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Application and Nursing Care of Mid-Length Catheters in the Infusion of Oxaliplatin in Gastrointestinal Tumor Patients Refusing Central Venous Catheterization

Hui Chi, Lili Sun*

Yancheng No.1 People's Hospital, Yancheng 224000, Jiangsu, China

**Author to whom correspondence should be addressed.*

Abstract: *Objective*: To investigate the application effectiveness and nursing care of mid-length catheters (MCs) in the infusion of oxaliplatin in gastrointestinal tumor patients who refuse central venous catheterization. *Methods*: A total of 71 patients with gastrointestinal tumors who were treated in our hospital from August 2024 to June 2025 were selected. All of them refused central venous catheterization due to subjective willingness and voluntarily accepted MC insertion for oxaliplatin chemotherapy. The MC insertion status of the patients was recorded, and the incidence of catheter-related complications during chemotherapy and the quality of life before and after intervention were observed. *Results*: The catheterization success rate among the 71 patients was 97.18%; the average catheterization time was (18.25 ± 1.12) minutes, and the average catheter indwelling time was (12.64 ± 4.58) days; a total of 5 catheter-related complications occurred during chemotherapy, with an overall incidence rate of 7.04%, all of which were mild to moderate complications, and no severe complications occurred; the quality of life score after intervention was significantly higher than that before intervention ($P < 0.05$). *Conclusion*: The application of mid-length catheters in the infusion of oxaliplatin in gastrointestinal tumor patients who refuse central venous catheterization offers advantages such as a high catheterization success rate, long indwelling time, low complication rate, and improved quality of life for patients. Combined with targeted nursing measures, it can further ensure medication safety.

Keywords: Medium-length catheter; Gastrointestinal tumor; Nursing; Complications

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1. Introduction

Chemotherapy is an important approach in the comprehensive treatment of gastrointestinal tumors. Oxaliplatin, as a third-generation platinum-based chemotherapy drug, exhibits certain intravenous irritancy. Clinically, it is

often recommended to administer the drug through central venous catheterization or peripherally inserted central catheters (PICCs) [1]. However, some patients with gastrointestinal tumors subjectively refuse central venous catheterization due to concerns about catheter-related trauma, infection risks, limitations in daily activities, and financial burdens, resulting in clinical dilemmas in selecting venous access routes [2]. Although direct peripheral venous infusion of oxaliplatin is simple to perform, the incidence of venous irritation reactions can be as high as 30% to 50%, which not only increases patient discomfort but may also affect the chemotherapy process due to deteriorating vascular conditions [3]. The medium-length catheter (MC), as a novel venous access device, combines the ease of operation of peripheral venous catheters with the safety and reliability of central venous catheters. It features minimal catheter-related trauma, convenient nursing care, and lower costs, and has gradually been applied in patients requiring medium- to long-term intravenous therapy [4]. Currently, further validation is needed regarding the application effects, complication prevention and control, and targeted nursing measures of medium-length catheters in chemotherapy for patients with gastrointestinal tumors. This study selected 71 patients with gastrointestinal tumors who refused central venous catheterization, employed MC insertion for oxaliplatin infusion, and implemented targeted nursing interventions to systematically explore its clinical application value and provide a safer and more feasible venous access solution for such patients.

2. Materials and methods

2.1. General information

Seventy-one patients with gastrointestinal tumors who were treated in our hospital from August 2024 to June 2025 were selected, including 42 males and 29 females; aged 38 to 74 years old, with an average age of (56.32 ± 9.45) years old; disease types: 48 cases of colorectal cancer and 23 cases of gastric cancer; clinical stages: 18 cases in stage II, 35 cases in stage III, and 18 cases in stage IV; chemotherapy cycles: 6 to 12, with an average of (8.45 ± 1.03) cycles.

2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) Diagnosed with gastrointestinal tumors via histopathological examination and requiring an oxaliplatin-based chemotherapy regimen; (2) Aged 18 to 75 years; (3) Explicitly refusing central venous catheterization due to subjective willingness and voluntarily accepting the insertion of a medium-length catheter; (4) Having clear consciousness and being able to cooperate with catheter insertion and nursing procedures; (5) Expected to undergo ≥ 2 chemotherapy cycles and requiring medium- to long-term intravenous access support.

Exclusion criteria: (1) Severe coagulation disorders; (2) Infection, rash, ulcer, or severe skin diseases at the puncture site; (3) Superior vena cava syndrome or a history of venous thrombosis in the limb where the catheter is to be inserted; (4) Mental illness or cognitive impairment that prevents cooperation; (5) Allergy to catheter materials or local anesthetics.

2.3. Methods

All patients received a chemotherapy regimen featuring oxaliplatin. Catheter placement method: The catheter placement procedure was performed by specialized intravenous therapy nurses who had undergone specific training, utilizing the ultrasound-guided modified Seldinger technique. The basilic vein was the first choice, followed by the median cubital vein and the cephalic vein. The patient was placed in a supine position with the upper limb abducted at 90 degrees, and routine disinfection and draping were performed. The target vessel was

located using an ultrasound probe. After the anesthesia took effect, the puncture needle was inserted into the target vessel along the long axis of the vessel under ultrasound guidance. After blood return was observed, the puncture needle was secured, and a guidewire was slowly inserted before the puncture needle was withdrawn. A dilator was inserted along the guidewire to dilate the subcutaneous tissue and then withdrawn. A medium-length catheter was slowly inserted to the predetermined length along the guidewire, after which the guidewire was withdrawn. After blood return was observed upon aspiration, the catheter was flushed with saline in a pulsatile manner to confirm its patency. Ultrasound examination confirmed that the catheter tip was located in the subclavian vein. The external portion of the catheter was secured in a "U" shape and covered with a sterile transparent dressing. Finally, the catheter was sealed with saline using pulsatile positive pressure.

Nursing measures:

(1) Pre-catheterization nursing: Before catheter placement, the advantages of inserting a central venous catheter were re-emphasized to the patient. If the patient refused, they signed an informed consent form refusing central venous catheter placement. The advantages of the medium-length catheter (MC), the catheter placement procedure, possible discomfort, and coping methods were explained in detail to the patient and their family. The risks associated with peripheral intravenous infusion were compared to alleviate the patient's anxiety. The patient was informed of key points for cooperation during catheter placement and signed an informed consent form for medium-length catheter insertion.

(2) Nursing care during catheter placement: Adjust the temperature of the ward to 22–24 °C. Provide soft cushions to support the patient's limbs and distract their attention. During catheter placement, closely observe the patient's complexion, facial expressions, and vital signs, communicate promptly, and address any discomfort. Ensure sterile operation to prevent contamination.

(3) Nursing care after catheter placement: Prevention and management of complications: Phlebitis: Encourage appropriate arm movement after catheter placement; promptly provide symptomatic treatment if phlebitis occurs. Thrombosis formation: Instruct patients to perform functional exercises such as clenching and releasing their fists with the upper limb on the puncture side to avoid prolonged immobilization; closely observe for limb swelling, pain, and increased skin temperature, regularly monitor vascular ultrasound, and promptly administer anticoagulant therapy if thrombosis is detected. Catheter occlusion: Strictly adhere to flushing and sealing protocols to avoid drug incompatibilities; in case of occlusion, never forcefully inject; first, attempt to aspirate the catheter with a syringe to clear the blockage; if unsuccessful, use urokinase for thrombolysis. Infection: Strengthen care at the puncture site and strictly adhere to sterile procedures; observe for redness, swelling, heat, pain, and purulent discharge at the puncture site, regularly monitor blood tests, promptly remove the catheter and administer antibiotics if infection is detected. Blood or fluid leakage: After catheter placement, press the puncture site for more than 5 minutes and closely observe for any bleeding; if significant bleeding occurs, promptly change the dressing and apply pressure bandaging. Inform patients to avoid exposure to cold stimuli to prevent peripheral neurotoxicity; in case of drug extravasation, immediately stop the infusion, retain the catheter, aspirate residual drugs, apply a 50% magnesium sulfate cold compress, and, if necessary, administer a local block. Provide patients and their families with an MC maintenance manual and explain relevant precautions in detail. Establish a follow-up file and conduct regular follow-ups to understand catheter usage and the occurrence of complications.

2.4. Observation indicators

2.4.1. Catheterization-related indicators

Success rate of catheterization, catheterization time (from the start of disinfection to completion of fixation), duration of catheter indwelling (from successful catheterization to catheter removal), and selection of catheterization site.

2.4.2. Incidence of complications

Phlebitis, thrombosis, catheter occlusion, infection, bleeding and exudation, catheter displacement/dislodgement, etc.

2.4.3. Quality of life

Assessed using the Quality of Life Questionnaire-Core 30 (QLQ-C30) for cancer patients, which includes five dimensions such as physical functioning, role functioning, and emotional functioning. The total score is 100, with higher scores indicating better quality of life.

2.5. Statistical methods

Data are presented as mean ± standard deviation (SD) for t-tests and continuous variables, all analyzed using statistical software (SPSS 24.0). A *P*-value less than 0.05 is considered statistically significant.

3. Results

3.1. Catheterization-related indicators

Out of the 71 patients, catheter placement was successful in 69 cases, resulting in a success rate of 97.18%. Catheter placement failed in 2 cases, with one failure attributed to vasospasm and the other to difficulty in guidewire insertion. After the failures, catheter placement was successfully performed on the contralateral upper limb. The average catheter placement time was (18.25 ± 1.12) minutes, and the average catheter indwelling time was (12.64 ± 4.58) days, with the longest indwelling time being 16 days and the shortest being 3 days. There were no interruptions in chemotherapy due to catheter-related issues.

3.2. Incidence of catheter-related complications

During chemotherapy, a total of 5 catheter-related complications occurred, with an overall incidence rate of 7.04%. All complications were mild to moderate in severity, and no severe complications were reported. See **Table 1**.

Table 1. Incidence of catheter-related complications

Complication Type	Number of Cases	Incidence Rate (%)
Thrombosis	1	1.41
Catheter Occlusion	2	2.82
Hemorrhage/Seepage	2	2.82
Total Incidence	5	7.04

2.3. Quality of life scores

The quality of life scores after intervention were significantly higher than those before intervention ($P < 0.05$). See **Table 2**.

Table 2. Quality of life scores (mean ± SD, points)

Time	*n*	Physical Function	Role Function	Emotional Function	Cognitive Function	Social Function	Total Score
Before Intervention	71	54.23 ± 7.33	55.34 ± 6.32	54.42 ± 7.41	57.53 ± 6.43	56.25 ± 6.34	55.54 ± 6.45
After Intervention	71	82.32 ± 7.34	84.43 ± 7.84	85.34 ± 6.33	84.23 ± 6.42	82.35 ± 6.45	83.64 ± 7.55
t-value		22.817	24.341	26.734	24.760	24.316	23.844
P Value		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

4. Discussion

Patients with gastrointestinal tumors require long chemotherapy cycles, and the intravenous irritation caused by oxaliplatin necessitates that the intravenous access be safe and durable to a certain extent. Although central venous catheterization can meet the demands of chemotherapy, some patients refuse it due to psychological concerns, worries about their quality of life, and other reasons, resulting in a clinical dilemma of "no suitable intravenous access" [5]. Studies have shown that more than 43% of patients are not clinically suitable for PICC [6]. As a venous access tool that falls between peripheral intravenous catheters and central venous catheters, medium-length catheters have their tips located in the axillary vein or the lower segment of the subclavian vein. They not only avoid direct irritation of peripheral veins but also do not require entry into the central veins, offering unique advantages in terms of safety, operational convenience, and cost-effectiveness.

Research indicates that medium-length catheters have lower incidences of thrombosis and catheter-related bloodstream infections compared to PICC, and their indwelling time can meet the needs of short-term chemotherapy, making them suitable for patients who refuse central venous catheterization [7]. Another study has confirmed that ultrasound-guided insertion of medium-length catheters can improve puncture success rates and reduce vascular injury [8]. The results of this study indicate that among 71 patients, the success rate of MC catheter placement was 97.18%, with an average catheter placement time of (18.25 ± 1.12) minutes and an average catheter indwelling time of (12.64 ± 4.58) days. This confirms that MC catheter placement is a simple procedure with a high success rate, eliminating the need for frequent changes of intravenous access and reducing the pain caused by repeated punctures in patients. The incidence of complications is a core indicator for evaluating the safety of intravenous access. Sheng et al. [9] pointed out that compared to short peripheral intravenous catheters, MCs have a longer indwelling time and lower incidences of phlebitis and exudation. Compared to central venous access devices, their insertion process is safer, with lower risks of catheter-related bloodstream infections and thrombosis. Researchers such as Li Xiuyun [10] have also noted that, in meeting patients' treatment needs, medium-length catheters can avoid unnecessary central venous catheter placement and reduce catheter-related bloodstream infections. In this study, the overall incidence of catheter-related complications was only 7.04%, with no serious complications such as severe infections, catheter rupture, or pulmonary embolism, indicating a low incidence of complications and good safety in the application of medium-length catheters. The study results also indicate that patients experienced a higher quality of life after the intervention. Prior to catheter placement,

diversified education was provided to alleviate patient anxiety. During catheter placement, specialized intravenous therapy nurses performed the procedure to ensure safety. After catheter placement, standardized maintenance and continuous management were implemented to reduce complications, while attention was also given to patients' psychological states and living needs, thereby improving their quality of life.

5. Conclusion

In summary, medium-length catheters (MCs) offer several advantages in the infusion of oxaliplatin in gastrointestinal tumor patients who refuse central venous catheterization, including a high catheter placement success rate, long indwelling time, low incidence of complications, and improved patient quality of life. When combined with targeted nursing measures, they can further ensure treatment safety and possess clinical value. However, this study has certain limitations. Firstly, it is a single-center study with a relatively small sample size, which may introduce selection bias. Secondly, the observation period was relatively short, and long-term follow-up of patients was not conducted. Therefore, the long-term complication rate of MCs still requires further investigation. In the future, large-sample, multicenter studies could be conducted to clarify the clinical value of MCs.

Disclosure statement

The authors declare no conflict of interest.

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