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Comparison of the incidence of dysfunction in non-tunneled double lumen catheters in patients with catheters inserted in the right jugular and femoral Veins at Dr. M. Djamil Hospital Padang

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Abstract
Background: End-stage renal disease (ESRD) is a major health issue that often necessitates renal replacement therapy, particularly hemodialysis (HD). Double lumen catheters (CDLs), particularly non-tunneled versions, are commonly used to provide vascular access in HD patients. However, these catheters are associated with complications such as thrombosis and infection, which can lead to catheter dysfunction. The site of catheter insertion—either the right internal jugular vein or the femoral vein—may influence the incidence of dysfunction.
Objective: This study aims to compare the incidence of dysfunction between non-tunneled CDLs inserted into the right internal jugular vein and those inserted into the femoral vein in HD patients at Dr. M. Djamil General Hospital, Padang.
Methods: An observational, cross-sectional analytical study was conducted, involving patients who had undergone non-tunneled CDL placement. Statistical analysis, including proportion tests and logistic regression, was used to evaluate the relationship between insertion site, age, and sex with the occurrence of dysfunction.
Results: The incidence of catheter dysfunction was higher in femoral vein insertions (40%) compared to jugular vein insertions (25%). A significant association was found between the insertion site and catheter dysfunction.
Conclusion: Insertion of non-tunneled CDLs in the right internal jugular vein is associated with a lower incidence of dysfunction compared to the femoral vein. This finding suggests that the jugular vein is a more favorable site for catheter insertion in HD patients.

Keywords: Double lumen catheter, internal jugular vein, femoral vein, hemodialysis, dysfunction, thrombosis

1. Introduction
Chronic kidney disease (CKD) is a growing public health concern, affecting millions of people globally. CKD can progress to end-stage renal disease (ESRD), which significantly impairs renal function and requires renal replacement therapy (RRT), such as hemodialysis (HD), to sustain life (Kurnianda *et al*., 2025) [2]. In these patients, vascular access is crucial for the initiation and continuation of hemodialysis.
Double lumen catheters (CDLs) are commonly used as temporary vascular access devices for hemodialysis patients who cannot undergo permanent access procedures such as arteriovenous fistulas (AVF) or grafts (Rahman *et al*., 2025) [3]. These catheters provide access for blood withdrawal and return but are associated with complications, particularly thrombosis and infections, which can lead to catheter dysfunction (Schmidt *et al*., 2021) [4]. The location of catheter insertion—whether in the internal jugular vein (IJV) or femoral vein—may influence these complications.
Previous studies have suggested that the femoral vein, while often used in urgent situations, may be associated with higher rates of catheter-related dysfunction due to factors such as anatomical positioning, access duration, and increased risk of thrombosis (Kurnianda *et al*., 2025) [2]. Conversely, the right internal jugular vein, being closer to the heart and having a more direct flow path, may offer a lower incidence of dysfunction, though the comparison of these two insertion sites has not been fully explored in the context of non-tunneled CDLs (Dunn *et al*., 2020) [1].

2. Methods

2.1 Study Design

This research was a prospective, observational, cross-sectional study conducted at Dr. M. Djamil General Hospital, Padang. Patients undergoing hemodialysis with non-tunneled CDL placements were enrolled for the study.

2.2 Inclusion and Exclusion Criteria

The inclusion criteria consisted of patients diagnosed with ESRD requiring hemodialysis and who had received non-tunneled CDL insertion in either the right internal jugular vein or femoral vein. Exclusion criteria included patients with previous vascular access devices, those with severe comorbidities affecting catheter insertion, and those who had not undergone at least two successful dialysis sessions.

2.3 Data Collection

Demographic information (age, sex), clinical data (comorbidities, medication use), and procedural data (location of catheter insertion, duration of catheter use, complications, and dysfunction occurrences) were collected. The primary outcome was the incidence of catheter dysfunction, which was defined as a failure to maintain a blood flow rate of 300 mL/min or more during dialysis (Schmidt *et al*., 2021) [4].

2.4 Statistical Analysis

Descriptive statistics were used to summarize patient demographics and clinical characteristics. Proportion tests compared the incidence of catheter dysfunction between the jugular and femoral insertion groups. Logistic regression models were used to adjust for confounders such as age and sex. All statistical analyses were conducted using SPSS version 22, with a significance level set at $p < 0.05$.

3. Results

A total of 200 patients were enrolled in the study, with 120 patients receiving non-tunneled CDLs in the right internal jugular vein and 80 patients in the femoral vein. The mean age of participants was 55 years, with a slightly higher proportion of males (60%) than females (40%). The overall incidence of catheter dysfunction was found to be higher in the femoral vein group (40%) compared to the jugular vein group (25%). Statistical analysis revealed a significant association between the insertion site and the incidence of dysfunction ($p < 0.05$), indicating that jugular vein insertion was less likely to result in dysfunction. Further logistic regression analysis suggested that age and sex did not significantly affect the likelihood of dysfunction ($p > 0.05$).

4. Discussion

This study provides evidence supporting the right internal jugular vein as a more favorable site for non-tunneled double lumen catheter insertion in hemodialysis patients. Our findings are consistent with previous research suggesting that femoral vein insertions are associated with a higher incidence of catheter dysfunction, possibly due to anatomical challenges, longer catheter lengths, and a higher risk of thrombosis and mechanical obstructions (Rahman *et al*., 2025) [3].

The jugular vein offers advantages such as a shorter and more direct path to the heart, which may improve blood flow dynamics and reduce the likelihood of complications (Schmidt *et al*., 2021) [4]. In contrast, femoral vein insertions are prone to mechanical kinks, external pressure, and limited mobility, leading to higher rates of dysfunction. These findings are consistent with those of previous studies, which demonstrated that femoral vein access is linked to increased risk of thrombosis and infection (Dunn *et al*., 2020) [1].

Our study did not find a significant association between age, sex, and catheter dysfunction. This is in line with studies that suggest that catheter dysfunction is more strongly influenced by the insertion site and procedural factors rather than patient demographics (Kurnianda *et al*., 2025) [2].

5. Conclusion

This study demonstrates that non-tunneled double lumen catheters inserted into the right internal jugular vein have a significantly lower incidence of dysfunction compared to those inserted into the femoral vein. These findings suggest that the right internal jugular vein should be the preferred site for catheter insertion in hemodialysis patients, particularly in those requiring temporary access. Future research should explore further the long-term outcomes of these two access sites and the impact of other factors such as catheter material and management protocols.

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