Cardiology in the Young

cambridge.org/cty

Brief Report

Cite this article: Bishnoi S, Banerji N, Champaneri B, and Deodhar S (2023) Transcatheter retrieval of embolised fractured peripherally inserted central catheter: a nightmare in very low birth weight preterm neonate. *Cardiology in the Young* **33**: 806–809. doi: 10.1017/S1047951122002761

Received: 10 May 2022
Accepted: 1 August 2022
First published online: 1 September 2022

Keywords:
PICC line; Very low birth weight neonate; Embolisation

Author for correspondence:
Dr. Bhavik Champaneri, Associate Professor, Department of Cardiology, UNMICRC, Civil Hospital Campus, Asarwa, Ahmedabad-380016, Gujarat, India. Tel: 91-9020278866; Fax: 079-22682092.
E-mail: champaneribhavik7@gmail.com

© The Author(s), 2022. Published by Cambridge University Press.

Transcatheter retrieval of embolised fractured peripherally inserted central catheter: a nightmare in very low birth weight preterm neonate

Suresh Bishnoi[1], Nayan Banerji[1], Bhavik Champaneri[2] and Shilpa Deodhar[2]

[1]Department of cardiology, U.N.Mehta Institute of Cardiology and Research Centre (UNMICRC), Civil Hospital Campus, Asarwa, Ahmedabad, Gujarat, India and [2]Department of Paediatric cardiology, U.N.Mehta Institute of Cardiology and Research Centre (UNMICRC), Civil Hospital Campus, Asarwa, Ahmedabad, Gujarat, India

Abstract

Peripherally inserted central catheters are commonly used for intravascular access in low birth weight neonates. Here, we describe a case of transcatheter retrieval of an embolised peripherally inserted central catheter line in the right ventricle extending to the left pulmonary artery in a preterm very low birth weight baby. To the best of our knowledge, this is the first case where transcatheter retrieval of embolised peripherally inserted central catheter line has been done from the left pulmonary artery in such a very low birth weight preterm neonate. Although retrieval of foreign body is common in adults and older children, very few case reports have documented successful retrieval of embolised peripherally inserted central catheter line in very low birth weight neonates using interventional techniques. Most of the cases in literature reported retrieval of an indwelling umbilical venous catheter rather than a peripherally inserted central catheter line as in our case. Also, none of these cases had the embolised fragment retrieved from the left pulmonary artery. This approach was technically very challenging as we were taking care of a 5-day old preterm neonate born at 32 weeks of gestation having very low birth weight (1100 g) with features of clinical sepsis, coagulopathy, and embolised catheter fragment extending from right ventricle to left pulmonary artery. The procedure was uneventful without any complication and the catheter was retrieved successfully.

Peripherally inserted central catheters line are being increasingly used for reliable intravascular access in low birth weight neonates, which can be used effectively for a prolonged time of period like, long duration of antibiotic therapy, total parenteral nutrition, chemotherapy regimen or for administration of medications that should not be done peripherally (e.g. inotropes) as well as repeated blood samplings.[1–3] It is a catheter that is introduced percutaneously at a peripheral site which extends into the superior or inferior vena cava and remains there for days or weeks. Although these lines are generally safe and effective, complications do occur which include thrombus formation, catheter occlusion, infection, and fractured catheter fragment embolisation.[3] Few case reports have documented successful retrieval of embolised umbilical venous catheter in low birth weight infants by transcatheter approach.[4–8] Here, we describe a case of transcatheter retrieval of an embolised peripherally inserted central catheter line in the right ventricle extending to the left pulmonary artery in a 1100 g baby. To the best of our knowledge, this is the first case where transcatheter retrieval of peripherally inserted central catheter line has been performed from the left pulmonary artery in such a very low birth weight pre-term neonate.

Case report

A very low birth weight (1100 g) male neonate born out of non-consanguineous marriage at 32 weeks of gestation was referred to our centre on day 4 of life for retained fractured segement of peripherally inserted central catheter line which embolised to the heart. On admission, the baby was haemodynamically stable with oxygen saturation of 96% at room air, heart rate of 130 beats *per* minute, respiratory rate of 50 *per* minute, and capillary refilling time of 2 s. On clinical examination, there was no evidence of cyanosis or murmurs and femoral pulses were palpable. The baby had features of clinical sepsis as evidenced by deranged blood counts, thrombocytopenia, elevated inflammatory markers, and coagulopathy. Blood culture was sent and IV antibiotics were started empirically based on the existing ICU protocol. Chest radiograph showed normal bronchovascular markings with no evidence of cardiomegaly; however, it

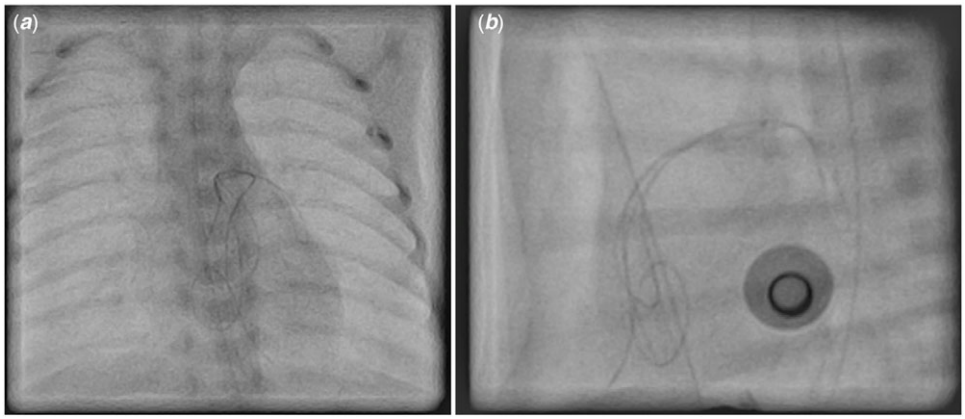

Fig. 1. (***a***) AP view and (***b***) Lateral view showing Peripherally Inserted Central Catheter extending from right ventricle to the left pulmonary artery.

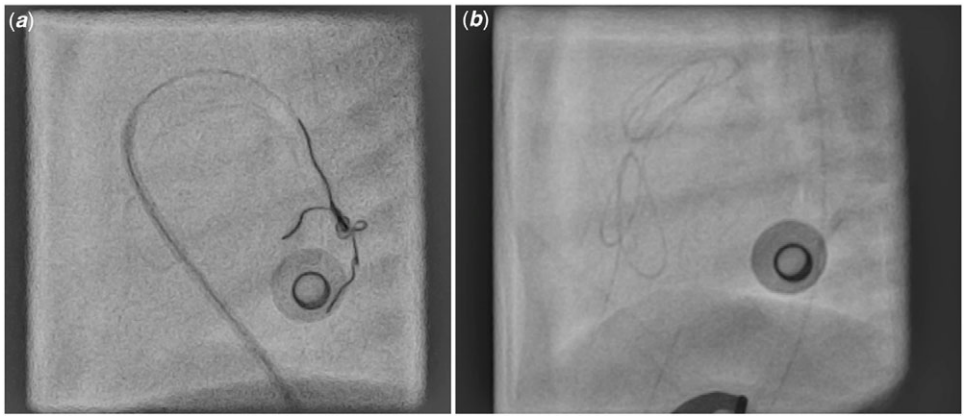

Fig. 2. (***a***) Lateral view showing peripherally inserted central catheter line entangled between the two Balance Middle Weight coronary wires [Wire Entanglement technique]. (***b***) Lateral view showing peripherally inserted central catheter line pulled out in main pulmonary artery by entanglement technique.

confirmed the presence of peripherally inserted central catheter line inside the cardiac silhouette. Electrocardiogram was suggestive of normal sinus rhythm with no pre-mature beats and no cardiac chamber enlargement. Bedside echocardiography showed the presence of patent foramen ovale in an otherwise structurally and functionally normal heart with presence of hyperechoic central line (peripherally inserted central catheter line) extending from right ventricular cavity to the left pulmonary artery.

After initial stabilisation and obtaining written informed consent, neonate was taken for transcatheter retrieval of the peripherally inserted central catheter line under strict aseptic measures inside the cardiac catheterisation lab (Philips Azurion). Meticulous steps were taken to avoid hypothermia like, use of pre-warmed linen and bedsheets, adjustment of catheterisation room temperature, use of pre-warmed betadine for painting of local body parts, rectal temperature monitoring, and use of warm saline during procedure. Heparin was judiciously used since neonate had coagulopathy and thrombocytopenia. The procedure was performed under conscious sedation without using general anaesthesia.

Right femoral venous access was taken using 24-gauge cannula and a 0.014" coronary guide wire and 4 Fr radial Sheath (Terumo Glide sheath) was introduced. Cinefluroscopy showed peripherally inserted central catheter line extending from right ventricular to left pulmonary artery. (Fig. 1a,1b) A 0.014" BMW (Balanced Middleweight Universal, Abott) wire was introduced across right ventricular and parked inside the left pulmonary artery. 4Fr JR (JUDKINS RIGHT) catheter was negotiated over the wire up to the main pulmonary artery. Due to difficult angulation of left pulmonary artery, it was very difficult to advance the catheter inside left pulmonary artery. Hence, another 0.014" Balance Middle Weight wire was advanced through the catheter inside the left pulmonary artery. The peripherally inserted central catheter line was entangled between the two Balance Middle Weight wires by rotating both the wires over each other Wire Entanglement technique. (Fig 2a) After peripherally inserted central catheter line was entangled between two Balance Middle Weight wires, it was pulled out slowly under fluoroscopic guidance. Since entanglement assembly got released, peripherally inserted central catheter line was pulled out until main pulmonary artery only. (Fig 2b) Afterwards, a 4Fr Amplatz gooseneck snare with 10 mm diameter was introduced into the main pulmonary artery through the catheter, peripherally inserted central catheter line was snared and removed en-masse through the femoral venous access under fluoroscopic guidance. (Fig. 3a,3b).

Post-retrieval cinefluoroscopy showed the absence of any residual segment of the line anywhere in the body. (Fig 4) Bedside echocardiography also confirmed the absence of residual fragments inside the heart. Post procedure, the sheath was removed and haemostasis was achieved by local compression.

The baby was haemodynamically stable during the procedure and was shifted back to paediatric cardiac ICU for observation. He was discharged and referred back to the referring hospital for further neonatal care.

Discussion

Peripherally inserted central catheter lines are widely used in neonatal ICU for rapid and dependable central venous access

https://doi.org/10.1017/S1047951122002761 Published online by Cambridge University Press

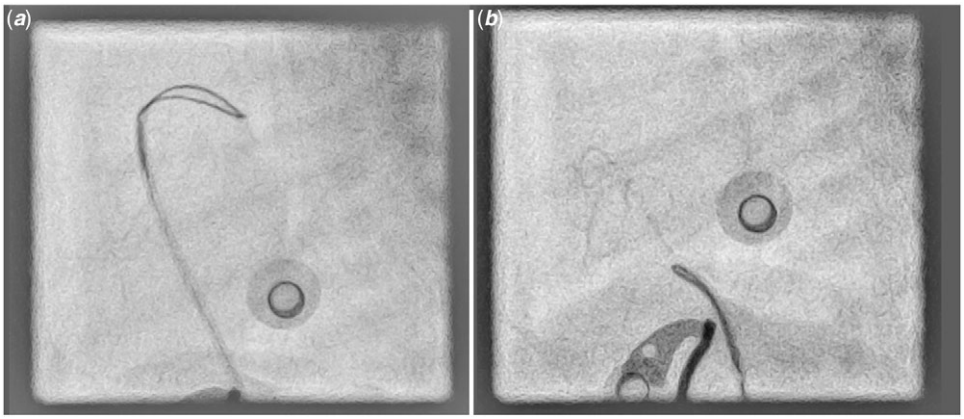

Fig. 3. (***a***) 4 Fr Amplatz gooseneck snare with 10 mm diameter in main pulmonary artery. (***b***) Embolised fragment of peripherally inserted central catheter line being snared out.

Fig. 4. Post retrieval cinefluoroscopy shows absence of any residual segment of the Peripherally inserted central catheters line.

in pre-term babies for long term vascular access. Several complications involving peripherally inserted central catheter line have been described including local complications, catheter migration, malposition, thromboembolism, infection, and fracture of the catheter causing embolisation.

The first transcatheter retrieval of an intravascular foreign body can be attributed to Porstmann in connection with his catheter technique for ductal closure. Porstmann's foreign body was a guide spring deliberately passed across the ductus and not an accidentally embolised fragment of guidewire or tubing.[9]

Removal of a centrally embolised foreign body is indicated in almost all cases because of the high incidence of complications. Mortality is highest with the embolised fragment located in the right side of the heart and slightly lower in the vena cava. Among the causes of death, perforation of the cardiac chamber is the most common followed by septic endocarditis, arrhythmia with heart failure, thrombus involving the vena cava with subsequent pulmonary embolism, and necrosis of the cardiac wall.[10]

Although foreign body retrieval is very common in adults and older children, very few case reports have mentioned successful retrieval of the embolised central venous catheter in very low birth weight neonates using interventional techniques.[4–8] However, most of these cases dealt with an indwelling umbilical venous catheter rather than a peripherally inserted central catheter line as in our case. Also, none of these cases had the embolised fragment retrieved from the left pulmonary artery.

Percutaneous retrieval is ideal being less invasive. This approach was technically very challenging in our case as we were dealing with a 5 days old pre-term neonate born at 32 weeks of gestation having very low birth weight of 1100 g, with features of clinical sepsis, coagulopathy and embolised catheter fragment extending from right ventricular to left pulmonary artery. Due to the small calibre of blood vessels, it was challenging to obtain the appropriate sized sheath and interventional catheters for the needed access. Few cases were described in the literature where 4 or 5 Fr sheaths were used successfully.[4–8] Though the catheter could be snared, it was often found to be difficult to retrieve it back into a 4Fr sheath as the catheter fragment was looped, thus limiting the success of its retrieval using this technique.

In our case, we retrieved the peripherally inserted central catheter line successfully from the left pulmonary artery by using wire entanglement technique followed by use of 4Fr Amplatz gooseneck snare (10 mm) in such a very low birth weight neonate under conscious sedation (without GA) with high risk of bleeding due to coagulopathy and thrombocytopenia. Other techniques for retrieval of a foreign body such as retrieval baskets, biopsy forceps, and small balloon techniques have been well documented.[11]

Several complications which are possible while attempting retrieval of a catheter from left pulmonary artery includes risk of haemorrhage, infection, dysrhythmias, cardiac perforation, pericardial effusion, cardiac tamponade, thromboembolism, sudden cardiac arrest, and limb ischaemia. However, our procedure was uneventful without any complication and the catheter was retrieved successfully.

Conclusion

Although it is very challenging to retrieve embolised central catheters from heart, with meticulous planning retrieval can be performed safely in very low birth weight newborns.

Acknowledgements. We are thankful to the team of Anesthetist, Intensivists, Pediatricians, Nursing staff and all clinical staff of the institute for taking good care of all the children.

https://doi.org/10.1017/S1047951122002761 Published online by Cambridge University Press

Financial support. This work was supported by U. N. Mehta Institute of Cardiology and Research Centre itself and received no specific grant from any funding agency, commercial, or not-for-profit sectors.

Conflict of interest. None.

References

1. Chopra V, Flanders SA, Saint S, et al. The Mmichigan Aappropriateness Gguide for Iintravenous Ccatheters (MAGIC): Rresults Ffrom a Mmultispecialty Ppanel Uusing the RAND/UCLA Aappropriateness Mmethod. Ann Intern Med 2015; 163: S1–S40.
2. "Guidelines for the Prevention of Intravascular Catheter-Related Infections". Centers for Disease Control and Prevention. Centers for Disease Control and Prevention. Retrieved July 23, 2019.
3. Westergaard B, Classen V, Walther-Larsen S. Peripherally inserted central catheters in infants and children - indications, techniques, complications and clinical recommendations: PICCs in children. Acta Anaesth Scand 2013; 57: 278–287.
4. Hsu YY, Wang CR, Yeoh HA, Lin JL. Endovascular retrieval of an embolized central venous catheter in a neonate of very low birth weight. AJR Am J Roentgenol 1998; 171: 276–277.
5. Brion LP, Kerr A, Weinberg G, Goldman H. Umbilical venous catheter retrieval under fluoroscopy in a very low-birth-weight infant. Am J Perinatol 1998; 15: 93–95.
6. Young T, Shaddy RE. Successful percutaneous retrieval of an intracardiac catheter fragment in an 800-g premature infant. J Perinatol 2003; 23: 67–68.
7. Nigam A, Trehan V, Mehta V. Umbilical venous catheter retrieval in a 970 gm neonate by a novel technique. Ann Pediatr Cardiol 2014; 7: 52–54.
8. Patel J, Ramarao S, Desai J, Savich R, Patel A. A case report of embolized umbilical venous catheter retrieval from the heart via femoral access in 660 g premature neonate. Radiol Case Rep 2019; 14: 1415–1419. DOI 10.1016/j.radcr.2019.09.006.
9. Porstmann W, Wierny L, Warulce H. Closure of persistent ductus arteriosus without thoracotomy. German Med Monthly 1967; 12: 1.
10. Grabenwoeger F, Bardoch G, Pock W, Pinterihis F. Percutaneous extraction of centrally embolized foreign bodies: a report of 16 cases. Br J Radiol 1988; 61: 1014–1018.
11. Paulus BM, Fischell TA. Retrieval devices and techniques for the extraction of intravascular foreign bodies in the coronary arteries. J Interv Cardiol 2010; 23: 271–276.

https://doi.org/10.1017/S1047951122002761 Published online by Cambridge University Press