DOI: https://doi.org/10.53350/pjmhs020231712563

ORIGINAL ARTICLE

Venous Thrombosis Comparison in Femoral versus Internal Jugular Catheterization for Hemodialysis

HARIS NAEEM[1], WAQAR AHMED[2], MATEEN AKRAM[3], ABAD-UR-REHMAN[4], RABBIA RIZVI[5], SAMEE ULLAH[6]
[1,5]Trainee Registrars, [2]Professor/Head, [3]Assistant Professor, Department of Nephrology, Shaikh Zayed Hospital, Lahore
[4]Associate Professor, Department of Nephrology, Punjab Institute of Cardiology, Lahore
[6]Associate Professor, Department of Nephrology, Sahiwal Medical College, Sahiwal
Correspondence: Haris Naeem, Trainee, Email: harry_903@hotmail.com, Cell: 0323-3688842

ABSTRACT

Background: Vascular access for hemodialysis is typically achieved through arteriovenous fistulas (AVFs), arteriovenous grafts (AVGs), or central venous catheters (CVCs). Despite the "Fistula First" initiative, CVCs remain widely used due to their ease of insertion and immediate availability in urgent cases. Approximately 25% of dialysis patients in United States are using them.

Objective: To compare the frequency of venous thrombosis in patients undergoing hemodialysis with femoral versus internal jugular double lumen catheterization.

Methodology: This randomized controlled trial was conducted at Department of Nephrology, Shaikh Zayed Hospital Lahore from 8th March 2022 to 7th September 2022. One hundred twenty patients were randomly divided into two groups: Group A (femoral vein catheterization) and Group B (internal jugular double lumen catheterization), each consisting of 60 patients.

Results: The mean age was 52.71±10.50 years. Venous thrombosis occurred in 9 (15%) in femoral catheterization (Group A) while internal jugular catheterization (Group B) had the incidence of 3 (5%), the difference between the two groups was not statistically significant (P<0.068).

Conclusion: The venous thrombosis occurred in 7.5% of patients with femoral catheters and 2.5% with internal jugular catheters and internal jugular vein may be the preferred site for catheterization due to its lower thrombosis rate.

Keywords: Hemodialysis, Venous Thrombosis, Femoral, Internal jugular

INTRODUCTION

End-stage renal disease (ESRD) significantly burdens healthcare systems worldwide, with hemodialysis being the most common renal replacement therapy. Vascular access for hemodialysis is typically achieved through arteriovenous fistulas (AVFs), arteriovenous grafts (AVGs), or central venous catheters (CVCs).[1] Despite the "Fistula First" initiative, CVCs remain widely used due to their ease of insertion and immediate availability in urgent cases. Approximately 25% of dialysis patients in United Statesare using them.[2] CVCs are categorized as either temporary, non-cuffed catheters for short-term use or permanent, tunneled catheters for long-term access.[3] However, CVCs are associated with complications, particularly catheter-related venous thrombosis, which can lead to partial or complete loss of vascular access in 30-40% of patients.[4] Key factors contributing to thrombosis are hypercoagulability, insertion site, number of insertion attempts, and catheter type used.

The internal jugular and femoral veins are commonly used for CVC placement[5], but studies report variable thrombosis rates between these sites.According to one study there is 28.6% thrombosis rate with femoral compared to 20.9% with internal jugular placement whereas another study suggestive of 10% thrombosis in femoral while none in internal jugular.[6,7] Limited data exists on thrombosis rates in the Pakistani population, making this study crucial for clinical decision-making and improving vascular access outcomes.

PATIENTS AND METHODS

This randomized controlled trial was conducted in the Nephrology Department of Shaikh Zayed Hospital Lahore from 8th March 2022 to 7th September 2022. All the patients who required hemodialysis either due to end-stage renal disease or acute kidney injury without any prior vascular access were included in the study. Patients with pre-existing central venous catheters, abnormal dialysis frequency (<2 or >3 sessions/week), significant psychological disorders, coagulation abnormalities, anatomical limitations to catheter insertion, local infection or recent surgery at the insertion site, or those on anticoagulation therapy were excluded.

After obtaining informed consent, eligible patients underwent evaluation through detailed history-taking, physical examination, and baseline laboratory investigations including complete blood count, coagulation profile, renal function tests, serum electrolytes, and duplex ultrasonography to exclude pre-existing thrombosis. Patients who fulfilled the inclusion criteria were then randomly assigned to receive hemodialysis catheterization either via the femoral vein (Group A) or the internal jugular vein (Group B). All procedures were performed under ultrasound guidance with local anesthesia, following standardized guidelines for central venous catheterization.[5] The catheters were left in place for up to six weeks, and patients were reassessed at 1, 4, and 6 weeks for venous thrombosis using duplex ultrasonography. If thrombosis was detected during follow-up, the catheter was removed and placed at the alternate site.

Received on 27-07-2023
Accepted on 03-11-2023

RESULTS

The mean age in both groups was 52.71±10.50 years, ranging from 18-80 years. The demographic data and etiology of end stage kidney disease of patients is shown in Table 1. Group A had a higher proportion of females 44 ((73.3%), whereas Group B had more males 44 (73.3%). Venous thrombosis was observed in 9 (7.5%) patients in the femoral group (Group A) and in 3 (2.5%) patients in the internal jugular group (Group B). Although the incidence was higher in the femoral group, the difference did not reach statistical significance (p=0.068).The incidence of thrombosis in male and female patients and different age groups (Table 2).

Table 1: Demographic data and etiology of end stage kidney disease of participants (n=120)

Variable	Group A (N=60)	Group B (n=60)
Gender		
Male	16 (26.6%)	44 (73.3%)
Female	44 (73.3%)	16 (26.6%)
Age (years)		
18-40	26 (43.3 %)	11 (18.33%)
41-80	34 (56.66%)	49 (81.6%)
Aetiology		
DM	13 (21.6%)	15 (25%)
GN	15 (25%)	10 (16.6%)
Hypertensive nephropathy	12 (20%)	8 (13.3%)
Stone	6 (10%)	9 (15%)
Miscellaneous	14 (23.3%)	18 (30%)

Femoral vein thrombosis was more prevalent among older patients, aged 41–80 years (n=6) compared to those with internal

jugular vein thrombosis reaching statistical significance (p=0.002). Although a higher frequency of thrombosis was noted in female patients (n=7) compared to males (n=5), the difference was not statistically significant and may be attributed to the greater proportion of females who received femoral catheters (73.3% vs. 26.6%). Twenty eight patients had diabetes, and thrombosis occurred in only 3 of them. Among 64 patients with hypertension, 7 developed thrombosis. Statistically there was no difference in Group A and group B with these different risk factors (Table 3).

Table 2: Incidence of thrombosis in different genders and age groups (N=12)

Variable	Group A (N= 9)	Group B (N=3)	P value
Gender			
Male (n=5)	4 (80%)	1 (20%)	1.00
Female (N=7)	5 (71.42%)	2 (28.5%)	1.00
Age (years)			
18-40	3 (50%)	3 50%)	0.23
41-80	6 (100%)	-	0.002

Table 3: Incidence of thrombosis in patients with different risk factors (n=12)

Comorbid conditions	Group A (N= 9)	Group B (N=3)	P value
Diabetes (n=28)	2 (66.7%)	1 (33.3%)	0.457
Hypertension (n=64)	6 (85.7%)	1 (14.3%)	0.113
Smoking (n=28)	1 (50%)	1 (50%)	0.662

DISCUSSION

Hemodialysis patients utilize various vascular accesses, including arteriovenous fistulae, grafts, tunneled, and non-tunneled catheters.[8] Despite being less durable and associated with more complications than native access, the use of percutaneous vascular access has risen in recent years. This increase is largely due to the older age, higher comorbidity burden, and cardiovascular complications in renal patients, as well as the ease and immediate availability of percutaneous access for hemodialysis.

A major complication is access-related thrombosis, which can result in loss of vascular access. This occurs due to inflammation, endothelial injury, blood stasis, and hypercoagulability.[9-11] However, effective monitoring and timely intervention can help prevent these outcomes.[12]

Femoral access is typically reserved as a last resort after other options are exhausted. Literature indicates that percutaneous accesses, particularly those involving the inferior venous system, are associated with higher rates of infection and dysfunction.[7]

In our study, femoral catheters had a higher thrombosis rate (7.5%) compared to internal jugular catheters (2.5%), althoughthe difference was not statistically significant (p=0.068).Venous thrombosis was slightly more common in females, likely due to a higher proportion receiving femoral catheters. This finding is consistent with another study that reported a significantly higher thrombosis rate in females.[13] Thrombosis was more frequent in older patients (aged 41–80 years) with femoral access, showing a statistically significant association (p=0.02), while younger patients (18-40 years) had similar risk across both access types. This is in contrast to data from other international studies which show no difference in thrombosis rates among different age groups.[14,15] Among diabetics, hypertensive and smokers, thrombosis occurred in 3, 7 and 2 cases respectively without any significant difference value. Previous studies have shown a significant association between diabetes and hypertension with vascular access thrombosis.[13]

CONCLUSION

Catheter-related thrombosis is a significant complication in hemodialysis, often resulting in loss of vascular access and 12 (10%) patients who developed venous thrombosis. The higher incidence of thrombosis in the femoral group compared to the internal jugular group, particularly among older patients (41–80 years). Given its lower thrombosis rate, the internal jugular vein appears to be the preferred site for catheterization to ensure better dialysis outcomes and reduced morbidity.

REFERENCES

1. Gunawansa N, Sudusinghe DH, Wijayaratne DR. Hemodialysis catheter-related centralvenous thrombosis: clinical approach to evaluation and management. Ann Vasc Surg 2018; 51:298-305.
2. Huriaux L, Costille P, Quintard H, Journois D, Kellum JA, Rimmelé T. Haemodialysiscatheters in the intensive care unit. Anaesth. Crit. Care Pain Med 2017;36(5):313-9.
3. Shafique MN, Akhtar SH, Mahnoor M, Hussain M. Hemodialysis Internal jugular veinversus Subclavian vein Catheters: Complications, patients' comfort, tolerance and cost-effectiveness. Pak J Med Sci 2019 ;35(1):124.
4. Beto J, Bhatt N, Gerbeling T, Patel C, Drayer D. Overview of the 2017 KDIGO CKDMBD update: practice implications for adult hemodialysis patients. J. Ren. Nutr. 2019;29(1):2-15.
5. Rupp SM, Apfelbaum JL, Blitt C, Caplan RA, Connis RT, Domino KB. Practiceguidelines for central venous access: a report by the American Society ofAnesthesiologists Task Force on Central Venous Access. Anesthesiology. 2012;116(3):539-73.
6. Sepas HN, Negahi A, Mousavie SH, Vosough F, Farazmand B. Patency and outcomes oftunneled hemodialysis catheter via femoral versus jugular vein access. J Adv Pharm Technol. 2019;10(2):81.
7. Abu-Sharkh IA, Martinez SP, Moas LJ, Arhda N, Diaz MF, Valente RA. Tunneledfemoral catheters and tunneled jugular catheters, our experience, efficacy andcomplications. Arch Clin Nephrol 2020;6(1):001-4.
8. Ferrari G, Talassi E, Baraldi C, Lambertini D, Tarchini R. Vascular access validity andtreatment efficiency in hemodialysis. G Ital Nefrol 2003; 20Suppl 22:S22-9.
9. Vadakedath S, Kandi V. Dialysis: A review of the mechanisms underlyingcomplications in the management of chronic renal failure. Cureus 2017;9(8), e1603.
10. Harnett JD, Foley RN, Kent GM, Barre PE, Murray D, Parfrey PS.Congestive heart failure in dialysis patients: prevalence, incidence, prognosis and riskfactors. Kidney Int. 1995; 47:884-90.
11. Volodarskiy A, Kumar S, Amin S, Bangalore S.Optimal treatment strategies in patients with chronic kidney disease and coronary arterydisease. Am J Med 2016;129:1288-98.
12. Koirala N, Anvari E, McLennan G. Monitoring and surveillance of hemodialysis. Semin Int Radiol 2016;33:25-30.
13. Mohazzab A, KhavaninZadeh M. Dehesh P.Investigation of risk factors for tunneled hemodialysis catheters dysfunction: competing risk analysis of a tertiary center data. BMC Nephrol 2022;23:300.
14. Morisi N, Montani M, Ehode EN, Virzi GM, Perrone S, Malaguti V, Ferrarini M, Donati G. Evaluating short-term outcomes of tunneled and non-tunneled central venous catheters in hemodialysis. J Clin Med 2024;23;13(13):3664.
15. Yoshida S, Sato Y, Naganuma T, Nukui I, Wakasugi M, Nakashima A. Risk factors for internal jugular vein thrombosis 1 month after non-cuffed hemodialysis catheter removal. J Clin Med 2024;13(24):7579.

This article may be cited as: Naeem H, Ahmed W, Akram M, Rehman AU, Rizvi R, Samee Ullah: Venous Thrombosis Comparison in Femoral versus Internal Jugular Catheterization for Hemodialysis. Pak J Med Health Sci, 2023;17(12):563-564.