Embolization of a fractured central venous catheter placed using the internal jugular approach

Atsushi Shimizu\textsuperscript{a,b,*}, Alan Lefor\textsuperscript{b}, Manabu Nakata\textsuperscript{c}, Umehachi Mitsuhashi\textsuperscript{a}, Masahiro Tanaka\textsuperscript{a}, Yoshikazu Yasuda\textsuperscript{b}

\textsuperscript{a} Department of Surgery, Koganei Central Hospital, Koganei 2-4-3, Shimotsuke, Tochigi 329-0414, Japan
\textsuperscript{b} Department of Surgery, Jichi Medical University, Yakushiji 3311-1, Tochigi 329-0498, Japan
\textsuperscript{c} Department of Radiology, Jichi Medical University, Yakushiji 3311-1, Shimotsuke, Tochigi 329-0498, Japan

\section*{A R T I C L E   I N F O}

\textbf{Article history:}
Received 23 January 2014
Accepted 4 February 2014
Available online 20 March 2014

\textbf{Keywords:}
Central venous catheter
Catheter embolus
Internal jugular vein
Interventional radiology

\section*{A B S T R A C T}

\textbf{INTRODUCTION:} Fracture and embolization of central venous catheters placed via the subclavian approach is well recognized, but fractured catheters placed via the internal jugular vein are extremely rare.

\textbf{PRESENTATION OF CASE:} A 65-year-old man presented with a catheter embolus after placement of a central venous port using the internal jugular approach undertaken to administer adjuvant chemotherapy for colon cancer with lung metastases. Goose neck and conformational loop snares were successfully used to percutaneously retrieve the severed catheter, which had migrated to the right ventricle.

\textbf{DISCUSSION:} Catheter fracture may occur even after placement via the internal jugular approach and may be underestimated because it is often asymptomatic. Interventional radiology techniques using goose-neck and conformational loop snares may be useful to retract an intravascular foreign body.

\textbf{CONCLUSION:} Imaging studies such as a chest X-ray are mandatory to check that the catheter tip is in the appropriate position during the entire follow-up period even if it was placed through the internal jugular vein.

© 2014 The Authors. Published by Elsevier Ltd. on behalf of Surgical Associates Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/3.0/).

\section*{1. Introduction}

Catheter fracture with subsequent embolization is a rare late complication of central venous catheter placement. It has been reported most commonly with a catheter placed using the subclavian approach and is often preceded by the “pinch-off sign”, first described by Aiken and Minton.\textsuperscript{1} To avoid this potentially serious complication, an internal jugular (IJ) approach has been advocated by some authors.\textsuperscript{2-4} We report a patient with a fragmented catheter embolus to the right ventricle in which the catheter of a central venous port was placed using the IJ approach. Interventional radiology techniques using goose-neck and conformational loop snares were used successfully to remove the catheter fragment, which had migrated to the right ventricle.

\section*{2. Presentation of case}

A 65-year-old man with a history of ascending colon cancer and synchronous metastases to both lungs underwent placement of a central venous port (Bard Port with Groshong Catheter, Bard Access Systems Inc., UT, USA) to receive adjuvant chemotherapy. The catheter of the central venous port was introduced via the right IJ vein without complications. He subsequently underwent 12 courses of FOLFOX treatment. Due to the high risk of recurrence, the port was left in place for possible future use after completion of the scheduled treatment. He underwent computed tomography (CT) scanning every three months as part of routine follow-up. At 508 days after placement of the central venous port, it was noticed on the CT scan that the central venous catheter had fractured at the entry site into the right IJ vein and the distal tip of the catheter had migrated to the inferior vena cava (Fig. 1).

The patient was brought to the interventional radiology department and emergency angiography performed. By the time he reached the angiography suite, the distal catheter fragment had migrated further to the right ventricle. The right ventricle was too small for the basket wire to get fully expanded, so a 15 mm goose neck wire (Amplatz Goose Neck Snare Kit, ev3, Inc., MN, USA) was used to move the catheter tip into the inferior vena cava, a more favorable position for retrieval using the snare device. It was...
then retrieved using a 45 mm conformational loop snare (EN Snare Endovascular Snare System, Merit Medical Systems, Inc., UT, USA). The electrocardiogram showed premature ventricular contractions during the procedure. The central venous port was removed subsequently. The patient tolerated the procedure well without any sequelae.

3. Discussion

This case report emphasizes two important features. First, catheter fracture is possible, even after using the IL approach. Second, interventional radiology techniques using goose-neck and conformational loop snares are useful to extract an intravascular foreign body. Fracture and migration of a central venous catheter is known as a late complication that occurs in 0.5%–3% of patients and is sometimes associated with port removal, but can also occur spontaneously.5–8 This complication is known to occur more commonly after a subclavian-approach is used to place the catheter. This has led some to recommend the IL approach as the preferred method to avoid catheter “pinch off” which has been associated with subsequent embolization.

However, this rare complication can also happen with a catheter placed using the IL approach. Previous similar reports showed a fracture in the proximal portion of the catheter placed using the IL route.9–11 The fracture was attributed to repeated compression of the catheter against the clavicle. The present case is unique in that the transection spontaneously occurred in the distal portion of the catheter, about 10 cm from the port, at the entry site into the IL in the right neck. We speculated that it might be due to material weakness of the silicone catheter.

Interventional radiology techniques using a combination of goose-neck and conformational loop wires were useful. The migrated catheter can cause significant complications such as pulmonary embolism, cardiac perforation, or sepsis. Percutaneous retrieval of an intravascular foreign body is standard therapy.8,12,13 Once a foreign body becomes endothelialized, it is usually impossible to remove percutaneously. Therefore in this patient, angiography and removal was carried out expeditiously. There was not enough room in the right ventricle for a basket snare or a 45 mm conformational loop snare to become fully expanded. A goose-neck snare was then used, the catheter fragment moved to the inferior vena cava, and a conformational loop snare used to extract it.

Spontaneous catheter fractures may be under-estimated. In one report 83% were asymptomatic.9 In the present case, the tunneled portion of the catheter was palpable up to the neck, and appeared normal. Heparin flush did not result in swelling at site of the injection port chamber nor pain in the shoulder which have been reported to be signs of catheter fracture and leak6,7,9,11,14 Some vascular access devices are not assessed after completion of scheduled treatment, which suggests that they may never be identified as damaged.

4. Conclusion

Catheter fracture may occur even after placement via the IL approach, and interventional radiology techniques using goose-neck and conformational loop snares may be useful to retract an intravascular foreign body. X-ray follow up is mandatory because damaged or embolized central venous catheters are often asymptomatic.

Consent

Informed consent was obtained from the patient.

Conflicts of interest

None.

Funding

None.

Author contributions

Drs. Atsushi Shimizu, Alan Lefor, Manabu Nakata, Umehachi Mitsuhashi, Masahiro Tanaka and Yoshikazu Yasuda contributed with the study design, data collection, data analysis, and writing the paper.

References

1. Aitken DR, Minton JP. The pinch-off sign: a warning of impending problems with permanent subclavian catheters. Am J Surg 1984;148:633–6.
2. Bannon MF, Heller SF, Rivera M. Anatomic considerations for central venous cannulation. Risk Manag Healthc Policy 2011;4:27–39.
3. Jensen MO. Anatomical basis of central venous catheter fracture. Clin Anat 2008;21:106–10.
4. Surov A, Wienen A, Carter JM, Stoevesandt D, Behrmann C, Spielmann RF, et al. Intravascular embolization of venous catheter–causes, clinical signs, and management: a systematic review. JPN J Parenter Enteral Nutr 2009;33:677–85.
5. Kusminsky RE. Complications of central venous catheterization. J Am Coll Surg 2007;204:681–96.
6. Wu CY, Fu JY, Feng PH, Kao TC, Yu SY, Li HJ, et al. Catheter fracture of intravenous ports and its management. World J Surg 2011;35:2403–10.
7. Lin CH, Wu HS, Chan DC, Hsieh CB, Huang MH, Yu JC. The mechanisms of failure of totally implantable central venous access system: analysis of 73 cases with fracture of catheter. Eur J Surg Oncol 2010;36:100–3.
8. Nayeemuddin M, Pherwani AD, Asquith JR. Imaging and management of complications of central venous catheters. Clin Radiol 2013;68:529–44.
9. Shimizu T, Mekata E, Murata S, Yamamoto T, Tani T. A case of catheter fracture of a totally implantable access port introduced through the right internal jugular vein. J Surg Oncol 2011;103:460–1.
10. Nagasawa Y, Shimizu T, Sonoda H, Chou H, Mekata E, Tani T. Is catheter rupture rare after totally implantable access port implantation via the right internal jugular vein? Report of a case. Surg Today 2013, http://dx.doi.org/10.1007/s00595-013-0631-4. Published 2013 Jun 4.
11. Harrison E, Lal S. Central venous catheter embolisation. BMJ Case Rep 2012, http://dx.doi.org/10.1136/bcr-2012-007249. Published 2012 Nov 21.
12. Liu JC, Tseng HS, Chen CY, Chen MS, Chang CY. Percutaneous retrieval of 20 centrally dislodged Port-A catheter fragments. Clin Imaging 2004;28:223–9.
13. Cheng CC, Tsai TN, Yang CC, Han CL. Percutaneous retrieval of dislodged totally implantable central venous access system in 92 cases: experience in a single hospital. Eur J Radiol 2009;69:346–50.
14. Mirza B, Vanek VW, Kupensky DT. Pinch-off syndrome: case report and collective review of the literature. Am Surg 2004;70:635–44.

Open Access
This article is published Open Access at sciencedirect.com. It is distributed under the IJSCR Supplemental terms and conditions, which permits unrestricted non commercial use, distribution, and reproduction in any medium, provided the original authors and source are credited.