

# Cardiac tamponade following central line in premature neonate: Case report and review of the literature

R Shenoy

## Citation

R Shenoy. *Cardiac tamponade following central line in premature neonate: Case report and review of the literature*. The Internet Journal of Pediatrics and Neonatology. 2008 Volume 10 Number 1.

## Abstract

With improved survival of extremely premature neonates, use of peripherally inserted central catheter (PICC) lines has gained favor as a means for providing parenteral nutrition. Improvements in technology have made their use safe. Pericardial effusion (PE) and cardiac tamponade resulting from placement of a PICC line is a rare but serious complication. There is controversy about the ideal location of the tip of the PICC line. We present a case of cardiac tamponade secondary to a PE following PICC line placement. We also have reviewed the literature for this complication.

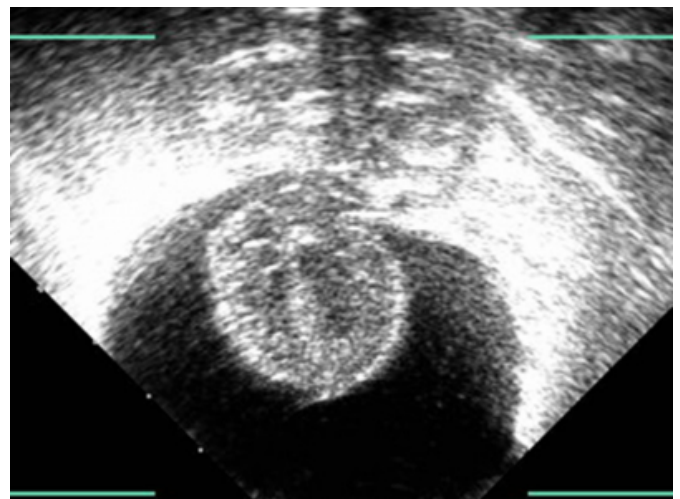
## CASE REPORT

The patient was born at 28 weeks of gestation by spontaneous vaginal delivery. On day three of life, a 28G Premicath catheter (Vygon GmbH & Co., Germany) was inserted through the right basilic vein. The tip of the catheter was noted to be within the right atrium by an anteroposterior roentgenogram. Three days after insertion of the catheter, the neonate started requiring increasing ventilatory support. This was associated with desaturations into the 60s, and hypotension with a systolic blood pressure of 40 mm Hg. On examination, the neonate appeared ashen in color. Peripheral perfusion was poor. On auscultation, the heart sounds were faint. A chest roentgenogram showed marked cardiomegaly, with a cardiothoracic ratio of 0.75. A two-dimensional echocardiogram was performed, and showed a massive pericardial effusion (Fig. 1A). There was diastolic collapse of the free wall of the right atrium, indicating cardiac tamponade. Pericardiocentesis was performed, and 30 ml of whitish fluid was aspirated (Fig. 1B). Fluid analysis revealed a glucose concentration of 912 mg/dL, triglyceride of 53 mg/dL, and total protein of 0.1 g/dL. There were 267 red blood cells/mm<sup>3</sup>, and 3 white blood cells/mm<sup>3</sup>. As the aspirated fluid was suggestive of total parenteral nutrition infusate, the central catheter was removed. There was no further accumulation of fluid, and a follow-up echocardiogram done three days after pericardiocentesis showed minimal fluid in the pericardial space. Pericardiocentesis was associated with an immediate improvement in oxygen saturation and blood pressure. The patient was weaned to nasal continuous positive airway

pressure four days after pericardiocentesis. The patient was subsequently discharged, and a chest roentgenogram done on routine follow-up four months later showed a normal cardiothoracic ratio.

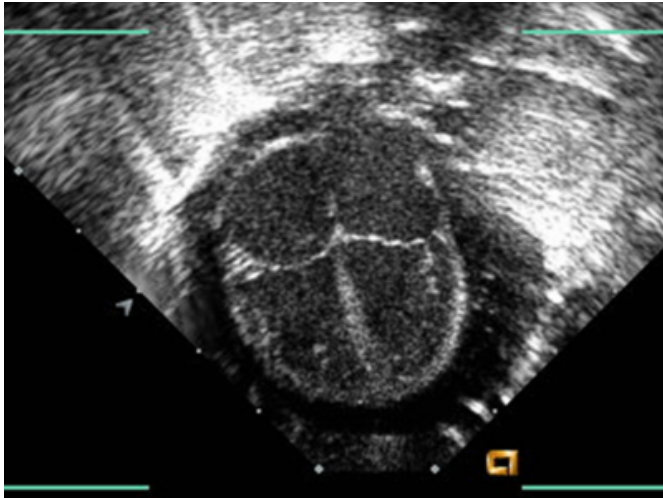
## Figure 1

Figure 1A: Initial echocardiogram shows a large pericardial effusion



**Figure 2**

Figure 1B: Following pericardiocentesis, the effusion is markedly decreased



**DISCUSSION**

Various complications have been reported following insertion of PICC lines. In a comprehensive review, Ramasethu [1] details catheter migration, effusion, neurologic complications including flaccid paraplegia and involuntary movements of the lower extremities, catheter-related sepsis, thromboembolism, catheter blockage, and an inability to easily remove indwelling catheters. PE and cardiac tamponade is an infrequent complication. The incidence of PE and cardiac tamponade is variable. Cartwright reported one case of a non-lethal PE after 2186 PICC lines had been inserted over a nineteen-year period[2]. Beardsall et al estimated the incidence to be 0.18%[3]. Nadroo et al reported a single-institution incidence of 0.76%[4]. Nowlen et al reported a review of 61 cases of PE, including 14 of their own[5]. Pezzati et al reported an incidence of 1.8% in an eight-year retrospective review of 280 PICC lines placed in 258 preterm newborns weighing less than 1,500 g[6].

The pathogenesis of this complication is unclear. It probably results from erosion of the vascular or cardiac wall secondary to contact with the end of the catheter. The perforation then probably seals, with the end of the PICC line adhering to the myocardium. The hyperosmolar fluid infused through the line then diffuses into the pericardial space creating the effusion.

There does not appear to be uniform agreement on the position of the tip of the catheter. The US Food and Drug Administration, the UK Department of Health, and most manufacturers recommend that the tip of the catheter be

placed outside the pericardial reflection, preferably in the superior vena cava. It is interesting to note, that the institution that reviewed a large consecutive series of neonates, and reported a very low incidence of this complication, has a policy of electively positioning the tip of the PICC line in the right atrium[2]. It is important that the position of the catheter be visualized by roentgenography. The position of the catheter can also be confirmed by ultrasonographic examination. Intra-atrial ECG monitoring can also be used to reduce the incidence of malpositioning.

Migration of the catheter might play a significant role in causing complications. Adduction of the arm might cause the tip of the catheter to move up to 15 mm. To prevent this from happening, some institutions dress the insertion site with a “bio-occlusive dressing” without using steri-strips. As all catheters manufactured in this day and age are radio-opaque, others perform X-Rays two times a week to monitor the position of the tip of the catheter.

While PE and cardiac tamponade with a PICC line is a rare occurrence, it has a mortality that approaches 62 – 100%[7]. The median duration from insertion to diagnosis is 3 days. Patients present with sudden cardiac collapse requiring cardiopulmonary resuscitation, or unexplained cardiorespiratory instability. Chest roentgenograms might not always show an increase in the cardiac silhouette. While an echocardiogram would help confirm the diagnosis, lack of its availability should not delay emergent pericardiocentesis, which is life-saving.

**CONCLUSION**

PICC lines have an important role in the management of premature neonates. PE and cardiac tamponade is a rare complication, but carries a high mortality. Most authorities recommend placing the tip of the PICC line outside the pericardial reflection in order to minimize the chance of this happening. Monitoring the position of the catheter by roentgenography is controversial. Occurrence of this complication is suggested by a sudden and rapid cardiorespiratory decompensation. Emergent pericardiocentesis is life-saving, and should not be delayed if an emergent roentgenogram or echocardiogram cannot be obtained.

**References**

1. Ramasethu J. Complications of Vascular Catheters in the Neonatal Intensive Care Unit. *Clin Perinatol* 2008;35:199-222.
2. Cartwright DW. *Arch Dis Child Fetal Neonatal Ed* 2004; 89: F504-F508

3. Beardsall K, White DK, Pinto EM, Kelsall AWR. Arch Dis Child Fetal Neonatal Ed 2003; 88: F292-F295
4. Nadroo AM, Lin J, Green RS, Magid MS, Holzman IR. Journal Ped 2001; 138(4): 599-01
5. Nowlen TT, Rosenthal GL, Johnson GL, Tom DJ, Vargo TA. Pediatrics 2002; 110:137-142
6. Pezzati M, Filippi L, Chiti G, Dani C, Rossi S, Bertini G, Rubaltelli FF. Central venous catheters and cardiac tamponade in preterm infants. Intensive Care Med 2004; 30(12): 2253-6
7. Hogan MJ. Neonatal vascular catheters and their complications. Radiol Clin North Am 1999; 37: 1109-1125.

**Author Information**

**Rajesh U. Shenoy, M.D.**

Division of Pediatric Cardiology, Department of Pediatrics, The Children's Hospital at Montefiore, Albert Einstein College of Medicine