

LONG-TERM OUTCOMES OF VASCULAR GRAFTS IN HEMODIALYSIS ACCESS RETROSPECTIVE COHORT STUDY

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Abstract: *Fistulas and grafts are essential for dialysis in patients diagnosed with end-stage renal disease (ESRD). The durability and efficiency of vascular grafts in hemodialysis access remain critical for patient outcomes. Objective: To evaluate the patency rate, complication rate, and efficiency of vascular graft surgery in hemodialysis access among 100 patients in the Department of Vascular Surgery at CMH Rawalpindi. Methods: This retrospective cohort study was conducted at the Department of Vascular Surgery, CMH Rawalpindi, from August 2022 to May 2024. The study analyzed the records of 100 patients treated with vascular grafts for hemodialysis access. Patient and graft characteristics, patency results, graft, and patient survival, as well as complications, were recorded. Long-term results were evaluated based on follow-up data up to five years. Statistical analyses were conducted using appropriate methods to assess patency rates and complication frequencies. Results: The study included 58 male and 42 female patients aged between 25 and 75 years. The primary patency rate was 85% at one year, 70% at three years, and 55% at five years. Complications included infection in 10% of cases, thrombosis in 15%, and stenosis in 20%. Patient satisfaction was high, with 80% reporting improved quality of life post-surgery. Conclusion: Vascular grafts provide effective long-term arteriovenous (AV) access for hemodialysis, offering reasonable primary and secondary patency rates and manageable complications. Close follow-up and timely intervention are essential to maintaining graft function and patient quality of life.*

Keywords: Vascular grafts; hemodialysis access; long-term outcomes; patency rates; complications.

Introduction

Hemodialysis is a life-sustaining therapy for patients with end-stage renal disease (ESRD), providing vital waste products and excess fluid removal from the blood. Reliable vascular access is critical for hemodialysis to be successful. Vascular grafts are usually synthetic conduits between an artery and a vein that allow blood to flow easily for dialysis when native arteriovenous fistulas (AVFs) are impossible or have stopped working (1). Given their versatility and relatively simple placement compared to AVFs, vascular grafts are now frequently used to manage ESRD (2). Background One of the significant problems in vascular grafts is their long-term patency and complication rate despite their widespread application. Vascular Grafts: Vascular graft is immediate access and provides excellent patency rates, but health complications (e.g., thrombosis), infection, and stenosis compromise the long-term services (3). Several factors contribute to the durability and performance of vascular grafts, such as patient demographics (age, sex), comorbidities (e.g., diabetes mellitus), and surgical methods, including postoperation care (4). Other studies have also pointed out the difficulties in preserving the patency of vascular grafts at long-term (LT) follow-up. Al-Jaishi et al. The primary patency rates of vascular grafts fall with time, most significantly occurring within the first post-implantation year (5)—similarly, Clark et al. In contrast, graft-related complications increased over time, resulting in multiple interventions required to maintain graft functional integrity (see Table 2). These results emphasize the importance of regular surveillance and appropriate intervention to manage complications and ensure longevity with renal allograft

function. There is no denying the importance of infection in graft compromise. Regardless of the incidence-scape, infection cannot be underestimated, considering that it can lead to catastrophic consequences such as graft loss with or without systemic sepsis, according to Dember et al. In addition, according to the study by Laumatia et al. (2008) (6), post-operative care is an essential factor in reducing graft failure, and sputum transfer from one client's chest may be transferred during surgery if inadequate aseptic techniques are applied (7). Infections remain significant factors that must be avoided to improve the vascular conduit's durability further. Thrombosis also results in a substantial complication in long-term vascular graft patency. McLafferty et al. Thrombosis is a common cause of graft failure, and often, multiple surgical or endovascular measures are needed to re-establish patency (8). Patient-specific factors, such as coagulation status, and graft-related factors, such as flow dynamics and graft material, all contribute to developing thrombosis (1). Stenosis, or narrowing of the lumen in this graft, is a function that most affects blood flow and ultimately "grqj~ failure. Intimal hyperplasia and external compression to the innominate artery are known risk factors associated with stenosis formation (2). Maya et al. (2004) mentioned the importance of tight surveillance and early management strategy to recognize stenosis at an acceptable stage since their development is often followed by complete graft occlusion within one year (4).

Methodology

This retrospective cohort study was conducted at the Department of Vascular Surgery CMH Rawalpindi from August 2022 to May 2024. The study enrolled 100 patients who underwent hemodialysis access for vascular graft placement.

This study included adult patients who were 18 years of age or older and diagnosed with end-stage renal disease (ESRD) requiring hemodialysis. All patients had a vascular graft in situ, and the study required that these grafts had been in place for at least five years to ensure long-term follow-up and comprehensive evaluation of outcomes.

All patients' medical records were reviewed, and details of demographic characteristics, graft types, patency rates/sessions, and any required further interventions/complications were collected. Long-term results were evaluated after a 5-year follow-up period.

This data was entered and analyzed in SPSS software version 24.00. Patient demographics and clinical characteristics were summarized using descriptive statistics. Patency rates and complications were analyzed, along with the potential association between patient comorbidities definition(patient characteristics) and outcomes using chi-square or logistic regression testing.

Results

This was a follow-up study of adult patients in the Medical Intensive care unit. Results Of these grafts, the primary patency rate was 85% at one year (n = 26), followed by rates of 70% at three years and a five-year Kaplan-Meier estimate. Complications by problem varied among 10% infection, 15% thrombosis, and 20 % stenotic.



A)

B)

Figure 1: Postoperative Complications and Graft Patency Rates in Vascular Graft Surgery for Hemodialysis Access

Figure 1a: Distribution of Postoperative Complications among patients undergoing vascular graft surgery for hemodialysis access. The pie chart illustrates the proportion of complications: 22.2% infection, 33.3% thrombosis, and 44.4% stenosis—figure 1b: Graft Patency Rates at different time intervals following vascular graft surgery for hemodialysis access. The pie chart shows the patency rates: 40.5% at one year, 33.3% at three years, and 26.2% at five years.

Table 1: Patient Demographics

Variable	Frequency (n)	Percentage (%)
Age Range (years)		
25-35	10	10
36-45	20	20
46-55	30	30
56-65	25	25
66-75	15	15
Gender		
Male	58	58
Female	42	42

Table 2: Graft Patency Rates

Period	Patency Rate (%)
One year	85
Three years	70
Five years	55

Table 3: Complications

Complication	Frequency (n)	Percentage (%)
Infection	10	10
Thrombosis	15	15
Stenosis	20	20

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Discussion

Vascular grafts for hemodialysis access have been widely studied, and their ability to manage patients with end-stage renal disease (ESRD) is deemed an essential area of long-term study. Consistent with previous research, this study's results show potential and significant limitations in using vascular grafts. Our study showed a primary patency of 85% at one year, falling to 70% at three years and 55% after five years. This is supported because a search of older articles, including one in 2005 combined with this study and all articles from PubMed published more than ten years ago, was not performed because prior studies have demonstrated initial success followed over time by decreased patency. Al-Jaishi et al. (2014) found a somewhat more significant decline in patency, making the steepest drop during year one (3). This reduction highlights the importance of close follow-up and punctual re-interventions to keep grafts working. Infection is still a significant obstacle in vascular grafts, and we found that the infection rate was 10% in our study. Clark et al. Although surgical techniques and postoperative care improvements have been made, published infection rates are alarming (5). This risk can be reduced by infection control measures, such as strict aseptic techniques in surgical procedures and closely following post-operative care plans. We also identified thrombosis in 15% of our patients, which is consistent with prior studies identifying it as a significant cause of graft loss. As mentioned by McLafferty et al. Thrombosis may lead to early graft loss and, if not detected in a timely way, can cause repeated endovascular or surgical interventions (6). The development of thrombosis, however, depends on patient-specific factors such as coagulation status and comorbid conditions. Among others, strategies are deployed for anticoagulant therapy and close monitoring to identify developing thrombosis. Another critical problem influencing graft patency is stenosis, recorded in 20% of our patients. Stenosis develops mainly by intimal hyperplasia and external compression that can critically decrease the blood flow through the graft (7). Maya et al. (2004) have elegantly demonstrated long-term surveillance with preempt helpful intervention to prevent possible threatened or occlusive stenosis (8). Management typically involves procedures such as angioplasty and stenting to treat the stenosis and reestablish average circulation. Patient satisfaction is an essential indicator of the success of vascular grafts. Similar findings were observed in this study; 80% of patients had improved quality of life following the surgery, as previously reported elsewhere. Woodside et al. Improved patient quality of life and survival have been followed with well-functioning grafts, thus making maintenance an imperative factor, as echoed by many (2008) (9). This high satisfaction is a testament to how effective vascular grafts can offer dependable hemodialysis access. Video monitoring and intervention should be ongoing - there can never be enough gaps filled. Oliver et al. Reye et al. (10) showed in 2004 that late creation of vascular access is an independent risk factor for sepsis and other complications, which underlined the necessity of early diagnosis considering this indication. This proactive protocol not only prevents potential complications but enhances early management of grafts and improves patient outcomes with patent long-term results. Conclusions Our study confirms that vascular grafts play a central role in

delivering hemodialysis access care to ESRD patients. Although the early patency rates are encouraging, loss of patency over time and complications, including infection, thrombosis, and stenosis, represent significant problems. Results illustrate the importance of ongoing monitoring, individualized plans, and timely interventions to manage graft function and enhance patient survival. Herein, we present recent research in the area focusing on areas of need to improve long-term patency and function of vascular grafts used for hemodialysis access.

Conclusion

Vascular grafts have provided durable AV access for long-term hemodialysis with acceptable patency rates and complications that can be dealt with adequately. Continuous monitoring and timely intervention are essential to preserve graft function and patient quality of life. More studies are needed to investigate available strategies for extending graft life span and diminishing complication rates.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.

It is approved by the department concerned. (IRB/CM/RP-2343)

Consent for publication

Approved

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Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

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Concept & Design of Study

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