Learning from neonatal clinical incidents: a rare complication of lower limb PICC insertion

British Association of Perinatal Medicine
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PATIENT SAFETY
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There have been two recent cases in Scotland where malpositioned peripherally inserted central catheters (PICCs) have resulted in extravasation of parenteral nutrition and lipid into the cerebrospinal fluid (CSF) with significant neurological sequelae for the infants involved. The purpose of this article is to highlight learning points from the incidents to those providing day-to-day care for babies

The cases

In both cases the PICC lines were inserted in the left long saphenous vein and positioning on initial anteroposterior X-rays was thought to be acceptable. Both infants developed neurological symptoms (abnormal movements, irritability, seizures) as extravasation occurred. A lumbar puncture in both cases revealed high levels of triglycerides in the CSF. Both infants have been left with profound neurological impairment and a need for intermittent catheterisation.

These cases highlight a very rare complication of lower limb PICC line insertion. A PICC line inserted in the left long saphenous vein can deviate and enter the epidural venous plexus (a network of small thin-walled veins) via the left ascending lumbar vein, which runs posterior and parallel to the inferior vena cava (IVC) (**FIGURE 1**). If vein perforation occurs, fluid from the PICC can infuse into the CSF and cause neurological damage.

Learning points

There are always lessons to be learned from clinical incidents no matter how appropriate the management has been:

- Insertion of a PICC into the ascending lumbar vein is a rare but well-documented complication. The majority of cases where this has been reported are associated with PICC lines placed in the left long saphenous vein. Where practical and possible, consider insertion in other sites prior to using the left leg.
- On anteroposterior X-ray, check the line position. A left saphenous PICC should track from the leg into the abdomen via the left iliac vein. It should cross the midline at lumbar spinal segments L4/5 to run on the right side of the vertebral column in the IVC.
- There should be no tortuosity in the path of the PICC line. Tortuosity could be a sign that it is in a small vessel.
- If a left lower limb PICC does not cross the midline as expected (**FIGURE 2**) or has a tortuous course (**FIGURE 3**), consider a lateral X-ray and discussion with the radiology department.

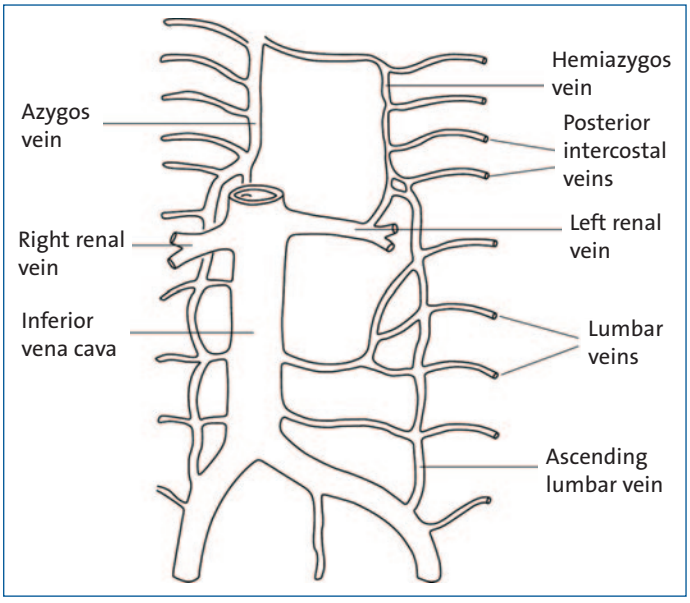

FIGURE 1 Anatomy of the left ascending lumbar vein. Malposition of a PICC into the ascending lumbar vein can be a complication of lower limb insertion.

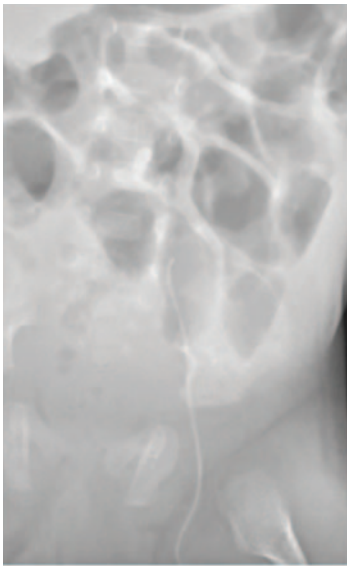

FIGURE 2 A malpositioned PICC that has not crossed the midline and remains on the left side of the vertebral column.

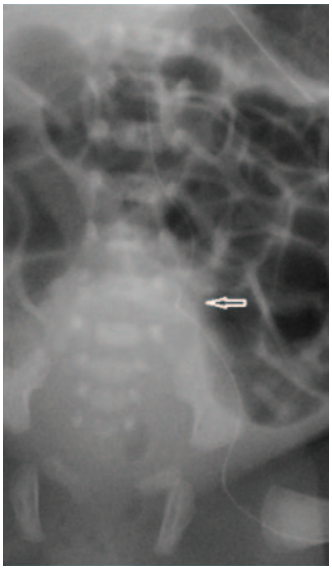

FIGURE 3 A PICC line with a tortuous course (arrow) that does not cross the midline to run on the right side of the vertebral column.

- In the case of PICC malposition, a lateral X-ray will demonstrate posterior deviation of the line towards the vertebral column (**FIGURE 4**).
- Extravasation of parenteral nutrition or lipid into the CSF can cause varying neurological signs including irritability, abnormal movements, seizures and hypotonia.
- CSF that is 'milky' white or has high triglyceride content is pathological and should alert clinicians to this rare complication.
- Remove a PICC line promptly if this complication is suspected.

Parental consent

The parents of both babies gave consent for dissemination of this learning bulletin.

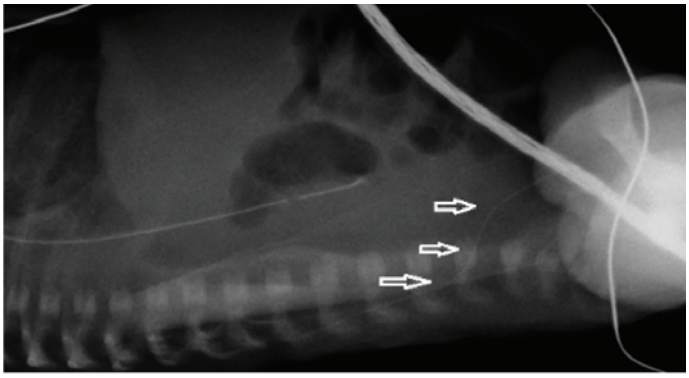

FIGURE 4 A lateral X-ray demonstrating posterior deviation (arrows) of the PICC line towards the vertebral column.

RESEARCH NEWS

Outcomes of extremely preterm babies: an international comparison

An article published in *Pediatrics* explores international differences in the classification of births at extremely low gestation and the subsequent impact on the calculation of survival rates. National data from the US, Canada, the UK, Norway, Finland, Sweden and Japan was used to compare neonatal survival rates using different denominators: all births, births alive at the onset of labour, live births, live births surviving to one hour, and live births surviving to 24 hours.

For births at 22 weeks' gestation, neonatal survival rates using live births as the denominator varied from 3.7-56.7% among the seven countries. This variation decreased when the denominator was changed to include stillbirths and fetuses alive at the onset of labour or excluded early deaths and limited to births surviving for at least 12 hours. Similar trends were seen for infants born at 23 weeks' gestation but variation diminished considerably at 24 and 25 weeks' gestation.

The authors concluded that international variation in neonatal survival rates arises in part from differences in the proportion of births reported as live births, which itself is closely connected to the provision (or not) of active care.

Reference

Smith L.K. et al. An international comparison of death classification at 22 to 25 weeks' gestational age. Pediatrics 2018;142 e20173324.

Three in five babies not breastfed in the first hour of life

The World Health Organization and Unicef have published a report on breastfeeding immediately after birth in which it is estimated that 78 million babies – or three in five – are not breastfed within the first hour of life, putting them at higher risk of death and disease and making them less likely to continue to breastfeed. Most of these babies are born in low- and middle-income countries.

The report notes that newborn babies who breastfeed in the first hour are significantly more likely to survive. Even a delay of a few hours after birth poses life-threatening consequences. The report, *Capture the Moment*, analyses data from 76 countries and is available to download at www.unicef.org/eca/reports/capture-moment.

Credit: Unicef/Quintos.

SACN reports on feeding in the first year of life

The Scientific Advisory Committee on Nutrition (SACN) has published its report *Feeding in the First Year of Life*, which provides recommendations on infant feeding from birth up to 12 months of age.

SACN recommends babies are exclusively breastfed until around six months of age and that they continue to be breastfed for at least the first year of life. Additionally, solid foods should not be introduced until around six months to benefit the child's overall health. By around six months of age, infants are usually ready to accept foods other than breast milk or formula. SACN concludes breastfeeding makes an important contribution to infant and maternal health, however breastfed infants up to 12 months should receive a daily supplement of vitamin D.

The committee recommends strengthening advice regarding the introduction of peanuts and egg – advice on complementary feeding should state these foods can be introduced from around six months of age and need not be differentiated from other solid foods. It also recommends monitoring the prevalence of overweight and overfeeding in infants, and ways to address high energy intakes in this age group.

The report can be downloaded at www.gov.uk/government/publications/feeding-in-the-first-year-of-life-sacn-report

Saving Babies' Lives Care Bundle can prevent over 600 stillbirths a year

An estimated 600 stillbirths annually could be prevented if maternity units adopt national best practice, according to an independent evaluation led by Professor Alexander Heazell, Clinical Director of the Tommy's Stillbirth Research Centre in Manchester, and Professor of Obstetrics at the University of Manchester.

Clinical improvements such as better monitoring of a baby's growth and movement in pregnancy, as well as better monitoring in labour, mean that maternity staff have helped to save more than 160 babies' lives across 19 maternity units. The detailed report, *Evaluation of the implementation of the Saving Babies' Lives Care Bundle in early adopter NHS Trusts in England*, shows that stillbirths fell by a fifth at the maternity units where the Saving Babies' Lives Care Bundle had been implemented. The best practice guidance is now being introduced across the country and has the potential to prevent an estimated 600 stillbirths a year.

The Saving Babies' Lives Care Bundle is part of a plan by NHS England to make maternity care safer and more personal. Key successes identified in the report include:

- reducing smoking in pregnancy
- improved monitoring and detection of small babies
- raising awareness of reduced fetal movements.

See the full report at: www.manchester.ac.uk/discover/news/action-plan-can-prevent-over-600-stillbirths-a-year.

Pulse oximetry screening helps identify CCHDs in newborn infants

Newborn infants with critical congenital heart defects (CCHD) are often asymptomatic at birth yet early detection increases the chance of successful treatment. A review published in the *Cochrane Database of Systematic Reviews* set out to determine the diagnostic accuracy of pulse oximetry by evaluating 21 studies of 457,202 babies where it was used as a screening test for CCHDs.

These results showed that for every 10,000 apparently healthy late preterm or full-term newborn infants, six will have a CCHD. Screening by pulse oximetry will detect five of these infants but one case will be missed. It will falsely identify 14 infants out of the 10,000 as having a suspected CCHD when they do not although waiting until babies are at least 24 hours old will minimise the number of false positives.

This new evidence supports the introduction of pulse oximetry as an additional screening test for CCHDs in asymptomatic newborns alongside existing methods (prenatal ultrasonography and postnatal clinical examination).

Reference

Plana M.N. et al. Pulse oximetry screening for critical congenital heart defects. Cochrane Database Syst Rev 2018;3: CD011912.

First ever study of serious case reviews of SUDI conducted

For the first time in England a study has been conducted of official investigations of sudden unexpected deaths in infancy (SUDI). The research was conducted by academics at the University of Warwick and published in *Archives of Disease in Childhood*.

The researchers examined 27 serious case reviews in England from April 2011 to March 2014. These were cases of infants aged up to two years for whom no clear medical or forensic cause of death was found. The review found that most SUDI cases occurred in hazardous sleep environments and were potentially preventable. Domestic violence, mental health problems and substance misuse were highlighted as factors. Most cases occurred when intoxicated parents shared sleeping surfaces with their child.

Reference

Garstang JJ, Sidebotham P. Qualitative analysis of serious case reviews into unexpected infant deaths. Arch Dis Childhood 2018 doi: 10.1136/archdischild-2018-315156.

Low birth weight linked to obesity, diabetes and hypertension in later life

A study published in the *Journal of Diabetes* has shown that low birth weight (<2,500g) is associated with subsequent obesity and a higher risk of type 2 diabetes and hypertension in adulthood. The researchers analysed data from two population-based cohort studies (11,515 men and 13,569 women) in China. The associations were observed even after adjusting for most socioeconomic and lifestyle factors in adulthood, such as educational level, income, smoking, alcohol consumption and exercise.

The authors conclude that low birth weight should be considered an important risk factor for obesity, diabetes and hypertension and may be used to identify high risk individuals.

Reference

Qinghua X.I.A. et al. Prospective cohort studies of birth weight and risk of obesity, diabetes, and hypertension in adulthood among the Chinese population. J Diabetes 2018 doi: 10.1111/1753-0407.12800.