vein group (28=n) No. (%)	p-value
Smoker	No	21(75)	20(7.71)	0.763
	Yes	7(25)	8(6.28)	
Blood pressure	No	17(7.60)	8(6.29)	0.021
	Yes	11(3.39)	19(4.70)	
Diabetes	No	25(3.89)	21(75)	0.163
	Yes	3(7.10)	7(25)	

two groups in terms of diabetes (χ^2=1.94; p=0.163).

The results revealed that none of the groups experienced limb ischemia immediately after surgery. One patient in the artificial vein group reported ischemia ۶ weeks after surgery. Comparison of ischemia six weeks and three months after surgery in the two groups indicated no significant difference (p<0.99). Furthermore, comparison of pseudoaneurysm in the two groups indicated no significant difference immediately after surgery, six weeks after surgery, and three months after surgery (p 0.99). In addition, there was no thrombosis immediately after surgery or six weeks and three months after surgery in the saphenous vein group. In the artificial vein group, 2 cases of thrombosis were observed immediately after surgery, 3 cases 6 weeks after it, and 5 cases 3 months after surgery. Comparison of the two groups in terms of the presence of thrombosis indicated no significant difference between the groups immediately after surgery (p=0.491) and six weeks after it (p=0.236). However, three months after surgery, a significant difference was observed between the two groups in terms of thrombosis, with the rate being higher in the artificial vein group (p=0.049). Six weeks after surgery, the artificial vein group reported two cases of edema. Comparison of the two groups indicated no significant difference between the groups in terms of edema six weeks after surgery (p=0.491). The findings indicated no bleeding immediately after surgery, six weeks after surgery, and three months after surgery in the saphenous vein group. Only one case of bleeding occurred in the artificial vein group six weeks after surgery. Comparison of the two groups indicated no significant difference in the rate of bleeding between the groups six weeks after surgery (p<0.99). Given that the findings indicated no significant difference between the two groups in terms of access (χ^2=0.076; p=0.783), the frequency of AVF failure three months after surgery in the two groups is shown. The findings showed that the frequency of AVF failure three months after surgery was significantly higher in the artificial vein group than in the saphenous vein group (p=076.0; χ^2 783.0).

Table 2. presents a comparison of the frequency of complications, such as artery perforation, limb ischemia, pseudoaneurysm, seroma, hematoma, thrombosis, edema, access challenges, and AVF failure, across two groups at different time points.

Discussion

The present study was conducted to investigate the effectiveness of using autologous saphenous veins as an alternative to hemodialysis access in dialysis-dependent ESRF patients compared with PTFE grafts. The study included 56 patients with chronic renal failure and ESRD, with a mean age of 55.3+13.99 years. The mean age and gender of the patients, smoking status, and diabetes were similar in the two groups. Blood pressure was higher in the artificial vein group than in the saphenous vein group. No cases of infection were reported immediately after surgery, and six weeks later in the patients. The saphenous vein group observed no cases of vein perforation, while the artificial vein group reported only one case. There was no significant difference in the problems of vein perforation between the two groups.

Table 2. Comparison of the frequency of complications across two groups at different time points

Variable		Saphenous vein group (28=n) No. (%)	Artificial vein group (28=n) No. (%)	p-value
Infection				
immediately after the intervention		0	0	--
6 weeks after intervention		0	0	--
3 months after intervention		0	3(7.10)	0.236
The problem of vein perforation				
immediately after the intervention		0	1(6.3)	<0.99
6 weeks after intervention		0	1(6.3)	<0.99
3 months after intervention		2(1.7)	0	0.491
Limb ischemia (blood vessels)				
immediately after the intervention		0	0	-
6 weeks after intervention		0	1(6.3)	>0.99
3 months after intervention		1(6.3)	0	>0.99
Pseudoaneurysm				
immediately after the intervention		0	0	-
6 weeks after intervention		0	1(6/3)	>0.99
3 months after intervention		0	1(6/3)	>0.99
Seroma and hematoma				
immediately after the intervention		0	0	-
6 weeks after intervention		0	0	-
3 months after intervention		0	0	-
Thrombosis				
immediately after the intervention		0	2(1.7)	0.491
6 weeks after intervention		0	3(7.10)	0.236
3 months after intervention		0	5(9.17)	0.049
Edema				
immediately after the intervention		0	0	-
6 weeks after intervention		0	2(1.7)	0.491
3 months after intervention		0	0	-
Bleeding				
immediately after the intervention		0	0	-
6 weeks after intervention		0	1(6.3)	<0.99
3 months after intervention		0	0	-
Access	First time	17(7.60)	18(3.64)	0.783
	Second or third	11(3.39)	10(7.35)	
AVF failure three months after surgery		0	9(1.32)	0.002

Neither group observed any cases of limb ischemia immediately after surgery. One patient in the artificial vein group reported ischemia six weeks after surgery, with no significant difference observed. Additionally, the artificial vein group only observed one case of pseudoaneurysm six weeks after surgery. Comparison of pseudoaneurysms in the two groups indicated no significant difference between the two groups. Neither group observed seroma or hematoma leakage immediately after surgery, six weeks after surgery, or three months after surgery. No case of thrombosis was observed in the saphenous vein group. However, in the artificial vein group, 2 cases of thrombosis were observed immediately after surgery, 3 cases 6 weeks after surgery, and 5 cases 3 months after surgery. The frequency of thrombosis was higher in the artificial vein group than in the saphenous vein. The saphenous vein group did not observe the incidence of edema immediately after surgery, six weeks after surgery, or three months after surgery. In the artificial vein group, 2 cases of edema were reported 6 weeks after surgery, with no significant difference between the two groups. Other findings indicated no bleeding in the saphenous vein group. Six weeks after surgery, the artificial vein group reported only one case of bleeding. Comparisons between the two groups showed no significant difference in bleeding rates.

Examination of the frequency of AVF failure three months after surgery in the two groups showed that the frequency of AVF failure in the artificial vessel group was significantly higher than that in the saphenous vein group. Due to the lack of sufficient donors for patients with renal failure and failure of kidney transplantation, as well as problems such as poor hygiene in peritoneal dialysis, the use of AVF is recommended as the first choice for regular hemodialysis sessions. A high-flow venous path is required for hemodialysis, which has led to the development of AVF since the early years of this method. An ideal AVF should have a flow of at least 300 *ml/min*. A good AVF should be easy to use, long-lasting, and safe. Upper extremity arteries and veins are most often used, but other surgical methods can be performed if the veins are unsuitable. The development of AVF should involve evaluating the patient's age, the presence of comorbidities, and the condition of the veins. Preserving the proximal parts is crucial to prevent the need for future fistula reoperation (13,14).

However, studies are still ongoing at alternative sites for fistula creation in patients with clotted fistulas. AVF creation methods are also being used with autologous grafts (grafts taken from the patient's own tissues) or synthetic grafts, in addition to modifications to conventional methods (15,16). The distal radial-cephalic anastomosis just above the wrist is still the best site for an internal AVF. When an AVF is permanently inoperable, other vascular access options include creating another AVF from the proximal site of the failed AVF, using central veins to place permanent tunneled hemodialysis catheters, or placing a graft into the functional central artery and vein. PTFE and autologous saphenous vein grafts are commonly used for this purpose. PTFE grafts provide rapid vascular access after surgery (17).

In general, there are few studies in the scientific literature on the use of autologous grafts compared to synthetic grafts. The general view of these studies is that autologous grafts have a higher patency rate. In this regard, the study by Odabaşı *et al* evaluated the complication rates of patients with secondary AVF with saphenous vein grafts and PTFE grafts for hemodialysis. The findings indicated that risk factors did not differ between the two groups at 43 to 54 months of follow-up. Saphenous vein grafts had a better patency rate (18). Similarly, in the present study, AVF failure was significantly higher in the synthetic vessel group than in the saphenous vein. A study by Huber *et al* emphasized that autologous grafts require less reoperation and occlusion than PTFE grafts (19). The findings of this study indicated that the advantage of the long-term patency of the saphenous vein compared with a PTFE graft for prosthetic hemodialysis access was not significantly different between the two groups. However, the study by Odabaşı *et al* showed that complications of hemodialysis access were more in the saphenous vein graft group than in the PTFE group (18).

PTFE grafts can be used for hemodialysis after surgery (48 *hr*) if there is no hematoma. Some studies have compared fistula formation with autologous grafts and PTFE. Among them, Ascher *et al* reported that the patency rate of autologous fistulas is much better than that of prosthetic grafts (20). Furthermore,

the study by Staramos *et al* reported that the patency rate at three years (median duration) was higher in the prosthetic group at 58% (21). These findings are in contrast to the Odabaşı study, which reported a secondary patency rate of 60% for saphenous vein grafts and 40% for PTFE grafts at 48 months (18). Furthermore, a prospective study by Uzun *et al* showed that the autologous saphenous vein has lower complication rates and costs compared to PTFE grafts due to its higher primary and secondary patency rates and should be selected as a prostatic graft for hemodialysis access (22). The findings of the study by Schneider *et al* also indicated that preserved saphenous vein graft is a good material for creating vascular accesses with patency rates similar to prosthetic grafts (23).

Other studies indicated that there was no statistically significant difference between the groups in the distribution of grafts used and the mean flow rate of secondary AVFs. However, when evaluating the graft patency at 24 and 48 months, it was found that the Verrier saphenous group had a statistically longer patency than the PTFE group (18). In the present study, the frequency of AVF failure was significantly higher in the prosthetic group compared to the saphenous vein group at 3 months after surgery. In this regard, the study by Belczak *et al* was conducted to compare forty-nine patients with arteriovenous fistula in the arm and forearm undergoing brachioaxillary bypass using autologous saphenous vein, PTFE, or PROPATEN® graft. In four cases, the first saphenous vein graft failed 3 or 6 months after surgery. The failure rates of PTFE and PROPATEN® grafts did not differ after 3, 6, and 12 months. There was no difference in complications leading to graft failure between the two types of prosthetic grafts (5). Furthermore, Wang *et al* reported in their study that synthetic loop grafts remained open for a longer period of time than smooth grafts (24). A study by Burger *et al* reported that the patency rate of fistulas created with native vessels was higher than that of prosthetic grafts (25). In conclusion, for patients requiring secondary AVF creation in the upper extremity, based on anatomical criteria, the findings suggest that, despite the higher incidence of hemodialysis complications such as bleeding, hematoma, and pseudoaneurysm, the use of saphenous vein grafts should be considered over PTFE grafts with higher rates of infection and thrombosis.

Graft thrombosis is a serious complication that threatens graft patency. Uzun *et al*'s study diagnosed 13 patients in the PTFE group and 2 patients in the saphenous group. These patients underwent thrombectomy. Two AVFs in each group remained active after thrombectomy. Primary and secondary patency in the saphenous group was significantly higher at 12 and 24 months (22). Similarly, the present study indicated that the rate of thrombosis was lower in the saphenous vein graft group than in the PTFE group. In this regard, the study by Odabaşı *et al* showed that infection and thrombosis were higher in the PTFE group than in the saphenous vein group. Thrombosis was observed in three cases in the saphenous vein graft group and in seven cases in the PTFE group, which was a statistically significant difference. These data support the superiority of saphenous vein graft compared with PTFE graft for patients with secondary candidal AVF in the upper arm (18).

In the Uzun study, native superficial veins were not sufficient for AVF in the study group, and patients underwent graft surgery. The mean preoperative transverse diameter of the cephalic vein in the study group was 1 *mm* at the wrist and 1.3 *mm* at the elbow. It has been noted that arteries less than 1.55 to 2 *mm* in diameter and veins less than 2 to 2.5 *mm* in diameter are associated with poor AVF maturity (26,27). Other studies also confirm the finding that vein size is the main predictor of a successful fistula (28,29). Contrary to recent reports, no cases of infection were reported in the present study. This finding was confirmed in the study by Uzun *et al* (22). Since all patients in the hemodialysis center were hemodialyzed by a nursing team, this procedure may have contributed to the absence of AVF infections. The findings of the study by Ramacciotti *et al* showed that patients undergoing saphenous vein clamps did not show any infections. However, of the 10 clamps performed with PTFE, 8 infections were reported during follow-up. Therefore, arteriovenous clamps are suitable blood alternative for patients who do not have access to other options, and in cases where the saphenous vein is used, greater patency and lower complication rates are observed, while those using PTFE have a high risk of infection

(30).

In the Odabaşı study, the results showed that infected grafts in the saphenous vein graft group recovered with antibiotic treatment, but in the PTFE group, despite antibiotic treatment, four patients experienced graft infection and had to have their grafts removed. Removing infected grafts is surgically challenging and carries a high risk of complications (18). In a study conducted by Huber *et al*, the incidence of infection was also lower in autologous grafts than in PTFE grafts (19). The study by Staramos *et al* also found that the infection rate in the saphenous vein graft group was lower than that in the PTFE graft group, which may be due to the greater susceptibility of PTFE grafts to infection due to repeated needle insertion (21). However, the present study's findings showed no infection cases in either of the two groups. Furthermore, Matsuura *et al* emphasized in their study that the preserved femoral vein is more resistant to infection than the prosthetic material (31). In another study by Curi *et al*, Vectra grafts were more resistant to infection in HIV-positive patients (32). These differences could be the result of differences in sample characteristics or other confounding variables such as surgeon experience and hospital facilities and conditions.

Conclusion

Based on the findings of the present study, no cases of infection, seroma leakage, or hematoma were observed in patients undergoing saphenous vein and artificial vein implantation. Only one case of vein perforation and ischemia was reported in the artificial vein group, while none of these cases were reported in the saphenous vein group. Also, only one case of pseudo-aneurysm was observed six weeks after surgery in the artificial vein group. Also, in the artificial vein group, 2 cases of edema and only 1 case of bleeding were reported 6 weeks after surgery. No case of thrombosis was observed in the saphenous vein group. However, in the artificial vein group, 2 cases of thrombosis were observed immediately after surgery, 3 cases 6 weeks after surgery, and 5 cases 3 months after surgery. The only cases where a significant difference was observed between the two groups were in the incidence of thrombosis and AVF failure 3 months after surgery, which was higher in the artificial vein group than in the saphenous vein group. It is important to include the consideration of vascular access methods during hemodialysis in an algorithm. If grafting is necessary, autologous saphenous vein grafting may be preferred due to its lower incidence of complications such as thrombosis, satisfactory patency rates, and lower cost compared to synthetic grafts.

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Conflict of Interest

There are no conflicts of interest.

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