

Case Report

Breakage and Disappearance of a Part of the Midline Catheter Tip During Insertion

J Oh, SY Jin, J Lee, S Shim

Department of Anesthesia and Pain Medicine, Samsung Changwon Hospital, Sungkyunkwan University School of Medicine, Changwon, Republic of Korea

Received:

31-Oct-2022;

Revision:

10-Mar-2023;

Accepted:

01-Jun-2023;

Published:

14-Jul-2023

ABSTRACT

Midline catheters have been proposed as alternatives to central venous catheters and peripherally inserted central catheters. Midline catheters reduce the incidence of overall needle stick injuries during hospitalization, have lower complication rates than central venous catheters or peripherally inserted central catheters, and provide potential cost benefits for hospitals. Complications with midline catheters are similar to those of other intravenous catheters, and intravenous catheter breakage is very rare and invasive. We report a case wherein a midline catheter tip was broken during insertion and removed by open surgery. For the safe use of midline catheters, accurate and delicate insertion techniques should be practiced. More case studies are warranted to verify the usefulness and convenience of various types of midline catheters for their universal use.

KEYWORDS: Catheter breakage, complication, midline catheter, open surgery

INTRODUCTION

Midline catheters (MCs) are 8–10 cm in length and are inserted into the peripheral veins of the upper arm. They terminate before the distal axillary vein, precluding it from central circulation.^[1] The reported benefits of MCs include fewer overall needle sticks, a low complication rate, and cost benefit for the hospital.^[2,3] In our operating room, MC is considered for patients with difficult intravenous access, those with scheduled long hospitalization, and those requiring additional intravenous access for transfusion or fluid infusion. We report a case wherein the MC tip was broken during insertion and removed by open surgery.

CASE REPORT

This case report was approved by the Institutional Review Board (No. 2022-07-012), and informed consent was obtained.

An 82-year-old woman (150 cm in height and 50 kg in weight) was scheduled to undergo laparoscopy-assisted distal gastrectomy under general anesthesia for early gastric cancer. Physical examination findings, laboratory

investigation results, family history, and past medical history were unremarkable, except that she was a hepatitis B carrier. In the operating room, routine monitors were attached to measure vital signs. The patient was anesthetized with propofol 120 mg, fentanyl 25 µg, and rocuronium 50 mg. Cannulation of the left radial artery was performed for continuous blood pressure monitoring and blood sampling. We used an MC because hospitalization was planned for >1 week and additional intravenous access was needed for transfusion. We attempted to insert a 20-gauge, 8-cm MC (PowerGlide Pro™; BD Healthcare, Franklin Lakes, NJ) in the right upper arm under ultrasound guidance. The catheter was an all-in-one device using the modified Seldinger technique with a needle, wire, and catheter in a combined unit. When the catheter was inserted into the basilic vein, resistance was felt and needle progression

Address for correspondence:


Dr. J Oh,
Department of Anesthesia and Pain Medicine, Samsung Changwon Hospital, Sungkyunkwan University School of Medicine (SKKU-SOM) 158 Paryong-Ro, Masanhoewon-Gu, Changwon, Gyeongsangnam-Do 51353, Republic of Korea.
E-mail: oja0430@naver.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Oh J, Jin SY, Lee J, Shim S. Breakage and disappearance of a part of the midline catheter tip during insertion. Niger J Clin Pract 2023;26:841-3.

Access this article online

Quick Response Code:	Website: www.njcponline.com
	DOI: 10.4103/njcp.njcp_752_22

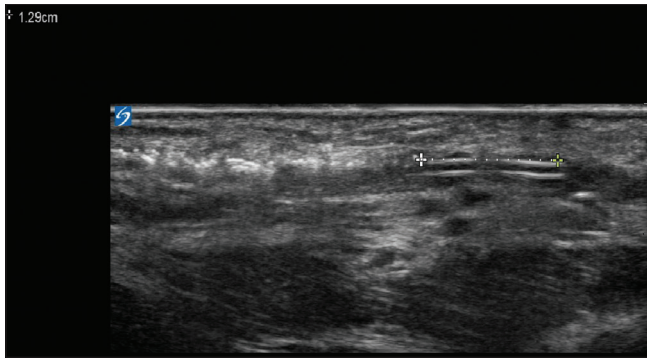


Figure 1: Ultrasound image of the right upper limb

was difficult. We removed the catheter, but further resistance was felt; therefore, catheter withdrawal was proceeded carefully. Catheter integrity was checked immediately after removal, and the catheter tip had broken. Ultrasound revealed that the catheter tip seemed to remain near the insertion site [Figure 1]. The surgeon tried to remove it after making a small incision, but the catheter was difficult to find. In consultation with the attending physician, the possibility of catheter movement was judged to be low on ultrasound. In cases of catheter migration, surgery or procedure was prepared as a follow-up, and the scheduled operation was performed. Postoperatively, computed tomography (CT) was performed to confirm the exact location of the catheter tip, excluding the possibility that the ultrasound image was an artifact. Based on the ultrasound and CT findings, we confirmed that the catheter tip was in the basilic vein. Consequently, we requested removal surgery by the vascular surgeon. The catheter fragment was removed by ligation and incision of the basilic vein [Figure 2]. We checked the integrity of the catheter fragments and confirmed that no fragments remained in the vein. Fortunately, the wound recovered well without sequelae, and the patient was discharged without any other complications.

DISCUSSION

MCs are longer than traditional peripheral venous catheters and reach deeper veins in the arm. Therefore, their dwell time can be longer than that of standard peripheral catheters. Moreover, MCs have a lower risk of infection and thrombosis than central venous devices; therefore, they are proposed as convenient alternatives to peripherally inserted central catheters or central venous catheters (CVCs).^[3]

The Michigan Appropriateness Guide for Intravenous Catheters recommends MCs for patients treated with peripheral appropriate solutions that will likely exceed six days of treatment and expected difficult intravenous access.^[4] Although no study has been conducted on

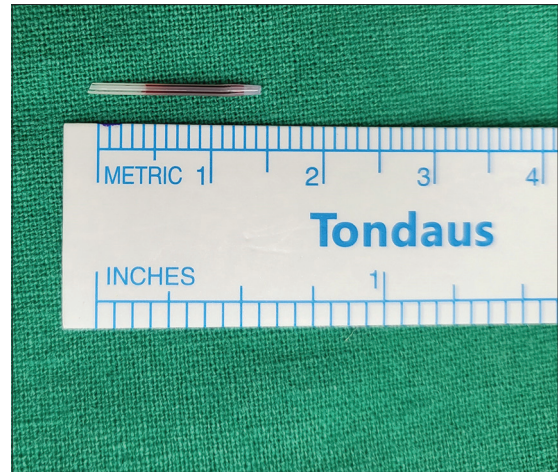


Figure 2: Damaged catheter tip

anesthetized patients, we performed MC insertion after anesthetizing a patient scheduled for surgery to reduce discomfort and pain.

Minor complications of MCs include dislodgement, leaking, and infiltration, whereas major complications include occlusion, upper-extremity deep vein thrombosis, and bloodstream infection. Catheter breakage has been rarely reported with MCs, but it has been reported with other intravenous devices.^[5,6] An uncommon case has been reported, wherein intravascular damage of MC occurred during dressing change, resulting in upstream migration of the broken catheter piece to the central circulation.^[7]

Intravascular catheter damage has been reported as a complication with other types of catheters, such as CVCs and peripheral catheters.^[5,6] In most cases, the catheter is broken by an introducer needle during insertion, and the catheter fragment is removed using a percutaneous approach or open surgery. In this case, when re-attempting needle insertion from the beginning after completely removing the guidewire, the catheter tip may have been damaged by the introducer needle when finding the target blood vessel, whereas the polyurethane catheter was not completely withdrawn [Figure 3].

In response to a damaged catheter, literature reviews advocate immediate removal of any catheter fragments due to the high incidence of complications, including arrhythmias, sepsis, thrombus formation on the catheter, pulmonary embolization, myocardial inflammation, and death.^[8,9] However, a previous study suggested that in asymptomatic patients, a conservative approach can be attempted while performing radiographic follow-up depending on the location of the foreign body.^[10] In our case, we removed the catheter fragment immediately to

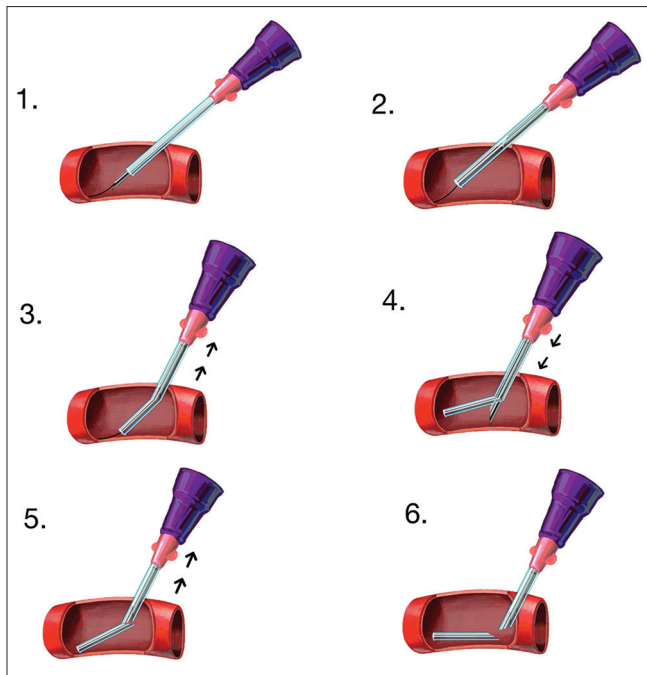


Figure 3: Illustration of the hypothetical catheter breakage process

reduce the risk of potential complications and to ensure safe management of the patient after discharge.

Regardless of the catheter type, practitioners should not advance or withdraw the catheter forcefully if resistance is felt during insertion. After removing the MC, it must be examined to verify if it is intact and if the length is the same as that recorded at the insertion time. Moreover, it is necessary to check whether convenience of use differs according to the MC type. We used an all-in-one device in which a catheter, wire, and introducer needle were combined, but there are products in which these components are separated (e.g., Arrow®). The all-in-one device is convenient to operate; however, it is difficult to identify a problem if one occurs during the procedure, and it is impossible to re-adjust the catheter's position after it is completely settled. The usefulness and convenience of MCs should be confirmed through larger prospective studies, and sufficient training should be conducted for practitioners.

Key messages

We describe a case of intravascular breakage of a midline catheter and its removal through open surgery. In addition, we provide a summary of the correct catheter insertion techniques. For safe and universal use of midline catheters, their usefulness and convenience should be confirmed through larger prospective studies, and sufficient training should be conducted.

Acknowledgement

We would like to acknowledge professor Moon Ok Lee for clinical advise and Jeong Hye Jin, MD, for image editing.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Mermel LA, Allon M, Bouza E, Craven DE, Flynn P, O'Grady NP, *et al.* Clinical practice guidelines for the diagnosis and management of intravascular catheter-related infection: 2009 Update by the Infectious Diseases Society of America. *Clin Infect Dis* 2009;49:1-45. doi: 10.1086/599376.
- Pathak R, Patel A, Enuh H, Adekunle O, Shrisgantharajah V, Diaz K. The incidence of central line-associated bacteremia after the introduction of midline catheters in a ventilator unit population. *Infect Dis Clin Pract (Baltim Md)* 2015;23:131-4.
- Chopra V, Kaatz S, Swaminathan L, Boldenow T, Snyder A, Burris R, *et al.* Variation in use and outcomes related to midline catheters: Results from a multicentre pilot study. *BMJ Qual Saf* 2019;28:714-20.
- Moureau N, Chopra V. Indications for peripheral, midline and central catheters: Summary of the MAGIC recommendations. *Br J Nurs* 2016;25:S15-24.
- Machat S, Eisenhuber E, Pfarl G, Stübler J, Koelblinger C, Zacherl J, *et al.* Complications of central venous port systems: A pictorial review. *Insights Imaging* 2019;10:1-12. doi: 10.1186/s13244-019-0770-2.
- Schraverus PJ, van Rijswijk S, Tuinman PR. Case report: Using ultrasound to prevent a broken catheter from migrating to the heart. *F1000Res* 2017;6:616. doi: 10.12688/f1000research.11206.1.
- Soták M, Čapek V, Tyll T. Where did the midline catheter disappear? *Clin Med Insights Case Rep* 2021;14:11795476211063318. doi: 10.1177/11795476211063318.
- Fisher RG, Ferreyro R. Evaluation of current techniques for nonsurgical removal of intravascular iatrogenic foreign bodies. *AJR Am J Roentgenol* 1978;130:541-8.
- Bernhardt LC, Wegner GP, Mendenhall JT. Intravenous catheter embolization to the pulmonary artery. *Chest* 1970;57:329-32.
- Szekely J, Racz L, Karatson A. Broken piece in the lungs: A complication of haemodialysis via subclavian cannulation. *Int Urol Nephrol* 1989;21:533-40.