

CLINICAL QUIZ (p120-121) ANSWER

Figure 1 showed the percutaneously inserted central catheter (PICC) tip located at the fifth intercostal space after insertion, and normal cardiac silhouette. Figure 2 showed enlargement of cardiac silhouette and right pulmonary field with exudative lesions. Bedside echocardiogram (Figure 3) indicated that pericardial effusion occurred with 1.0 cm width of sonolucent area. Furthermore, echocardiogram detected the tip of PICC was at the right atrium. Thus, a diagnosis of pericardial effusion associated with PICC was made. After the examinations of ultrasound and X-ray, the PICC was removed immediately, moreover, a milky liquid was aspirated from the right pleural cavity. Fortunately, the baby was stable and extubated on the second day. Ultrasound showed no pericardial effusion after 2 days.

PICC is an essential device to facilitate intravenous infusion of nutrition and medications for preterm babies in modern neonatal intensive care units. However, PICC may cause a series of complications including infection, thrombosis and displacement. Pericardial effusion, one of the complications, was rare but severe and life-threatening. Incidence of pericardial effusion associated with PICC insertion has been reported to be between 0.07% and 2%.^{1,2} The etiology of such a pericardial effusion is not very clear. One of the possible explanations has been related to the malposition of the PICC tips leading to endocardial damage. The ideal position for central venous catheters is at the junction of the superior or inferior vena cava and the right atrium.³ The myocardium in neonates may be vulnerable to injury since it is not completely muscularised. Repeated contact of the catheter tip with the cardiac wall with each contraction leads to endothelial cell damage if the tip of PICC was displaced into the atrium. Another possible explanation is related to the TPN solution injection through PICC. The hyperosmotic solutions may lead to increased vascular permeability.

In order to avoid such complication, strict PICC insertion guidelines must be adopted. First, PICC should only be used when it is absolutely essential. Second, the procedure of PICC insertion must follow pre-set standard guidelines and protocol. The possible length should be measured precisely with specific position (arm must be abducted), especially for very low birth weight infants. To prevent forward catheter movement, fixation of the catheter and skin should be properly secured. Third, the positions of PICC tip must be confirmed by X-ray after the insertion. Injection of contrast during radiographic exposure would ensure the accurate location even when radio-opaque catheters are used.^{1,4} Moreover, the position of PICC tip should be re-checked over time to avoid unexpected migration. Fourth, echocardiogram can help to monitor the position of PICC tips. As three days was the median time for pericardial effusion occurrence after PICC insertion,^{5,6} echocardiogram should be re-checked within 3 days to reduce the risk of pericardial effusion.

The baby in our case had developed life-threatening deterioration within hours. The differential diagnoses for a preterm baby with symptoms including apnoea, cyanosis, metabolic acidosis, hypoglycaemia and lactate can easily lead to the suspicion of infection or septic shock which is common in preterm babies. And muffled heart sounds, bradycardia and poor perfusion which are not specific signs for pericardial effusion are possibly related to heart failure. Therefore, the clinicians shall be cautious and not forget the possibility of pericardial effusion in neonates with PICC, particularly in babies who deteriorate rapidly without obvious reasons. Heart auscultation should be the first step when pericardial effusion is suspected and chest X-ray should be taken to compare the cardiothoracic ratio. In addition, the correct diagnosis should be proven by echocardiogram. Thus, a timely bedside echocardiogram is very useful and important. Table 1 shows the common reasons of pericardial effusion. Pericardial effusion associated with PICC induced trauma is one of the important causes.

Once the diagnosis of pericardial effusion is made, stopping all infusions through the PICC and removal of the catheter are essential. It is insufficient to retract the catheter unless it can relieve symptoms. Whether pericardiocentesis should be performed depends on volume of pericardial effusion or if cardiac tamponade happened. In our case,

pericardiocentesis was not done because the effusion was not massive. In addition, thoracocentesis needs to be performed if the pleural effusion (more than 1 cm) contained TPN liquid that is hardly absorbed. Usually, pericardial effusion would be absorbed within several days after PICC removal. Appropriate supportive treatments, like ventilation, maintenance of water and electrolyte balance, transfusion, etc. should be continued until the baby's condition become stabilised.

In conclusion, pericardial effusion is a rare but severe complication seen in neonates with PICC. A high index of suspicion should be maintained in neonates with hemodynamic and respiratory instability after PICC insertion and timely echocardiography should be performed to confirm the pericardial effusion.

Table 1 Causes of pericardial effusion

Causes

1. Idiopathic
 2. Infectious:
 - a. Viral
 - b. Bacterial including tuberculosis
 - c. Fungal
 - d. Parasitic
 3. Immune-mediated:
 - a. Collagen vascular disorders: SLE, Wegener's granulomatosis
 - b. Dressler's phenomenon
 - c. Drug-induced
 - d. Amyloid
 4. Endocrine: Hypothyroidism
 5. Neoplastic: Malignant effusions
 6. Cardiac:
 - a. Aortic dissection
 - b. Congestive heart failure
 - c. Post cardiac surgery
 - d. Post cardiac intervention
 7. Traumatic
 8. Radiation-related
 9. Renal: Uraemia
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References

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