

Pericardial Effusion Associated  
with Umbilical Venous Catheter  
Masquerading as Extubation FailurePoonam Singh<sup>1</sup> and Guntant Singh Eske<sup>2\*</sup><sup>1</sup>Department of Pediatrics, Delhi Newborn Centre, India<sup>2</sup>Department of Pediatrics, Gajra Raja Medical College, India

## Article Information

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Abbreviations PE: Pericardial Effusion; IVC: Inferior Vena Cava; HR: Heart Rate

## Abstract

Pericardial effusion is a rare but lethal complication of umbilical venous catheterization. We are reporting a case of preterm neonate developing pericardial effusion and tamponade in relation to umbilical venous catheter immediately after extubation which was confused as extubation failure. We are also elaborating a distinguished experience of external cardiac massage while resuscitating this baby. A gentle but ongoing cardiac compression was required to prevent bradycardia as described in this report.

## Introduction

Umbilical venous catheterization is a commonly performed procedure in the neonatal units. Pericardial Effusion (PE) with tamponade is a relatively uncommon but potentially fatal complication of umbilical venous catheterization. The reported frequency of PE and cardiac tamponade as a complication of neonatal long lines is 1.8 per 1000 catheters with a mortality of 30% [1]. We are describing a case of a preterm neonate with PE and tamponade in relation to Umbilical Venous Catheter (UVC) immediately after extubation which masqueraded as extubation failure and the peculiar findings of external cardiac massage experienced with this condition.

## Case report

An 1100 gm female infant born at a gestational age of 29+4 weeks was admitted in the neonatal intensive care unit with severe respiratory distress. She was ventilated and given surfactant. Umbilical venous catheterization was done and X ray revealed UVC tip placed just above the diaphragm. Parenteral nutrition, antibiotics and minimal enteral nutrition were started. After 12 hr, second dose of surfactant was also instilled in view of worsening respiratory distress and X ray showing reticulogranular pattern. Next day, infant was extubated to CPAP. On day 4, she was reintubated for recurrent apneas and hemodynamic instability. Inotropes were started and antibiotics were upgraded in view of positive sepsis screen. Echocardiogram done showed closed ductus arteriosus. X ray displayed hazzy lung fields with catheter tip lying just above the diaphragm. She improved over next 2 days. Infant's activity and respiratory efforts were good so planned extubation was done on day 6. Immediately after extubation, infant became off colored despite good respiratory efforts, nasal prongs in place and an intact CPAP circuit. Baby's saturations continued to decrease so ventilation was resumed keeping the possibility of extubation failure due to lung collapse or air leak. Transillumination done was normal. Meanwhile baby went into cardiac arrest so Cardiopulmonary Resuscitation (CPR) was started. During CPR, distinctive finding noted was immediate increase in Heart Rate (HR) as chest compressions were begun and compressions even less than the recommended depth of one third of antero posterior diameter of chest were able to maintain the HR in the range of 140 to 160. As HR was more than 60, an attempt was made to discontinue chest compressions but just after lifting the thumbs HR began to drop rapidly below 60. So chest compressions were continued, injection adrenalin bolus was also given but continuous gentle chest compressions were required to prevent bradycardia. Chest X ray done was apparently normal but catheter tip was located within the cardiac silhouette. CPR was continued and echo performed revealed PE with tamponade with small, compressed and poorly contracting heart. Infusion through UVC was stopped. Pericardiocentesis was done and 12 ml of milky fluid was aspirated. Echo repeated showed resolution of pericardial collection and good cardiac contractility. Chest compression was discontinued. Baby's HR and blood pressures were maintained with inotropes but blood gas done showed severe metabolic acidosis. Unfortunately the baby expired after 12 hours of diagnosis due to refractory shock. Repeated echoes done meanwhile did not show fluid recollection.

## Discussion

Umbilical venous catheterization is a common, relatively easy and quick method to gain central venous access. It is recommended to place UVC tip at the junction of Inferior Vena Cava (IVC) and right atrium which corresponds to 8<sup>th</sup>-9<sup>th</sup> thoracic vertebra on chest radiograph [2]. Most of the complications develop in relation to mal positioned catheters. As portions of both IVC and superior vena cava are intrapericardial so to avoid the complication of PE, the catheter tip should be placed not only outside the cardiac silhouette but also the intra-pericardial portion of these vessels (1 cm outside the cardiac silhouette in preterms and 2 cm in term neonates) [3].

PE associated with UVC may present as sudden cardiovascular collapse, unexplained cardiovascular instability or increase in cardiothoracic ratio on chest radiograph developing after a median time of 3.2 days of line insertion. [2,4]. Our patient presented on day 6 of life with cardiovascular instability immediately after extubation. Handling the baby during extubation might have resulted in catheter migration.

A high index of suspicion is required to diagnose the condition. Cardiac tamponade should be suspected in any infant with sudden cardiovascular deterioration with UVC in situ. Other clinical indicator noted here was quick improvement in HR with gentle chest compression and rapid decline in HR as compressions were discontinued. HR picked up immediately as compressions were resumed and a continuous light rhythmic chest compression was required to keep the heart beating at a normal rate. This is in contrast to the findings of Schulman et al who observed an unexpected resistance to sternal compression while doing cardiac massage in two infants with PE [5]. Difference between our observations could be due to variation in amount of fluid collection. We aspirated 10 ml of pericardial fluid from our patient whereas in Schulman's et al case series amount of pericardial fluid retrieved was 25 ml and 30 ml in two babies with gestational age and weight of 27 weeks, 984g and 28 weeks, 1080g respectively. Relatively less fluid collection in this case might have provided liquid cushion through which external chest compressions were easily transmitted to the heart whereas larger volume of fluid collection in Schulman's case series resulted

in myocardial encasement into a fluid filled inelastic container where bilateral thumb compression of the sternum produced minimal displacement. Management of PE includes immediate discontinuation of infusion and attempt to aspirate through the line which if remains unsuccessful warrants pericardiocentesis [6].

## Conclusion

PE should be suspected in neonates with cardiovascular instability and central venous catheter in situ. Gentle but ongoing need of chest compression required to sustain cardiac activity prompts the diagnosis of pericardial effusion. Echocardiography should be performed early if a neonate deteriorates suddenly with central venous catheters to diagnose pericardial effusion timely and guide pericardiocentesis.

## Contributors' Statement

Dr Poonam Singh managed the case and Dr Gunvant Singh Eske drafted the manuscript. Both the authors approved the final manuscript.

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