

## Case Report

# Milky Cerebrospinal Fluid Following Migration of a Central Venous Catheter

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### Abstract

Recently, the use of percutaneously inserted central catheters (PICCs) is the mainstay procedure in premature infants, requiring long-term venous access for administration of medications and parenteral nutrition. The complications associated with PICCs placement have been reported including malposition, infection, thrombosis and catheter migration. We reported an extremely low birth weight infant presenting with lethargy associated with milky cerebrospinal fluid secondary to the administration of parenteral nutrition through right saphenous vein indwelling central catheter.

### Key words

*Catheter migration; Neonate; Peripherally inserted central catheter; Preterm*

### Case Report

A male neonate with a birthweight of 785 g and 29 weeks gestational age was delivered by caesarean section due to foetal distress. Apgar scores were 2 and 3 at 1 and 5 minutes, respectively and he was intubated and on mechanical ventilator after birth. During the first week of life, he had multiple problems including, respiratory distress syndrome, patent ductus arteriosus and spontaneous intestine perforate. On day 14, he had an operation to explore laparotomy with jejunal resection. During this time, the infant received total parenteral nutrition (TPN) via umbilical venous catheter. On day 16, a silastic central venous catheter (28-gauge Premicath, Vygon, Aachen, Germany) was inserted via the right saphenous vein. A plain radiograph without contrast showed

the line tip at fourth-lumbar vertebra level (L4). Infusion of TPN was commenced and enteral feeding with breast milk was introduced. Ten days later, the infant developed lethargy and desaturation. The physical examinations were normal, anterior fontanelle was not tense, there was no spasticity of the extremities and deep tendon reflex was normal. Lumbar puncture (LP) was performed and the appearance of cerebrospinal fluid (CSF) was cloudy yellow fluid (Figure 1). Laboratory analysis showed lipemic 4+, glucose 3577 mg/dL, protein 79.6 mg/dL, white blood cell 25700 cell/mm<sup>3</sup> and polymorphonuclear 99%. The serum triglyceride and glucose levels were 155 and 145 mg/dL, respectively. The C-reactive protein level was 210 mg/L. Meropenem and vancomycin were immediately prescribed through the peripheral line. There was no bacterial growth on CSF and blood. A lateral plain radiograph showed the line tip displaced posterior to lumbar spine (Figure 2). The bedside abdominal ultrasound could not visualize the line tip. After that, the catheter was removed. A repeat LP was performed after 7 days and CSF showed bloody appearance (traumatic tap), white blood cell 240 cell/mm<sup>3</sup> and polymorphonuclear 70%. The level of glucose and protein could not be evaluated due to inadequate amount of CSF. There was no bacterial growth on CSF. The duration of antibiotic drug was 14 days.

During admission, there was no neurologic symptom and the cranial ultrasound on week 3 of life revealed

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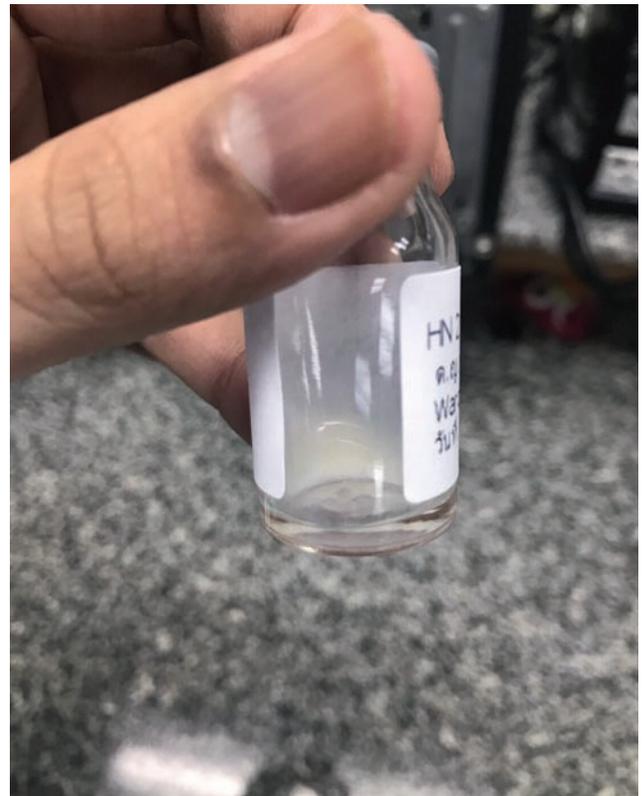
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bilateral intraventricular haemorrhage grade 1. Follow-up at the age of 12 months showed increase of muscle tone and deep tendon reflex was 3+. The developmental stimulation program was implemented and follow-up clinical assessment was performed at a local hospital.

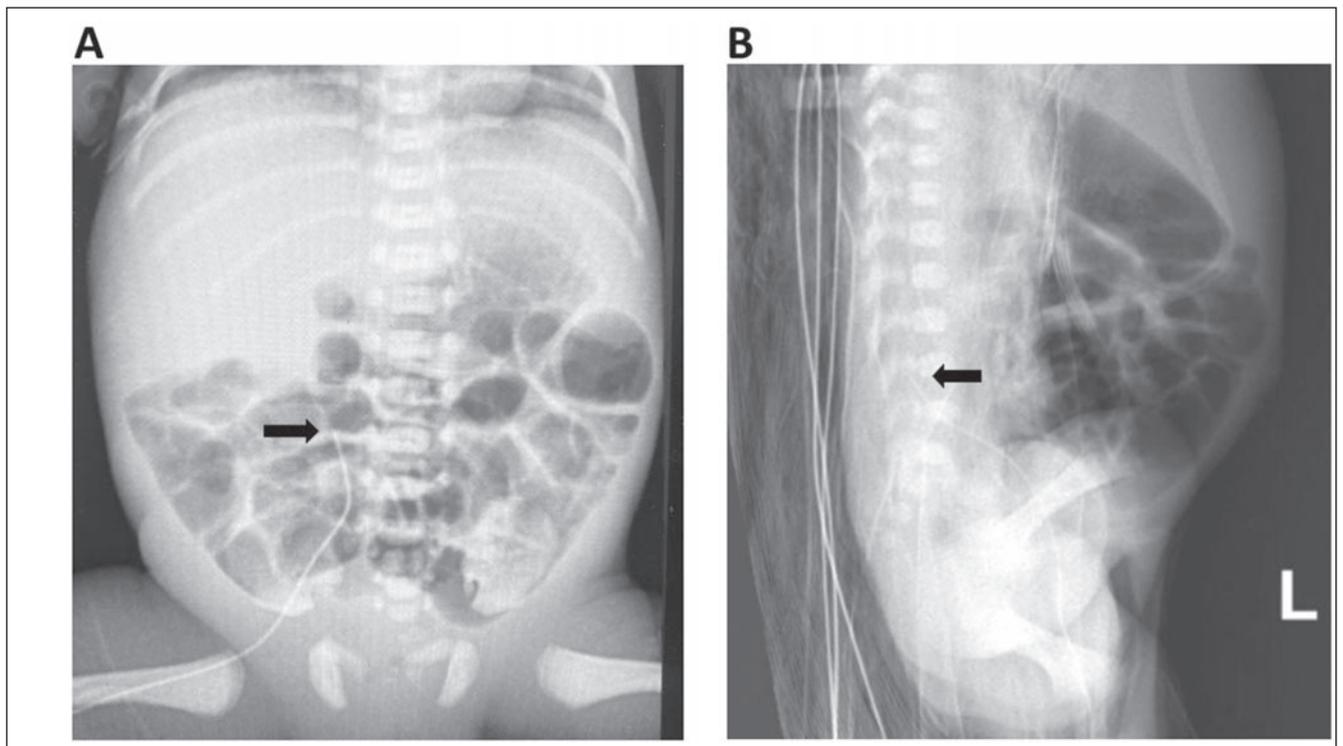
**Discussion**

In this case report, the patient developed lethargy with milky CSF while receiving TPN through a right saphenous percutaneous central venous catheter. CSF profile showed a pleocytosis of white blood cells with polymorphonuclear predominance. The first differential diagnosis was a bacterial meningitis. However, lipemic CSF and high level of glucose in CSF were the striking abnormalities. The leakage of TPN and mixed with the CSF fluid should be considered.

The complications associated percutaneously inserted central catheters (PICCs) placement have been reported, in which the incidence varied from 1.5-10%.<sup>1</sup> The common veins for PICCs placement are the basilic, cephalic, and axillary veins in the upper extremities and the saphenous and popliteal in the lower extremities.<sup>1,2</sup> The tip should be



**Figure 1** Cerebrospinal fluid showed a milky colour.



**Figure 2** Anteroposterior (A) and lateral (B) plain radiograph demonstrated the position of line tip of the catheter (L4 level).

located in the superior vena cava (SVC) just proximal to the right atrial junction when the catheter is inserted in the upper extremities. If the PICC line is inserted in the lower extremities, the catheter tip should be at inferior vena cava and avoid location at the level of fifth-lumbar vertebra (L5) to first-sacral vertebra (S1) which is the ascending lumbar veins (ALV) location.<sup>4</sup> The confirmation of the tip location was important. Radiopaque water-soluble contrast material should be performed, if the position of the catheter tip is not clear.<sup>3,4</sup> The other imaging is the ultrasonography which can also identify the tip position, however, the ultrasound should be performed by trained personnel.

According to previous publications, the migration of the catheter located on lower extremities may enter the contralateral femoral vascular system, the renal veins or the ALV and can cause extravasation of the fluid into peritoneal, retroperitoneal areas and epidural space.<sup>2,3</sup> In this case report, the tip was located at L4 level, however, we found leakage of TPN that mixed with the cerebrospinal fluid. Normally, the ALV emerges from the iliac veins at the level of L5-S1 and communicates with epidural veins in the spinal canal via bridging intervertebral veins.<sup>2</sup> When the catheter migrated to the ALV, TPN may have retrograde flow of fluid into the veins of the vertebral venous plexuses or the solution can cause endothelial damage which releases TPN into the epidural space. Furthermore, the tip can move to the spinal epidural plexus and enter the epidural space.<sup>2</sup>

Besides our case report, there were previous reports in the cases of TPN extravasation to CSF. Lachowska et al, reported the case of misplacement of catheter inserted via left saphenous vein. The patient developed lethargy and seizure and CSF profile showed milky appearance. The tip was located at L3-L4 level after the catheter insertion. However, the plain radiograph with contrast showed the catheterization of the left ALV and the contrast was found in the epidural space. There was no neurological sequelae and the patient had normal development at 1 year of age.<sup>5</sup> Katz et al, reported the preterm infant developed seizure on day 19 of life. The infant received TPN through a long intravenous line inserted via a scalp vein. The tip was located into the SVC. The CSF profile showed hyperglycorrachia due to diffusion into the CSF of TPN solution in the subdural space and the cranial ultrasound showed bilateral subdural collections. Aspiration and drainage the collection was performed and the clinical

condition improved rapidly.<sup>6</sup> Moreover, Clarke et al, reported two preterm infants had silastic lines inserted via the left saphenous vein and the plain radiograph without contrast showed the tip at L4 level. The infants developed lethargy and desaturation and lumbar puncture was performed. Parenteral nutrition solution was recovered in the cerebrospinal fluid. The infants were normal at neurodevelopmental follow up at 5 months and 24 months of age.<sup>3</sup>

As mentioned above, the extravasation of hyperalimentation fluid from the migration or malposition of PICCs can occur anytime. When the catheter tip takes an unexpected location, it may be malposition. The physician should obtain a lateral film to ensure that the tip has not entered ALV or renal veins. Ultrasonography and fluoroscope may be alternative imaging to assess the tip location. Moreover, the physicians should be careful to take care of the infants and seek a strategy to prevent the complications of indwelling PICCs, such as, secure the proper position of catheter, determine the catheter length daily or take serial radiographs.

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## Conflicts of Interest

The authors have no conflicts of interest relevant to this article.

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## Author Contributions

G.M. wrote the manuscript. A.T. reviewed and supervised the manuscript. G.M., W.J., S.D. and A.T. treated the patient. All authors read and approved the final manuscript.

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