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Permanent hemodialysis catheters inserted with traditional (blind) technique: 10 years experience

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ABSTRACT

Aims: In this study, complications and patency rates of permanent hemodialysis catheters, all inserted with traditional (blind) techniques in our clinic, were evaluated.

Methods: Between June 2012 and June 2022, with the traditional (blind) technique, 627 patients were inserted with permanent hemodialysis catheters. These 627 patients were included in this study. Demographic characteristics of the patients, catheter insertion location and techniques, reasons for removal, duration of use, and catheter-related complications were recorded.

Results: Between June 2012 and June 2022, 720 permanent hemodialysis catheters were inserted into 627 patients in our clinic. 350 patient's male, and 277 patients were female. The mean age was 45.35±15.9 (16-82 years). 610 catheters were inserted into the right jugular vein (84.7%), 90 catheters were inserted (12.5%) into the right femoral vein, 11 catheters (1.52%) were inserted into the left femoral vein, and 9 catheters (1.25%) were inserted into the left jugular vein. The need for re-catheter insertion developed in 93 patients. The reasons for re-catheter insertion were infection in 20 patients, intracatheter thrombosis in 63 patients, catheter malposition in 5 patients, and other causes in 5 patients.

Conclusion: The permanent hemodialysis catheter placement method depends on the clinician's experience. Complication rates for permanent hemodialysis catheters inserted with the traditional (blind) technique are similar to other methods.

Keywords: Hemodialysis, catheter, complication

INTRODUCTION

End-stage renal disease (ESRD) is a chronic disease with high morbidity and mortality and high treatment costs worldwide.[1] Kidney transplantation is the first preferred treatment method in these patients. However, most patients are still dependent on hemodialysis.[2] Arteriovenous fistulas (AVF) or hemodialysis catheters (HD) are usually used for hemodialysis.[3]

Hemodialysis catheters are vital for these patients. They are helpful methods that can provide vascular access in a short time. There are two types of hemodialysis catheters: permanent and temporary. Permanent HD catheters should be preferred for use longer than 3-4 weeks. Emergency HD is the most critical indication for temporary or permanent HD catheters.[4] Permanent HD catheters are also ideal for long-term use in patients who cannot use AVF or have a short life expectancy.[5]

Placement of these catheters is an invasive procedure. Therefore, these procedures have some mortality and morbidity rates. Different imaging techniques are offered to reduce these rates. However, in this article, we have discussed the permanent catheters we place without imaging. We evaluated 627 patients whose permanent HD catheters were inserted with blind technique between 2012 and 2022. In this retrospective study, we identified the complications that developed during permanent catheterization with the blind technique. We calculated the reinsertion rates of the catheters and compared them with imaging-guided interventions in the literature.

METHODS

This study was carried out between June 2012 and June 2022. Our analysis is retrospective and descriptive. Before the start of the study, approval was obtained from the Kastamonu University Clinical Researches Ethics Committee (Date: 14.12.2022, Decision No: 2022-KAEK-118). The study was conducted in accordance with the principles of the Declaration of Helsinki. A total of 627 patients whose permanent tunneled catheters were inserted blindly were studied. The age and gender of the patients, insertion sites and techniques of the catheters, reasons for removal, duration of use, and catheter-related complications were recorded.

Complication rates of patients with a permanent HD catheter inserted between 2012 and 2022 were investigated. The

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obtained results are discussed by comparing them with other techniques in the literature.

Between June 2012 and June 2022, 720 permanent hemodialysis catheters were inserted in 627 patients in our clinic. Three hundred fifty patients were male, and 277 were female; the mean age was 45.35±15.9 (16-82 years). Only patients who had to continue hemodialysis through a permanent catheter were included in the study.

Of the catheters, 610 (84.7%) were inserted in the right jugular vein, 90 (12.5%) in the right femoral vein, 11 (1.52%) in the left femoral vein, and 9 (1.25%) in the left jugular vein.

The need for re-catheter insertion developed for various reasons in 93 patients with a catheter. Catheters had to be changed due to infection in 20 patients, intracatheter thrombosis in 63 patients, catheter malposition in 5 patients, and other reasons in 5 patients.

A double lumen 14-15 F permanent HD catheter was inserted into all patients. Catheter lengths ranged from 19 to 23 centimetres. There was a Dacron cuff, which provides permanence by making fibrosis in the part of the catheters inside the tunnel and has a protective barrier against infection. The first preferred route was access to the right internal jugular vein by anterior approach (84.7%). The catheter was inserted into the femoral vein in patients with orthopneic or bleeding diathesis. The femoral vein was also used in patients who could not enter the jugular vein. Permanent catheters were inserted in the right femoral vein in 90 patients (12.5%) and the left femoral vein in 11 patients (1.52%). Subclavian access was not performed in any of the patients. All catheters were inserted in the operating room under sterile conditions under local anesthesia and using the Seldinger method. No imaging technique was used during catheter insertion in any of the patients. All catheter insertion procedures were performed using the traditional blind technique. After each insertion procedure, ten cc of saline was administered to the catheter lumens. Then, approximately two cc of heparin was helped into the catheter lumens. Chest X-rays were not routinely taken, except for the patients who were thought to have complications.

Statistical Analysis

The patients' data were obtained retrospectively from the hospital database. IBM SPSS v.22 program was used in the data analysis. Descriptive statistics were used to calculate the mean and median values of the patient's demographic data.

RESULTS

Between 2012 and 2022, 720 permanent tunnelled catheters were inserted in 627 patients using the blind technique. All catheter patients were end-stage renal disease patients referred from the nephrology outpatient clinic. Of the catheters, 610 (84.7%) were placed in the right jugular vein, 90 (12.5%) in the right femoral vein, 11 (1.52%) in the left femoral vein, and 9 (1.25%) in the left jugular vein (Table 1).

The need for re-catheter insertion developed for various reasons in 93 patients with a catheter. Infection in 20 patients, intracatheter thrombosis in 63 patients, catheter malposition in 5 patients, and other reasons in 5 patients were replaced with a new permanent catheter (Table 2).

Of the 93 patients requiring catheter replacement, 70 had a femoral catheter, and 23 had jugular catheters. Catheter revision was performed by sending a guide wire through the catheter in 60 patients who required catheter replacement. In the other 33, a new catheter was inserted using the Seldinger method from a new route.

Table 1. Where permanent tunneled catheters are inserted

Catheter insertion site	n	%
Right jugular vein	610	84.7
Right femoral vein	90	12.5
Left femoral vein	11	1.52
Left jugular vein	9	1.25
Total	720	100

Table 2. Reasons for catheter reinsertion

Indication	n	%
Thrombosis	63	67.74
İnfection	20	21.50
Malposition	5	5.37
Other	5	5.37
Total	93	100

Arterial puncture was not performed in any of the patients during the interventions. Pneumothorax was seen in 2 patients. Tube thoracostomy was required in 1 patient who developed pneumothorax. Hemothorax was not observed in any patient.

Catheter infection was seen in 20 patients as one of the late complications. The catheters of all patients with catheter infections were removed, and new ones were inserted. Intra-catheter thrombosis was observed in 63 patients, and catheter malposition was observed in 5 patients. No deep vein thrombosis was observed in the extremities connected to the catheter. There was no mortality in any patient during the insertion of the catheters.

DISCUSSION

The most recommended vascular access for hemodialysis in patients with end-stage renal disease is natural arteriovenous (AV) fistulas. According to the kidney disease outcome quality initiative (KDOQI) (Vascular Access Work Group, 2006) guidelines, it is recommended that at least 50% of these patients begin hemodialysis treatment with a mature AV fistula and less than 10% with a permanent catheter.[6]

However, the use of permanent catheters in patients has recently increased for various reasons. These are reasons such as not waiting for the necessary time to enter the fistula, providing painless access to the patient's blood, or sometimes the patient's request. For this reason, it has been reported in the literature that the rate of permanent catheter use in patients with renal failure is up to 32%.[7]

Permanent catheter insertion is, of course, a complex vascular access procedure. Significant complications such as arterial injury, pneumothorax, and hemothorax may occur. The process must be performed under sterile operating room conditions.[8] To avoid such undesirable situations, permanent tunneled catheter applications under the guidance of Doppler ultrasonography are widely used.[9] Complications such as

arterial puncture, arterial injury, hematoma, pneumothorax, and hemothorax have been reported during catheterization with the traditional (blind) technique.[10] Studies have reported 0.4-4.1% pneumothorax, 0.2-1.5% hemothorax, and 1% death during permanent catheter insertion procedures with imaging techniques.[11] Pneumothorax rates are seen to be higher, especially in subclavian vein interventions.[12] We found our pneumothorax rate of 0.31% in only 2 of 720 permanent catheters we inserted without imaging. This was seen as a low complication compared to the literature. We did not know of any mortality related to catheter insertion in our patients. In addition, we did not have arterial puncture in any of the patients during catheterization. Hemothorax and pericardial effusion due to cardiac and vascular injury were not observed in any of the patients.

The need for re-catheter insertion developed for various reasons in 93 patients with a catheter. Infection in 20 patients, intracatheter thrombosis in 63 patients, catheter malposition in 5 patients, and other reasons in 5 patients were replaced with a new permanent catheter. In our study group, the rate of catheter dysfunction was 14.8%. In the literature, this rate was 38.4%. Our catheter infection rate was 3.1%. The rate of catheter infection was 9.6% in the literature. Both rates were relatively low compared to the literature.[13]

The insertion of a permanent tunneled catheter guided by Doppler ultrasonography has been reported as a procedure to reduce complications.[14,15] However, with increasing clinical and surgical experience and standardized traditional methods (blind technique), permanent catheter interventions can be performed.

We have reached results that are consistent with the results of permanent catheter inserted with imaging in the literature. All catheter insertion procedures were performed by the same surgeon using standard methods. All catheter placement procedures were performed in the operating room under sterile conditions. A catheter was inserted in every patient who needed a permanent catheter on the same day without waiting. Without Doppler Ultrasound or any other imaging method, we placed all catheters at no cost and no additional time. Since the scope was not used, there was no radiation exposure. Cost and time loss are minimized. Mortality and morbidity rates were reasonable.

Limitations

First, some data may need to be included because it is a retrospective study. In addition, it is challenging to generalize interventions performed by a single-centered and experienced surgeon to clinical practice. Some patients with minimal pneumothorax and hemothorax may have been overlooked because routine control X-rays were not performed. However, we take a consistent approach because the aim of the study is less time and cost. This study showed that "ordering fewer tests" does not increase complications and mortality in clinical practice. The patients included in the study were those who applied to our hospital's cardiovascular surgery clinic for permanent hemodialysis catheterization. In the literature, the importance of experience is emphasized in both imaging-guided and blind technique insertion catheters.[16] We aimed to present our blind technique experiences in our clinic. Considering patient satisfaction, our clinic has low mortality and morbidity rates in our city and the Western Black Sea Region. It provides permanent catheter service in the provinces and districts of Çankırı, Karabük, Sinop.

CONCLUSION

The permanent hemodialysis catheter placement method depends on the clinician's experience. Complication rates for permanent hemodialysis catheters inserted with the traditional (blind) technique are similar to other methods.

ETHICAL DECLARATIONS

Ethics Committee Approval

Before the start of the study, approval was obtained from the Kastamonu University Clinical Researches Ethics Committee (Date: 14.12.2022, Decision No: 2022-KAEK-118).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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