CASE REPORT

Cardiac tamponade in a neonate: a dreadful condition—need for functional echo

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SUMMARY

Cardiac tamponade is a clinical emergency. Detection of a swinging heart rate is one of the earliest markers of large pericardial effusion, in which the four cardiac chambers are free to float in a phasic manner. We present a case of a preterm baby, one of the twins, who developed sudden onset of deterioration in the form of swinging heart rate, fluctuation in blood pressure and desaturation, requiring emergency intubation and inotropic support. Bedside functional echo was performed, which demonstrated cardiac tamponade; an immediate echocardiography-guided tap was initiated and fluid was aspirated from the pericardial space.

BACKGROUND

This case may serve as an eye opener for neonatal physicians, and underscores the need for knowledge of acute emergency procedures and for immediate intervention to save infants presenting with this serious condition.

CASE PRESENTATION

A female dichorionic diamniotic (DCDA) twin was born at 29 weeks of gestation by spontaneous vaginal delivery to a primigravida mother, and required intubation at birth. The mother had received a course of antenatal steroids. The baby was transported to neonatal intensive care unit (NICU). A few hours after admission, she was extubated to continuous positive airway pressure (CPAP) and was started on intravenous fluids and antibiotics. Parenteral nutrition (PN) was started through a 28-gauge premcath inserted into the right median cubital vein. The tip was seen in superior vena cava by anteroposterior chest roentgenogram (figure 1).

Two days after starting PN, the baby developed signs of deterioration in the form of a fluctuating

Figure 2 Poorly contracting chambers surrounded by pericardial fluid.

heart rate, dropping blood pressure and desaturation, and she looked blue in colour. Her heart sounds were muffled and peripheral pulses were feeble. She was immediately ventilated and emergency chest roentgenogram was called for, which pointed to a clinical diagnosis of suspected tension pneumothorax/cardiac tamponade/intraventricular haemorrhage.

Ultrasound of the cranium ruled out intraventricular haemorrhage. Chest roentgenogram revealed cardiomegaly but there was no evidence of pneumothorax (figure 1). Bedside echocardiography showed a poorly contracting heart surrounded by pericardial fluid (figures 2–5). Immediate echo-guided pericardiocentesis was performed and 15 mL of fluid was aspirated through subxiphoid approach (figures 6 and 7).

Figure 1 Chest roentgenogram showing cardiomegaly and tip of catheter in superior vena cava.

Figure 3 Normally contracting chambers after pericardiocentesis.

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Figure 4 M mode echocardiogram showing evidence of diastolic collapse of the right ventricular free wall.

The baby showed quick improvement in the form of increasing and stable heart rate, increase in saturation and dramatic improvement in colour. The tip of the peripherally inserted central catheter (PICC) line was seen in the right atrium. The PICC was immediately removed. Analysis of pericardial fluid is shown in [table 1](#) below. The fluid analysis was consistent with the PN composition. Within 12 h, the baby was extubated to CPAP and subsequently debronged. Currently, she is haemodynamically stable, on full enteral feeds, saturating well on room air and gaining weight. Chest roentgenogram performed after pericardiocentesis revealed reduction in the size of the heart ([figure 8](#)).

INVESTIGATIONS

- ▶ Chest roentgenogram
- ▶ Ultrasonography of the cranium
- ▶ Functional echocardiography
- ▶ Pericardial fluid analysis

DIFFERENTIAL DIAGNOSIS

- ▶ Pneumothorax
- ▶ Acute intraventricular haemorrhage
- ▶ Sepsis

Figure 5 Normal M mode echocardiogram after pericardiocentesis.

Figure 6 Echocardiography-guided pericardiocentesis.

TREATMENT

Pericardiocentesis

OUTCOME AND FOLLOW-UP

The baby survived and is doing well in NICU.

DISCUSSION

In premature infants, PN is an integral part of neonatal care. Usually, peripherally inserted long lines are used to administer the PN. Complications are not unusual with PICC lines inserted in preterm babies.^{1 2} Common complications are usually catheter related, such as infection, catheter block, migration of the catheter and pericardial effusion, thromboembolism, fracture of the catheter and difficulty in catheter removal. Pericardial effusion and cardiac tamponade are unusual complications of the indwelling catheter.³ Cartwright reported one case of pericardial effusion (non-lethal) after 2186 PICC lines had been inserted over a period of 19 years.⁴ Pathogenesis of pericardial effusion due to a catheter is not clear. It may be due to erosion of the vascular or cardiac wall by the tip of the catheter. With the end of the PICC line adhering to the myocardium, the perforation probably closes off. Total PN fluid, which is hyperosmolar, diffuses into the pericardial space creating the effusion and subsequently tamponade if not discovered.⁵ With increasing accumulation of pericardial fluid, intrapericardial pressure increases and begins to further affect right heart filling. The overall effect is to limit the total blood volume allowable within the four cardiac chambers and, therefore, to exaggerate the respiration-dependent ventricular volume interaction. When the intrapericardial pressure approaches normal filling pressures of the heart, it becomes the determining factor for passive intracardiac pressure. When intrapericardial pressure is above the normal filling pressure, the diastolic pressure in all the chambers becomes equalised. Left ventricular filling is less impacted than the right as it has stiffer walls.

Figure 7 Effusion fluid collected during pericardiocentesis.

Table 1 Analytes of pericardial aspirate

Specimen (pericardial fluid)	
Appearance	Turbid
WCC	22 cells/mm ³
Cell type	
Neutrophils	1022 cells/mm ³
Lymphocytes	1222 cells/mm ³
Triglycerides	248 mg/dL
Protein	0.2 g/dL
Glucose	161 mg/dL
Chloride	8.3 mmol/L

WCC, white cell count.

The US Food and Drug Administration (FDA) and UK Department of Health recommend that the tip of the catheter be placed outside the pericardial reflection, preferably in the superior vena cava, and that the position be confirmed by X-ray

Figure 8 Chest roentgenogram postpericardiocentesis.

and ultrasound.⁶ Catheter migration is a known cause of complications, as in our case, where the catheter tip, placed in the superior vena cava, migrated, possibly eroding the myocardium and causing effusion. Proper positioning of the limbs while performing chest roentgenogram and periodically checking the catheter position at least once in 2 days is important to avoid this life-threatening complication.⁷ In addition, pericardial effusion/cardiac tamponade should be suspected in any neonate with long-line deterioration. Although pericardial effusion and cardiac tamponade are rare complications of PICC lines, they carry a high mortality (60–100%).⁸

Learning points

- ▶ Pericardial effusion and cardiac tamponade are uncommon neonatal emergencies.
- ▶ They carry high mortality.
- ▶ All neonates requiring long lines are at risk for pericardial effusion and need careful monitoring and periodic checking on the position of the tip of the line.
- ▶ Early recognition and intervention can save the child.
- ▶ Bedside functional echo is a necessity when monitoring a neonate with sudden deterioration.

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Competing interests None.

Patient consent Obtained.

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