

Original Article

Temporary hemodialysis catheters: Duration of use and associated complications

 Tarik Tastekin¹,  Burak Atessacan²

¹Burdur State Hospital, Department of Cardiovascular Surgery, Burdur, Türkiye

²Ankara 29 Mayıs State Hospital, Department of Cardiovascular Surgery, Ankara, Türkiye

Received: May 08, 2025 Accepted: August 01, 2025 Published online: September 15, 2025

Content of this journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License



Abstract

Aim: Temporary hemodialysis catheters (THCs) are frequently used for urgent vascular access but carry high risks of complications, especially infections and mechanical issues. Complications depend on insertion site, catheter duration, and patient factors. This study investigates the relationship between catheter insertion site, patient age, catheter duration, and the development of catheter-related complications, and also assesses the preferred vascular access type after THC removal.

Material and Methods: This retrospective analysis included 122 patients undergoing THC placement from August 2022 to August 2024. Demographic data, catheter insertion sites, duration of use, and catheter-related complications (infection, bleeding, malfunction) were evaluated. Statistical analysis utilized SPSS 26.0, with significance set at $p < 0.05$.

Results: The mean age of the patients was 65.2 ± 13.4 years; 57.4% were male. Femoral catheter insertion was associated with the highest infection rate (44.8%), significantly higher than jugular (18.5%) and subclavian (18.2%) access sites ($p = 0.0005$). Older age was significantly associated with an increased risk of infection ($p = 0.018$). After THC removal, 62.3% of patients continued with permanent catheters and 39.3% with arteriovenous fistula (AVF). Two patients received both modalities during the follow-up period and are included in both categories.

Conclusion: Femoral vein catheterization should be minimized due to high infection risk, with jugular access preferred as the safest. Shorter catheter duration and early AVF planning are recommended, particularly for elderly patients.

Keywords: Renal dialysis, catheter-related infections, chronic kidney disease, central venous catheterization, vascular access devices

INTRODUCTION

Chronic kidney disease (CKD) is an increasingly prevalent global health issue. Among patients who progress to end-stage renal disease, hemodialysis is one of the most frequently employed renal replacement therapies. The administration of hemodialysis requires a safe and sustainable vascular access route [1]. Although an arteriovenous fistula (AVF) is considered the gold standard for long-term access, it is often not the initial option in many patients requiring urgent hemodialysis due to the time required for AVF maturation or unsuitable vascular anatomy [2].

In such cases, temporary hemodialysis catheters (THCs) become a practical alternative. THCs offer several advantages including rapid insertion, no need for anesthesia, and suitability for short-term use [3]. However, these benefits are offset by the frequent association of THCs with complications such as infections, bleeding, mechanical issues, venous thrombosis, and catheter dysfunction [4]. The literature suggests that the frequency of these complications is influenced by multiple factors, notably the anatomical site of catheter placement, the duration of catheter use, and patient-specific variables such as age and systemic condition [5,6].

CITATION

Tastekin T, Atessacan B. Temporary hemodialysis catheters: Duration of use and associated complications. Turk J Vasc Surg.2025;34(3):192-6.



Corresponding Author: Tarik Tastekin, Burdur State Hospital, Department of Cardiovascular Surgery, Burdur, Türkiye
Email: tarikastekin@gmail.com

Several studies have reported that the internal jugular vein is associated with the lowest complication rates, while the femoral vein carries the highest risk of infection [7-9]. Placement in the subclavian vein, although sometimes used, is generally not recommended due to the associated risk of venous stenosis and is typically reserved for cases where other access sites are unsuitable [10]. Moreover, infection risk increases substantially when catheters are used beyond 2–3 weeks, especially in elderly or immunosuppressed individuals, potentially leading to severe or fatal sepsis [11].

This study aims to retrospectively evaluate patients who underwent temporary hemodialysis catheter placement in our Cardiovascular Surgery Department. Specifically, it investigates the relationship between catheter insertion site, duration of use, patient age, and the incidence of infection and bleeding. Furthermore, the study examines whether patients transitioned to permanent catheters or had AVFs created following temporary catheter use. In this respect, the study seeks to assess both the complications associated with temporary catheters and the current state of long-term vascular access planning.

MATERIAL AND METHODS

This retrospective descriptive study included patients who underwent THC placement between August 1, 2022, and August 1, 2024. Ethical approval for the study was obtained from the Isparta Süleyman Demirel University Ethics Committee on October 3, 2024, under the decision number E.852485. A power analysis was conducted using the G*Power 3.1 statistical software to evaluate the adequacy of the sample size. Assuming a Type I error rate (α) of 5% and a statistical power (1- β) of 85%, it was determined that a total of 118 participants would be required to detect a medium effect size (Cohen’s $d=0.50$). A total of 122 patients receiving active hemodialysis treatment with temporary catheter access were included in the study.

No interventional procedures were performed on patients during the study period; all data were collected from clinical follow-up notes, hospital electronic health records, and patient discharge summaries. For missing or incomplete records, nephrology files were reviewed, and additional information was obtained via telephone interviews when necessary. Only patients whose temporary catheters were inserted in our Cardiovascular Surgery Department were eligible for inclusion.

For each patient, the following variables were recorded: age, sex, catheter insertion site (jugular, femoral, subclavian), duration of catheter use (in days), and complications such as infection, occlusion, bleeding, and catheter exchange. In our clinic, ultrasound guidance is routinely used during catheter insertions, especially for jugular and subclavian vein placements. For femoral vein access, ultrasound was utilized in the majority of cases. Infection was defined based on clinical signs such as fever, localized erythema or purulent discharge at the catheter

site, and/or positive blood cultures, in accordance with Centers for Disease Control and Prevention (CDC) criteria. Bleeding was categorized as any bleeding at the catheter site recorded in medical notes. Major bleeding was defined as bleeding requiring transfusion, surgical intervention, or resulting in hemodynamic instability, while minor bleeding included self-limited bleeding not requiring intervention. Complications that occurred during catheter insertion were extracted from operative notes and patient discharge summaries.

Statistical Analysis

All data were analyzed using SPSS version 26.0 (SPSS Inc., Chicago, IL, USA). The Kolmogorov–Smirnov test was used to assess the normality of data distribution. Parametric tests were applied for variables with normal distribution, while non-parametric tests were used for data that did not meet normality assumptions. Descriptive statistics were presented as number (n), percentage (%), median, and interquartile range (IQR).

For between-group comparisons, the Chi-square test was used for categorical variables, and the Mann–Whitney U test was used for continuous variables. The patency and survival of permanent catheters were analyzed using the Kaplan–Meier method. A $p\text{-value}<0.05$ was considered statistically significant for all tests.

RESULTS

This retrospective study included a total of 122 patients who underwent THC placement between August 1, 2022, and August 1, 2024. Of the participants, 70 were male (57.4%) and 52 were female (42.6%). The mean age of the patients was calculated as 65.2 ± 13.4 years. Catheters were inserted via the jugular, femoral, and subclavian veins.

The median duration of catheter use was 19 days (range: 2–122). The longest durations were observed in catheters placed via the jugular and subclavian veins, while the shortest duration was associated with the femoral site. Although the association between catheter duration and infection did not reach statistical significance ($p=0.0594$), the trend toward longer durations in patients who developed infections (18.2 days vs. 13.1 days) may have clinical relevance.

A statistically significant association was found between catheter insertion site and infection development ($p=0.0005$). The femoral site emerged as the most infection-prone access location, whereas jugular vein catheters were associated with significantly lower infection rates. The subclavian site showed an intermediate risk for infection (Table 1).

Table 1. Infection rates by catheter insertion site (%)			
Catheter site	Yes (%)	No (%)	p value
Femoral	52.2	47.8	0.0005
Jugular	18.5	81.5	
Subclavian	18.2	81.8	

Catheter site bleeding was observed in approximately 14% of all patients. Bleeding was most frequently seen with catheters placed via the subclavian vein; however, no statistically significant association was found between bleeding and catheter site ($p=0.1321$).

Additionally, the mean age of patients who developed infections was significantly higher than that of those who did not ($p=0.018$), suggesting that advanced age may be an independent risk factor for catheter-related infections (Table 2).

Table 2. Infection rates by age group (%)			
Age group	Yes (%)	No (%)	p value
<60	18.4	81.6	0.018
60–75	31.0	69.0	
>75	50.0	50.0	

Following the use of temporary catheters, 62.3% of patients ($n=76$) continued treatment with a permanent hemodialysis catheter, while 39.3% ($n=48$) transitioned to long-term hemodialysis via AVF. Two patients received both modalities during the follow-up period and are included in both categories (Table 3).

Table 3. Post-catheter treatment modality	
Treatment type	Number of patients (n)
Permanent catheter	76
Arteriovenous fistula	48
Both methods applied*	2

*Two patients received both a permanent catheter and an AVF; therefore, they are counted in both groups. Percentages may sum to more than 100% due to this overlap.

DISCUSSION

In this study, the data of 122 patients who underwent THC placement were retrospectively analyzed, focusing on parameters such as infection, bleeding, catheter duration, and access route preference. The findings demonstrated that complication rates varied significantly depending on the anatomical site of catheter insertion, patient age, and duration of use.

Femoral insertion was significantly associated with higher infection rates ($p=0.0005$). In our study, the infection rate for femoral catheters was found to be 44.8%, which is higher than the 36% reported by Naumovic et al., although the trend remains consistent [6]. Similarly, Clark and Barsuk reported that femoral catheters are more prone to bacterial colonization and present a significantly higher infection risk compared to jugular access [8]. International guidelines, such as those from Kidney Disease Outcomes Quality Initiative (KDOQI) and National Kidney Foundation–Dialysis Outcomes Quality Initiative (NKF-DOQI), recommend femoral access only for short-term or emergency use [12].

A statistically significant relationship was also observed between age and infection development ($p=0.018$). Infection rates were notably higher among patients aged 75 and above. Jean et al. suggested that advanced age increases susceptibility to infections due to a weakened immune response and associated comorbidities [10]. Similarly, Mermel emphasized that catheter-related infections tend to be more severe in elderly patients, underlining the importance of stricter care protocols for this population [13]. Although the association between catheter duration and infection did not reach statistical significance ($p=0.0594$), it was clinically relevant. Infections were more common in patients whose catheter duration exceeded 21 days. Schwab and Beathard also reported that prolonged catheter use increases cumulative microbial colonization and infection risk [1]. In our study, the mean catheter duration in patients who developed infections was 18.2 days, compared to 13.1 days in those who did not, an important finding with practical clinical implications. This finding suggests that even a modest increase in catheter duration may elevate the risk of infection, underscoring the importance of early arteriovenous fistula planning and timely catheter removal in clinical practice.

Although no statistically significant difference was found in bleeding rates across catheter insertion sites in our study ($p=0.1321$), subclavian catheters exhibited a numerically higher bleeding rate. Barsuk and Clark previously reported a statistically significant association between subclavian access and increased mechanical complications, including bleeding [9]. However, our results did not reach statistical significance despite showing a similar numerical trend. Therefore, a definitive relationship between catheter insertion site and bleeding risk cannot be established. This finding should be interpreted with caution and re-evaluated in future studies with larger sample sizes.

When analyzing vascular access choices following temporary catheter use, only 39.3% of patients transitioned to an AVF, while 62.3% continued dialysis with permanent catheters. This finding contrasts with recommendations from KDOQI and Kidney Disease: Improving Global Outcomes (KDIGO) guidelines, which advocate for AVF as the preferred long-term access [12]. Moreover, this rate is substantially lower than international benchmarks, where AVF usage often exceeds 60–70% in chronic hemodialysis populations [14]. The discrepancy may be attributed to several barriers, including delayed nephrology referrals, inadequate preoperative vascular assessment, unsuitable vascular anatomy, patient-related factors such as noncompliance or comorbidities, and limited surgical resources. To address these limitations, the literature emphasizes early nephrology referral preferably when the estimated glomerular filtration rate (eGFR) falls below 30 mL/min/1.73 m² to allow for timely AVF planning and maturation. In addition, routine preoperative vascular mapping using duplex ultrasound has been shown to improve AVF creation rates and reduce catheter dependency

[15]. Implementing standardized vascular access protocols and multidisciplinary care teams involving nephrologists, vascular surgeons, and dialysis nurses may further enhance coordination and increase AVF transition rates. Promoting these practices is particularly crucial for elderly or high-risk patients to improve long-term dialysis outcomes and reduce complications related to catheter use [16,17].

Another noteworthy finding is that approximately 14% of patients experienced catheter site bleeding, with a potential increase in those on anticoagulant therapy, though our dataset did not include this variable. Additionally, infection rates did not significantly differ between male and female patients, suggesting that gender may not be a determining factor in this context.

It is also essential to consider the multifactorial nature of catheter-related complications. Factors such as the experience of the operator, adherence to aseptic technique, infection control protocols within the hospital, and the level of nursing staff education on catheter care can all influence infection rates [18]. Therefore, the quality of the entire procedural process, not just the insertion site, is crucial for clinical success [19].

Graphical analyses further supported that patients who developed infections were generally older and had longer catheter durations. These findings reinforce the need for closer monitoring in elderly patients. Finally, one of the most clinically relevant conclusions of this study is that jugular vein access should be the preferred route in patients requiring temporary catheters, and simultaneous AVF planning during catheter placement can positively impact overall patient management.

CONCLUSION

This study provides a comprehensive analysis of the relationship between the anatomical site of THC insertion and the development of related complications. Notably, femoral vein access was found to be associated with significantly higher rates of infection compared to other insertion sites ($p=0.0005$). In contrast, jugular access emerged as the safest option, with lower rates of both infectious and mechanical complications.

In addition, the study demonstrated that increasing age was significantly associated with a higher risk of infection ($p=0.018$), highlighting the need for closer monitoring and preventive strategies in elderly patients. Although the relationship between catheter duration and infection risk did not reach statistical significance, the trend observed suggests a clinically relevant association that should not be overlooked.

Based on these findings, it is recommended that temporary hemodialysis catheters be inserted via the jugular vein whenever possible, and that their use be limited to the shortest feasible duration. The femoral site should be reserved only for situations where other access options are not viable. This approach may help to reduce complication rates and enhance patient safety.

Limitations

This study has several limitations. First, it is a single-center, retrospective analysis, which may limit the generalizability of the findings. Second, certain confounding factors such as operator experience, adherence to aseptic technique, and the quality of nursing care during catheter maintenance were not recorded. These variables can significantly influence infection rates and procedural complications but could not be evaluated in this study. Third, although anticoagulant therapy is a known risk factor for bleeding complications, data regarding patients' anticoagulation status were not available in our dataset. This limits our ability to fully interpret the bleeding outcomes. Lastly, while the sample size was adequate for detecting moderate effects, larger multicenter studies would help validate these findings and allow for more comprehensive multivariate analyses.

Ethics Committee Approval: Ethical approval for the study was obtained from the Isparta Süleyman Demirel University Ethics Committee on October 3, 2024, under the decision number E.852485.

Patient Consent for Publication: Not necessary for this manuscript.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: All authors contributed equally to the article.

Conflict of Interest: The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding: The authors received no financial support for the research and/or authorship of this article.

REFERENCES

- Schwab SJ, Beathard G. The hemodialysis catheter conundrum: hate living with them, but can't live without them. *Kidney Int.* 1999;56:1-17.
- Lok CE, Mokrzycki MH. Prevention and management of catheter-related infection in hemodialysis patients. *Kidney Int.* 2011;79:587-98.
- Polderman KH. Central venous catheter use. Part 1: mechanical complications. *Intensive Care Med.* 2002;28:1-17.
- Casanegra AI, Ziegelbein RC, McBane RD, Bjarnason H. Short-term femoral vein catheterization rarely causes thrombosis or bacteremia. *J Hosp Med.* 2011;6:33-6.
- NKF-DOQI clinical practice guidelines for vascular access. National Kidney Foundation-Dialysis Outcomes Quality Initiative. *Am J Kidney Dis.* 1997;30:S150-91.
- Naumovic R, Jovanovic D, Djukanovic L. Temporary vascular catheters for hemodialysis: a 3-year prospective study. *Int J Artif Organs.* 2004;27:848-54.

7. Parienti JJ, Mégarbane B, Fischer MO, Lautrette A, Gazui N, Marin N, et al. Catheter dysfunction and dialysis performance according to vascular access among 736 critically ill adults requiring renal replacement therapy: a randomized controlled study. *Crit Care Med*. 2010;38:1118-25.
8. Clark EG, Barsuk JH. Temporary hemodialysis catheters: recent advances. *Kidney Int*. 2014;86:888-95.
9. Vats HS. Complications of catheters: tunneled and nontunneled. *Adv Chronic Kidney Dis*. 2012;19:188-94.
10. Jean G, Charra B, Chazot C, Vanel T, Terrat JC, Huot JM. Long-term outcome of permanent hemodialysis catheters: a controlled study. *Blood Purif*. 2001;19:401-7.
11. Dhingra RK, Young EW, Hulbert-Shearon TE, Leavey SF, Port FK. Type of vascular access and mortality in US hemodialysis patients. *Kidney Int*. 2001;60:1443-51.
12. Chan C, Collins K, Ditschman E, Koester-Wiedemann L, Saffer T, Wallace E, Rocco M. Overcoming barriers for uptake and continued use of home dialysis: an NKF-KDOQI conference report. *Am J Kidney Dis*. 2020;75:926-34.
13. Mermel LA. Prevention of intravascular catheter-related infections. *Ann Intern Med*. 2000;132:391-402. Erratum in: *Ann Intern Med* 2000;133:395.
14. Bonfante GM, Gomes IC, Andrade EI, Lima EM, Acurcio FA, Cherchiglia ML. Duration of temporary catheter use for hemodialysis: an observational, prospective evaluation of renal units in Brazil. *BMC Nephrol*. 2011;12:63.
15. Yasim A, Özbudak E, Erdoğan O, Albayrak N, Karabacak K. The effect of preoperative mapping on our short-time results of arteriovenous fistula for hemodialysis. *Damar Cer Derg* 2008;17:104-8
16. Lyu B, Chan MR, Astor BC. Catheter dependency after vascular access placement among elderly patients on hemodialysis: an intention-to-treat analysis. *J Am Soc Nephrol*. 2020;31:443.
17. Rahman A, Özsin KJ. Late complications requiring revision of arteriovenous fistulae for hemodialysis. *Turk Gogus Kalp Dama*. 2008;16:167-71.
18. Kumbar L, Yee J. Current concepts in hemodialysis vascular access infections. *Adv Chronic Kidney Dis*. 2019;26:16-22.
19. O'Grady NP, Alexander M, Burns LA, Dellinger EP, Garland J, Heard SO, et al.; the Healthcare Infection Control Practices Advisory Committee (HICPAC) (Appendix 1). Guidelines for the prevention of intravascular catheter-related infections. *Clin Infect Dis*. 2011;52:e162-93.